

*Powertech (USA), Inc.*  
*Pre-Permit Baseline*

Dewey-Burdock In Situ  
Uranium Project





DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES

JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182  
[www.state.sd.us/denr](http://www.state.sd.us/denr)

February 11, 2008

Dan Hoyer, Ph.D., P.E.  
Vice President  
RESPEC  
PO Box 725  
Rapid City, SD 57709

Re: Baseline Sampling Plan for Dewey-Burdock In Situ Uranium Project (January 2008)

Dear Dan:

The department has reviewed Powertech's Baseline Sampling Plan submitted January 28, 2008. Based on our review, we have developed the following comments:

**General**

1. In the table of contents, Table 3-2 (Constituents to Be Analyzed in Surface Water Samples) is not listed.
2. The QA/QC Plan in Appendix B appears to be inclusive of the "radiological" portion of the plan. If the baseline plan is intended to be comprehensive, Powertech needs to submit additional QA/QC information on the other portions of the plan (ground water sampling, etc.), or if the ground water sampling protocol referenced in Section 2.5, includes QA/QC provisions, it should be mentioned. The data quality objectives (DQO's) for water sampling should also be included.
3. As the revised sampling plan does not indicate when drilling of the new wells will be completed or when the actual baseline sampling will begin, it would be helpful to have an updated schedule for baseline data gathering activities.

**2.0 Ground Water Sampling Plan**

1. Section 2.3 Data Collection (page 3), this section identified available completion reports submitted for wells monitored quarterly (NRC wells). Completion reports and other logging information for the other groundwater sampling sites must also be submitted.



Sampling results from the NRC sampling program which focuses on nearby domestic wells should also be sent to the department.

2. In Section 2.5 Groundwater Sampling Subset, in addition to Figures 2-1 and 2-2 which show the monitoring well locations, Powertech should include a table of the well sites listing name or number, GPS locations (or approximate location), and other pertinent information.

### **3.0 Surface Water Sampling Plan**

1. In Section 3.3 Streams, in addition to Figure 3-2 which shows the stream monitoring locations, Powertech should include a table of the stream monitoring sites listing name or number, GPS locations (or approximate location), and other pertinent information. This table could be combined with Table 3-1, Surface Impoundment Sample Sites.

### **4.0 Radiological Sampling Plan**

1. As per ARSD 74:29:11:02 (2), the department must approve a preoperational environmental radiological monitoring plan. The plan shall include a radiation survey of proposed mine facilities area, to include process or recovery facility, ponds, impoundments, and wellfields. Has the plan outlined in Section 4.0 been submitted to the NRC, and if so, has the NRC approved it?

### **4.2 Air Monitoring Plan**

1. In Section 4.2 Air Monitoring, the first paragraph says that eight high-volume air monitoring stations are being used. However, Figure 4-1, High-Volume Air Monitoring Site Near Dewey-Burdock, only shows six stations. In addition to Figure 4-1, Powertech should include a table of the air monitoring sites listing name or number, GPS locations, and other pertinent information.
2. Also in Section 4.2 Air Monitoring, the first paragraph says that eight passive radon-222 detectors will be placed near each high-volume air sampler as well as seven other locations within the proposed permit boundary. The locations of these detectors should be shown on Figure 4-1 and should be included on a table listing name or number, GPS locations, and other pertinent information.

### **Appendix B Radiological QA/QC Plan**

1. The plan should include a list of names, organizations, titles identifying managers or personnel who have developed the plan.
2. There are numerous sections in the QA/QC Plan (1.6.2.2, 1.7.2.1, etc.) that reference Appendix "A". In the report Appendix A refers to the "Well Completion Reports", not to an associated Appendix A to the QA/QC Plan. This reference should be corrected. However, should the Appendix A mentioned in the QA/QC Plan be included (but renamed)?



3. Powertech should add two tables to the QA/QC Plan in Appendix B. The first table would list the standard operating procedures and manuals used in the project. The second table would list each type of instrument operated and have rows for each one showing the sections in each manual or standard operating procedure for calibration, operation, and maintenance.

Should you have any questions concerning these comments, please contact the Minerals and Mining Program.

Sincerely,

Michael Cepak, PE  
Natural Resources Engineering Director  
Minerals and Mining Program  
Telephone: (605) 773-4201  
E-mail: [mike.cepak@state.sd.us](mailto:mike.cepak@state.sd.us)

cc: Mark Hollenbeck, Powertech, Edgemont, SD



## RECORD OF EMAIL AND/OR PUBLIC CONTACT REPORT

CONFIDENTIAL

Route: \_\_\_\_\_

☒ NOT CONFIDENTIAL

cc: \_\_\_\_\_

Date of Email: January 3, 2008

DENR Employee Contacted: Mike Cepak

E-mail from: Cory S. Foreman

Name of Visitor: \_\_\_\_\_

Address: RESPEC  
3824 Jet Drive  
Rapid City, SD 57709-0725

Address: \_\_\_\_\_

Email Address: Cory.Foreman@respec.com

Telephone: (605) 394-6505

RE: Requested Monitoring Wells

Staff Signature: \_\_\_\_\_



Michael D. Cepak

1/03/08

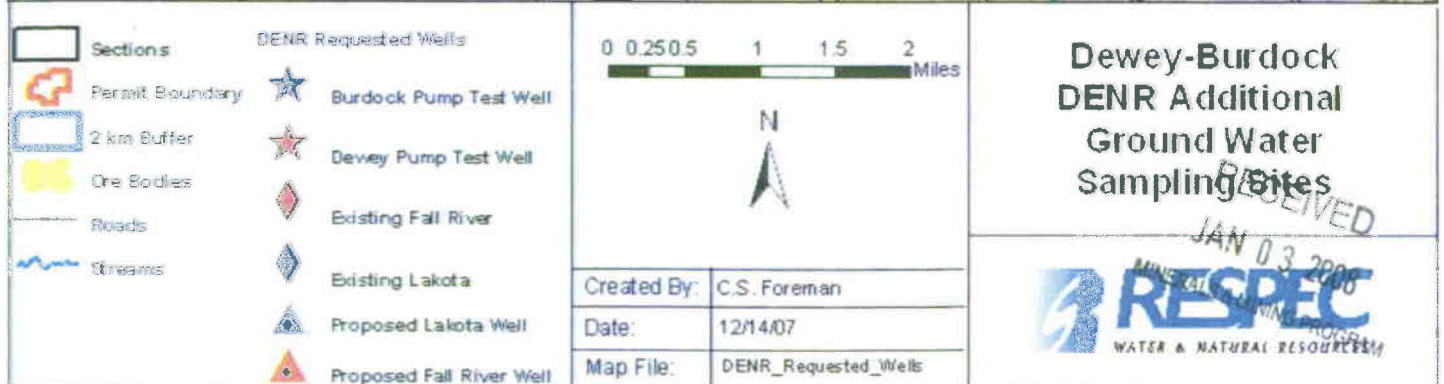
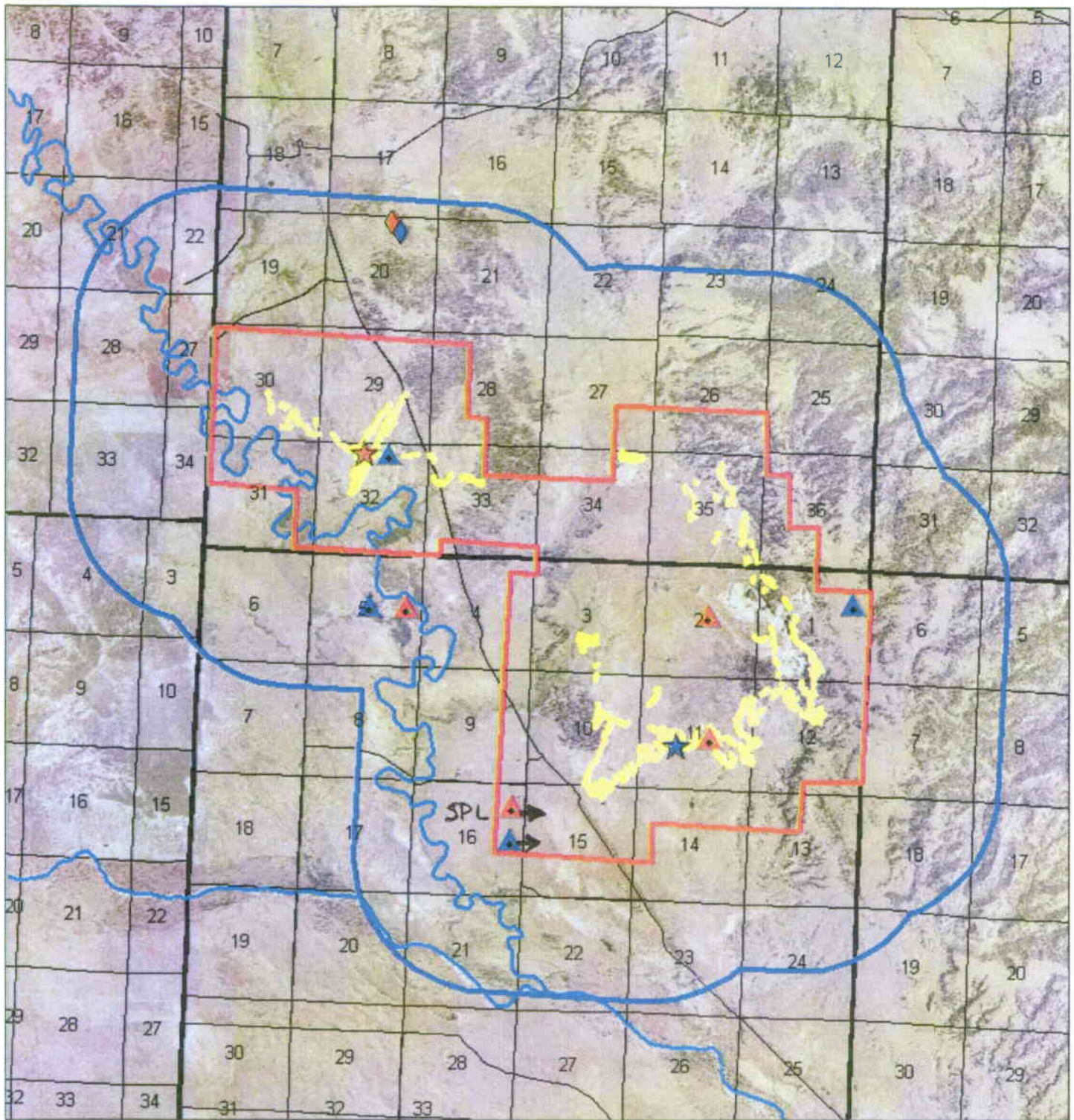
## COMMENTS:

**From:** Cory S. Foreman [mailto:]  
**Sent:** Thursday, January 03, 2008 10:09 AM  
**To:** Cepak, Mike  
**Subject:**

Recently you have had conversations with Dan Hoyer and Mark Hollenbeck about monitoring 12 wells in the Dewey/Burdock area related to the proposed uranium mining. I have been working on a sampling plan to meet your request. I have attached a map figure showing locations of proposed wells we feel will satisfy your request. I was hoping that we could have conversation with you to discuss this figure and make sure we understand your request. Is there a time in the near future when you would be available for a short conference call with Mark Hollenbeck and me? Please let me know. Hope to hear from you soon.

Cory Foreman  
**RESPEC**  
Water Resources Engineer









**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182  
[www.state.sd.us/denr](http://www.state.sd.us/denr)

November 28, 2007

Dan Hoyer, Ph.D., P.E.  
Vice President  
RESPEC  
PO Box 725  
Rapid City, SD 57709

Re: Baseline Sampling Plan for Dewey-Burdock In Situ Uranium Project (November 2007)

Dear Dan:

The department has reviewed Powertech's Baseline Sampling Plan submitted November 13, 2007. Based on our review, we have developed the following comments:

**General**

1. In Section 2.2 Permit Requirements and Section 3.2 Water Impoundment, the term "the SD DENR Large-Scale Mine Permit requires ...". We need to be careful about use of the term "permit" as no permit has been granted or issued. This could be confusing to the public, and some folks could misinterpret these statements in thinking that a mine permit already exists. These sections should be revised to say: "SD Large Scale Mine Permit rules (or statutes) require ...", or even better: "SD mining rules ARSD 74:29 or SD statutes SDCL 45-6B require ...".

**2.0 Ground Water Sampling Plan**

1. In Section 2.2 Permit Requirements, it states SD rule (ARSD 74:29:11:07) says that samples should be taken once a month for a minimum of 6 months before mining. This rule is specifically for new mining units as they are being developed. Please note that ARSD 74:29:2:07 requires at least a one-year period during which baseline water quality data is collected monthly, unless the applicant can demonstrate to the satisfaction of the department that less frequent sampling is hydrologically justifiable. The requirements in ARSD 74:29:11:07 are in addition to the requirements of ARSD 74:29:02:07.

Justification for less frequent sampling should be submitted in writing and should be based on hydrological reasons.



Also on page 3, Section 2.2, Permit Requirements, the second sentence of this paragraph states: "... samples should be taken once a month for a minimum of 6 months ...". This phrase should be changed to read: "... samples **shall** be taken once a month for a minimum of 12 months ...".

2. Page 3, Section 2.3, Data Collection, the last sentence states: "Sampled wells without completion reports will be logged in the near future to determine depth and completion". The sampled wells must be logged prior to sampling so we know whether they will be sampling the appropriate zones.
3. Page 4, Section 2.5, Groundwater Sampling Subset, the last sentence references US EPA standard operating procedures for well sampling and QA/QC as USEPA, 2005. However, the actual reference on page 35 (Section 8.0 References) refers to the DENR's "Handbook for Investigation and Corrective Action Requirements for Discharges from Storage Tanks, Piping Systems and Other Releases". While these SOPs are modified from USEPA SOPs they are not the 2005 version. In addition, the reference is only for SOP 6 which covers QA/QC Samples. The reference for SOP 4 must also be included as it covers monitoring well sampling. The correct reference for SOP 4 is, "Modified from U.S. Environmental Protection Agency Environmental Response Team, Response Engineering and Analytical Contract, Standard Operating Procedures, Well Sampling, SOP 2007, Rev. 2.0, 12/20/91". The correct reference for SOP 6 is, "Modified from U.S. Environmental Protection Agency Environmental Response Team, Response Engineering and Analytical Contract, Standard Operating Procedures, Quality Assurance/Quality Control Samples, SOP 2005, Rev. 1.0, 2/7/92".
4. Page 4, Section 2.5 Groundwater Sampling Subset, Monitoring Well Sampling SOP 4 covers various methods for conducting well sampling, the sampling plan needs to provide more detail as to which specific method(s) will be used to sample the wells.
5. Section 2.7, Potentiometric Surface, Figure 2-1, this section discusses the potentiometric surface map that was generated for the Fall River and Lakota aquifers using historical TVA data. When was this data collected? Figure 2-1 must show the date this data was collected.
6. The revised baseline plan's map (Appendix B, Dewey-Burdock Ground Water Sampling Sites) shows only one monitoring site in the immediate vicinity of the ore zones. More baseline sampling points are needed within the immediate vicinity of the proposed mining operation. The majority of the proposed baseline monitoring sites are over a mile from the ore body zone.

In Appendix B, the Dewey-Burdock Groundwater Level Measurement Locations map shows several wells on the map that appear to be in or near the ore body. At present these wells are only being used to collect water level information. Some of these wells could be added to the baseline sampling plan if they are screened in the proper zones.



7. The baseline ground water sampling plan also lacks sufficient stratigraphic coverage within the vicinity of the ore zone. Given the target zones occur in the lower units of the Fall River, and the upper-most and lower-most units of the Lakota, the additional wells could target the immediate vicinity of the ore zone for both the Fall River and the Lakota (i.e., at least two wells near/within the ore zone in the Lakota plus at least two wells near/within the ore zone in the Fall River.)
8. The plan is lacking well construction details. Appendix A contains only a couple well construction reports for the sampled wells. At the very least we need to know the well depths, screen lengths/open hole length, etc., for all the wells in the sampling plan (sampling site and water level wells). There must be a table in the sampling plan showing this information. There should also be a table with longitude, latitude, and casing elevations so the Department can construct its own ground water contour maps.
9. All the pump test wells shown on the Appendix B, Dewey-Burdock Ground Water Sampling Sites map are alluvial wells. No pump test wells are shown for the other formations.
10. All the wells that will be used for sampling or water level measurements must be assigned a unique identification code and this code will be used to identify these wells on a map(s).

### 3.0 Surface Water Sampling Plan

1. No surface water sampling standard operating procedures (SOP's) are mentioned.
2. During the September 27, 2007 meeting in Pierre, the department wanted surface water impoundments with a groundwater influence to be including on the Table 3-1. Please add the following surface water impoundment sites to Table 3-1 (note these sites are taken from Table 3-1 in the draft September 2007 Baseline Plan):

September 2007

<u>ID Number</u>	<u>Location</u>	<u>Name/Comment</u>
5	Sec. 15, T.7S, R. 1E	Pond with turtles fed from flowing well
16	Sec. 15, T.7S, R. 1E	Flowing well (casing not visible)
33	Sec. 16, T.7S, R. 1E	Stock dam fed from flowing well

### 4.2 Air Monitoring Plan

1. Add a photo of one of the monitoring sites to the plan (i.e., the photos attached to the September 28, 2007 10:04 AM e-mail from Daniel Hoyer to Brad Schultz) and a description of the types of monitors used.
2. Discuss any quality assurance (QA) to be used.
3. How long will each sample run?



4. Are there specifics on how the samples will be combined?
5. What type of filter media is being used and what has been done to ensure the filter media does not have a background level of contamination.

#### **4.3 Vegetation, Food, and Fish**

1. Page 13, Section 4.3, Powertech should mention that radiological data (natural uranium, radium-226, thorium-230, lead-210, and polonium-210) will also be collected from baseline vegetation transect areas. During the September 27, 2007 meeting, Powertech indicated that this data could be collected. In the present plan, Powertech will only collect the data from the air quality monitoring sites. The vegetation transects will provide more uniform coverage.

Should you have any questions concerning these comments, please contact the Minerals and Mining Program (telephone: (605) 773-4201).

Sincerely,



Michael Cepak, PE  
Natural Resources Engineering Director  
Minerals and Mining Program  
Telephone: (605) 773-4201  
E-mail: mike.cepak@state.sd.us



RECEIVED  
APR 30 2008  
MINERALS & MINING PROGRAM

**Pump Test Workplan  
Dewey-Burdock In Situ Uranium Project**

**April 25, 2008**

**Powertech (USA) Inc.  
5575 DTC Parkway, Suite 140  
Greenwood Village, CO 80111  
Telephone: (303) 790-7528  
Facsimile: (303) 790-3885**

**Project DV10200279.01**

G:\102\00279.01\A\Reports Specs\KP\Pump Test Workplan\Pump Test Workplan\_Rev2.doc



## **Pump Test Workplan Dewey-Burdock In Situ Uranium Project**

### **Table of Contents**

---

List of Tables .....	iii
List of Figures .....	iii
1.0 Test Objectives.....	1
2.0 Burdock Pumping Test Design .....	2
2.1 Pumping Well Location and Capabilities .....	2
2.2 Pumping Rates .....	2
2.3 Discharge Rate Measurements and Flow Discharge .....	2
2.4 Locations and Depth of Observation Wells .....	3
2.5 Pre-Test Measurements.....	4
2.6 Test Duration .....	4
2.7 Water Level Measurements .....	5
2.8 Single Well Tests .....	5
2.9 Groundwater Samples.....	5
2.10 Core Samples .....	6
2.11 Methods of Analyzing Data .....	6
2.11.1 Theis Analysis.....	6
2.11.2 Analysis with Specific Input of Formation Thickness.....	7
2.11.3 Full Groundwater Modeling .....	8
2.11.4 Conditions at the Test Site Likely to Violate Theis Assumptions .....	8
3.0 Dewey Pump Test Design.....	9
3.1 Pumping Well Location and Capabilities .....	9
3.2 Pumping Rate and Discharge Measurements .....	9
3.3 Locations and Depth of Observation Wells .....	9
3.4 Pre-test Measurements .....	10



## **Table of Contents** *(Continued)*

---

3.5 Test Duration .....	10
3.6 Water Level Measurements .....	11
3.7 Single Well Tests .....	11
3.8 Groundwater Samples .....	11
3.9 Core Samples .....	11
3.10 Data Analysis and Modeling.....	11
3.11 Conditions at the Test Site Likely to Violate Theis Assumptions .....	11
4.0 References .....	12



## **List of Tables**

---

<b>Table</b>	<b>Title</b>
1	Burdock Test Observation Wells
2	Time, Distance, Drawdown Calculations
3	Intervals for Water Level Measurements
4	Dewey Test Observation Wells

## **List of Figures**

---

<b>Figure</b>	<b>Title</b>
1	Burdock Pump Test Area Location Map
2	Burdock Pump Test Area Pilot Study Lithology (Draft)
3	Burdock Test Area Schematic Hydrostratigraphy and Well Completions
4	Dewey Pump Test Area Location Map
5	Dewey Pump Test Pilot Study Area Lithology (Draft)
6	Dewey Test Area Schematic Hydrostratigraphy and Well Completions



## **Pump Test Workplan Dewey-Burdock In Situ Uranium Project**

### ***1.0 Test Objectives***

---

The primary objective of the pumping tests is to determine aquifer parameters (transmissivity, storativity) for the design of operational wellfields for the in situ recovery of uranium. Two tests, one at the Burdock Site and one at the Dewey Site, are planned. At each site, local three-dimensional determinations of geological layering known as "Pilot Study" geological models have been determined. Consistent with these geological models, each test will determine aquifer parameters according to theoretical analytical analysis (Theis, leaky confined, etc.) as well as empirical, site-specific experience with operational factors such as well inefficiency (actual compared to theoretical drawdown at the pumping well), maximum sustainable pumping rates, and possible anisotropy in drawdown.

The tests will also provide important information related to meeting the requirements of NRC licensing, EPA UIC and SD DENR large mine permitting. Discussions with the NRC have determined that the pumping test and associated groundwater modeling will be examined to evaluate whether the applicant demonstrates that the wellfield can be operated in a manner where the mining solutions can be contained. The NRC also intends to independently build a groundwater model to verify the information in the application. Similarly, discussion with the EPA UIC geologist also indicates that the agency will independently re-analyze the pumping test to verify assumptions and parameters.



## ***2.0 Burdock Pumping Test Design***

---

### ***2.1 Pumping Well Location and Capabilities***

The Burdock pumping test well is located in NE ¼ SW ¼ Sec. 11, T. 7S, R. 1E, Fall River County, South Dakota (Figure 1). The pumping test well will be completed within the ore zone near the bottom of one of the lower Lakota sandstone layers (Table 1, Figures 2 and 3). A well construction diagram together with geological formation log, static water level, results of well integrity testing, and results of any pump testing and water level measurements obtained during well installation and development will be distributed to provide all available information for determination of pump size and placement together with pressure transducer placement. The pump will be set in the well to maximize available head.

### ***2.2 Pumping Rates***

The pumping rates will be controllable by varying discharge at the surface in addition to varying the pump speed. Preliminary information suggests that a 30 gallon per minute (gpm) rate can be sustained for 72 hours. This may be verified by conducting a step drawdown test. The suggested rates are 10 gpm, 15 gpm and/or 20 gpm, up to maximum step-rates of 25 and 30 gpm. Four steps will be obtained (Clark, 1977). The duration of pumping for each rate will be a minimum of 100 minutes that may be extended to two to three hours as time permits. The objective is to verify stabilization of drawdown in each step and, ideally, there will be equal time increments for each step. Time should be allowed for complete recovery prior to starting the constant rate test.

### ***2.3 Discharge Rate Measurements and Flow Discharge***

During both the step drawdown and constant rate tests the discharge from the pumping well will be measured by redundant systems. Discharge will be measured using both instantaneous flow and totalizer flow meters. It is recommended that discharge should be measured and adjusted (the rate should not vary by more than 5 percent) at 5, 10, 20, 30, 60 minutes, and hourly thereafter [Ohio Environmental Protection Agency, 2006].

Water discharging from the pumped well will be disposed of in accordance with the well permits issued by the SD DENR based on the results of analyses of groundwater to be pumped. The estimated cumulative volume of water that may be discharged over a series of 12 hours of step-rate testing up to 30 gpm and a 72 hour pump constant rate test at 30 gpm is about 151,000 gallons (20,200 ft<sup>3</sup> or 0.5 ac-ft).



#### **2.4 Locations and Depth of Observation Wells**

Based on the pumping tests objectives, three observation wells will be completed within the same ore zone as the pumping test well located approximately 200 to 1,300 feet away from the pumped well (Table 1, Figures 1 and 3). Previous discussions have determined that there is not sufficient need for a fourth ore-zone observation well to perform analysis of aquifer anisotropy.

During installation, wells will first be drilled and logged to determine the proper screen interval. The casing will then be installed and cemented. Pressure testing of the casing will precede placement of the well screen. A well construction diagram together with geological formation log, static water level, results of well integrity testing, and results of any water level measurements obtained during well installation and development will be prepared and distributed to allow determination of pressure transducer placement and sizing of transducer cables.

One observation well will also be completed in the lower sands of the overlying Fall River Formation (Table 1, Figure 3). This will also be one of the "DENR background wells". In addition, a table will be prepared listing the present status, completions, and, if construction is still in progress, proposed completions of all the DENR observation wells.

One observation well will be completed in the underlying Sundance/Unkpapa Formation. Another observation well will also be completed in the upper sandstone beds of the Lakota in an effort to determine degree of confinement of the pumping test sand (Table 1, Figures 1 and 3). The rationale for this well is further discussed under test analysis and modeling of pump test results (Section 2.11).

Other existing wells in the area will also be monitored during the pumping test if they can be identified. Also, one or more wells located outside the zone of influence of the pumping well will be monitored to determine any possible natural changes in head throughout the test area during the time of the test.



### **2.5 Pre-Test Measurements**

Prior to the start of the pumping test, the static water level will be measured at the pumped well and each observation well. In addition, water level measurements from at least one well in each test area (both areas simultaneously, if possible) will be taken for at least one week prior to the pumping test. These data will be compared to barometric readings (Section 2.11).

### **2.6 Test Duration**

In general, the well will be pumped until the cone of depression has developed sufficiently in the observation wells (perhaps at least one foot of drawdown in the furthest observation well in the ore zone). In order to determine this, it will be essential to plot the drawdown data during the test. Based on calculations with a USGS spreadsheet (Halford and Kuniansky, 2002) in hypothetical aquifers ranging from 20 to 50 ft thick (perfectly confined or leaky confined) pumping at about 20 gpm would produce drawdown of about one foot after approximately 48 hours at distances of 1,100 to 2,000 feet (Table 2). Allowing for the range of hydraulic conductivities and average storativity measured during the TVA pumping test (Boggs and Jenkins, 1980), the pumping phase of the test will, therefore, last at least 48 hours. However, the test will continue to 72 hours if operational conditions permit.

The critical limiting factor for producing larger pumping rates to produce a larger drawdown cone is considered likely to be the available head at the pumping well. As shown in Table 2, drawdown at the pumping well at the Burdock site has been calculated as 235 feet at 18 gpm. As a safety factor, this should be multiplied by 1.3 for partial penetration (yielding 305 feet), and then by a further unknown safety factor to account for well inefficiency. We are presently assuming about 350 feet available head at the Burdock test site. As the sensitivity calculation on aquifer thickness (see top row in Table 2) illustrates, for an effectively thin aquifer of 20 feet (or perhaps for a very inefficient well), the required drawdown of 410 feet to sustain 18 gpm would exceed the available water column at the pumping well.

After the pump is shut off, recovery measurements will immediately commence and continue for approximately the same duration as the pumping test or until approximately 90 to 95 percent of initial head is recovered. The aquifer might not recover as quickly as it drew down.



## **2.7 Water Level Measurements**

Pressure transducers with data loggers will be used to measure water levels with verification by hand measurements as conditions and personnel permit. Water level measurements are taken at various intervals being more frequent at the beginning of the test. Table 3 presents ideal minimum measurement frequencies obtainable with hand equipment. For each well, pre-printed forms will be prepared to record manual measurements.

The pressure transducers (Troll 700) will have a memory capacity of about 200,000 measurements. For the constant rate test, this is more than sufficient to set each transducer to record once per second for a period of 120 minutes (7,200 readings), with the aim of starting the test within a one hour window (i.e. within time zero to 60 minutes). As shown in Table 3, thereafter, the transducers can record at 10 second intervals up to 72 hours (25,920 readings), at which time the frequency cycle will repeat to obtain recovery data while allowing the pump to be shut off within a one hour window. Based on previous discussions, the transducer in the pumping well will either be: (1) placed inside a 1" PVC pipe to avoid tangling the transducer with cables and drop pipe leading to the pump, or (2) tied off to the pump drop pipe, in which case the pump will need to be removed to remove the transducer from the pumping well.

## **2.8 Single Well Tests**

Single well tests will be performed on selected new observation wells for the purpose of determining hydraulic conductivity and subsurface heterogeneity. This test will be performed by pressurizing the well with air or by displacing water with a solid volume "slugger" (i.e., slug tests) at a time where a pressure transducer and data logger are available.

## **2.9 Groundwater Samples**

Although groundwater samples are being taken to characterize the baseline water quality, most of those wells are screened over a larger zone and perhaps even across several different sand layers. Because it is essential to know the chemistry of the water in the ore zone as it will directly impact mining solutions, two samples will be taken from the pumped well, once before the test and then at the end of the test. One groundwater sample will also be taken from each of the ore zone observation wells, and each of overlying and underlying formation observation wells, prior to the pumping test.



During the pumping tests, field parameters will be recorded twice daily at the pumping well. These parameters typically include temperature, pH, conductivity and possibly turbidity. If large fluctuations in field parameters become apparent, the conditions will be evaluated to consider whether additional samples should be taken.

### **2.10 Core Samples**

A table will be prepared summarizing the core collection program and the laboratory analyses for which core has been submitted. To date, the pumping well has reportedly been cored and samples of the Fuson shale and Lakota ore have been collected. Additional core collected from the observation wells will include samples of Skull Creek, Morrison, and shale bed aquitards within the Lakota. These samples will be analyzed for properties including porosity and permeability.

### **2.11 Methods of Analyzing Data**

The drawdown versus time data for both the pumping and recovery phases of the test will be analyzed using appropriate methods with commercial test analysis software (AQTESOLV), other analytical methods, and possibly numerical modeling. As a result of the partial penetration of wells, which could induce vertical flow, corrections may be applied.

The barometric pressure will be monitored during the test using a "BaroTroll" sensor, and if required, the drawdown data will be corrected for changes in barometric efficiency. The pressure transducers will be vented and self-correcting for changes in atmospheric pressure; however real fluctuations in groundwater levels in confined aquifers may occur and can be corrected for based on various algorithms.

Given the known range of conditions at the Burdock site, several non-ideal factors (Section 2.11.4) may be present which could require direct modeling of the aquifer using a numerical modeling code such as MODFLOW. Following is a brief discussion of the various analytical and modeling methods that will be considered for analyzing the pump test data.

#### **2.11.1 Theis Analysis**

The Theis analysis can be considered to be both an analytical solution to obtain aquifer parameters as well as a particular type of groundwater model. Forward calculations using Theis analysis (e.g. the drawdown extents at particular time described in Section 2.6) are one type of



groundwater model. The following simplifying assumptions underlie the Theis analysis (Driscoll, 1986):

- The water-bearing materials have uniform hydraulic conductivity within the radius of influence of the well (infinite extent)
- The aquifer is not stratified
- The [confined] aquifer thickness is constant
- The pumping well is 100 percent efficient
- The intake portion of the well penetrates the entire aquifer
- The potentiometric surface has no slope (perfectly horizontal)
- Laminar flow exists throughout the radius of influence of the well

Computer programs such as AQTESOLV automatically produce a fit that may minimize the degree to which the fit curve deviates from the plotted data. Rarely, in fact, do all portions of a fit curve match exactly the plotted data, and there is much professional judgment (and often disagreement) as to the overall fit (which determines match points which determine aquifer parameters). In addition to the Theis curve, theoretical analytical models, particularly the Hantush-Jacob solution, have been developed to account for leaky confining layers.

It is important to note that the aquifer parameters determined from confined Theis analysis are transmissivity and storativity. Storativity is dimensionless. Transmissivity can be calculated as the product of hydraulic conductivity multiplied by formation thickness, but is produced in Theis or Hantush-Jacob analysis without input of formation thickness.

### ***2.11.2 Analysis with Specific Input of Formation Thickness***

Considering transmissivity alone, a more complicated level of analysis separately considers formation thickness or relative thicknesses of the screened interval compared to formation interval (partial penetration). The literature for partial penetration analyses has been searched and there are theoretical considerations for where the well screen is located in the top, bottom, or middle of the aquifer (Todd and Mays, 2005), but where the pumping well screen is about 50 percent or more of formation thickness. There does not appear to be a specific solution for where a well is screened over a limited portion of a confined aquifer (see Figure 3 for a schematic representation of the likely case at Burdock where there are 10 feet well screens within an approximately 50 foot sand zone).



Another possibility is for the partial completion case (Schlumberger, 2002). Partial completion is something slightly different from partial penetration, because it may present itself as spherical flow rather than radial flow. If the time-drawdown data or its derivative presents itself as spherical flow, data can be interpreted to estimate  $S$  and  $k$  (intrinsic permeability) and then calculate  $K$ . How to calculate  $T$  is not straightforward.

### ***2.11.3 Groundwater Modeling***

If no analytical method fully matches the pumping test data, a numerical model may be necessary. It is possible to use MODFLOW with the U.S.G.S. parameter estimation code UCODE with an aquifer configuration that represents the known conditions. Observation well data are input together with the pumping rate, and aquifer parameters are estimated by a program that varies parameters while optimizing the match to data at all wells simultaneously.

The most complex conditions currently expected would require five separate model layers to represent the current conceptual hydrostratigraphy: (1) the lower Lakota sand beneath the well screen, (2) the 10-foot well screen/ore zone interval, (3) the lower Lakota sand above the well screen, (4) the intervening aquitard layer in the Lakota, and (5) the upper Lakota sand. Alternate configurations are possible for three model layers if the upper Lakota sand observation well does not respond, or possibly one model layer depending on the pumping test results.

### ***2.11.4 Conditions at the Test Site Likely to Violate Theis Assumptions***

To the extent the match of the pump test data to the Theis curve justifies, the simplest analytical solution will be used for the purposes of modeling for the regulatory permit applications. However, until the pump test data are in hand, the following non-ideal conditions may be anticipated given the presently known conditions of the Burdock test:

- Partial penetration: the ore zone pumping and observation wells have 10-foot well screens within an approximate 50 foot sand zone; interpretation of test results may result in uncertainties in the estimated transmissivity and storativity values.
- Leaky confining layers: aquitard layers within the Lakota and possibly the Fuson Formation
- Boundary effects: a recharge boundary may be associated where the upper Lakota sand may variably connect with lower Lakota sand; also, based on the TVA tests the possibility of cross-connection of aquifers by boreholes must be considered.



## ***Dewey Pump Test Design***

---

### ***2.12 Pumping Well Location and Capabilities***

The Dewey pumping test well is located in NE ¼ NW ¼ Sec. 32, T. 6S, R. 1E, Custer County, South Dakota (Figure 4, Table 4). The pumped well (DB07-32-1C) will be completed to and screened within the lower Fall River Formation (Figures 5 and 6). Drilling, logging, and pump installation will be as described in Section 2.1

### ***2.13 Pumping Rate and Discharge Measurements***

Determining the pumping rate, measuring discharge, and disposal of the discharge will be done the same as at Burdock pump test site (see Sections 2.2 and 2.3). Based on recent reports that the Fall River pumping well has good flow rates, the suggested rates for a step drawdown test, if necessary, are 10 gpm, 15 and/or 20 gpm, if possible 25 and 30 gpm, with a minimum of four steps as described in Section 2.2. The estimated cumulative volume of water that may be discharged over a series of 12 hours of step-rate testing and constant rate test is as for the Burdock well described in Section 2.3.

### ***2.14 Locations and Depth of Observation Wells***

Based on the pumping test objectives, three of the observation wells will be screened within the Fall River ore zone and located approximately 260 to 2,400 feet away from the pumped well (Figure 4, Table 4). Drilling and logging of the observation wells will be as described in Section 2.4

One other observation well will be located within the Lakota Formation, which is also one of the "DENR background wells", and will be monitored during the test. Similarly, one observation well will be completed in the underlying Unkpapa Formation (Figures 4 and 6). Another observation well will also be completed in the upper sandstone beds of the Fall River Formation in an effort to determine degree of confinement of the pumping test sand (Table 4). The rationale is identical to those discussed for the Lakota Formation under test analysis and modeling of pump test results (Section 2.11).

Other wells in the area that may be identified will also be monitored during the pumping test (Table 4). The nearest other Fall River well is located approximately 4,700 feet north-northeast



of the pumped well and is likely outside the zone of influence from the pumping test; however, this well would serve as an appropriate place to monitor any possible natural changes in head.

### **2.15 Pre-test Measurements**

Prior to the start of the pumping test, the static water level will be measured at the pumped well and each observation well. See Section 2.5.

### **2.16 Test Duration**

In general, the well will be pumped until the cone of depression has developed sufficiently in the surrounding observation wells. In order to determine this, it will be essential to plot the drawdown data during the test. Because less is known about the hydraulic characteristics of the Fall River Formation, especially in the Dewey area, it is more difficult to accurately predict drawdown and test duration. Using the lower storativity value found by TVA (Boggs, and Jenkins, 1980), an eight gpm pumping rate should produce adequate drawdown (Table 2). However, if the storativity of the Fall River in the Dewey area is similar to that of the Lakota, then either a pumping rate greater than 8 gpm and/or a test duration greater than 48 hours would be required. The constant rate pumping phase of the test will therefore be planned for 72 hours unless and until more information can be determined.

We are presently assuming about 600 feet available head at the Fall River test site. As shown in Table 2, drawdown at the pumping well at the Fall River site has been calculated at 250 feet at 8 gpm, or possibly as much as 435 feet for an effectively thin aquifer of 20 feet (or perhaps for a very inefficient well). As a safety factor, this should be multiplied by 1.3 for partial penetration (yielding 325 to 585 feet), and then by a further unknown safety factor to account for well inefficiency. As always, a critical limiting factor for producing larger pumping rates to produce a larger drawdown cone is likely to be the available drawdown at the pumping well, but this appears to be less of a problem at the Fall River aquifer (compared to the Burdock Site) if the pump and pressure transducers are set deep enough.

After the pumped well is shut off, recovery measurements will immediately commence and continue for approximately the same duration as the pumping test or until water levels reach 90 to 95 percent of the pre-test head.



### **2.17 Water Level Measurements**

See Table 3 and Section 2.7.

### **2.18 Single Well Tests**

See Section 2.8.

### **2.19 Groundwater Samples**

Two groundwater samples will be collected from the pumped well during the pumping test and one sample from most observation wells during the Fall River test. See Section 2.9 and Table 4.

### **2.20 Core Samples**

A table will be prepared summarizing the core collection program and the laboratory analyses for which core has been submitted. During drilling of the new wells, the Lakota observation well will be cored for collection of rock samples of uranium ore and (if not recovered from the Burdock area core) Skull Creek, Fuson, and Morrison shale. A core sample of Fall River interbed aquitard will also be collected. These samples will be analyzed for properties including porosity and permeability.

### **2.21 Data Analysis and Modeling**

See Section 2.11

### **2.22 Conditions at the Test Site Likely to Violate Their Assumptions**

The following non-ideal conditions may be anticipated given the presently known conditions of the Dewey test:

- Partial penetration: same general considerations as for Burdock site.
- Leaky confining layers: the aquitard layers within the Fall River Formation, and possibly the underlying Fuson Formation
- Boundary effects: (1) a recharge boundary may be associated where the upper and lower Fall River sands may variably connect; (2) the TVA test (Boggs and Jenkins, 1980) identified a barrier boundary associated with the Dewey Fault zone, but this is likely too far away to affect the current test..



### ***3.0 References***

---

- Boggs, J. M., and A. M. Jenkins, 1980. "Analysis of Aquifer Tests Conducted at the Proposed Burdock Uranium Mine Site: Burdock, South Dakota," Report No. WR28-1-520-109, Norris, Tennessee.
- Clark, Lewis, 1977. "The Analysis and Planning of Step Drawdown Tests", Q. Jour. Engineering. Geol., 17, p. 125-143.
- Driscoll, F. M., 1986. "Groundwater and Wells", Johnson Filtration Systems, Inc., St. Paul, MN, 1089 pp.
- Halford, K.J. and E.L. Kuniansky, 2002, "Documentation of Spreadsheets for the Analysis of Aquifer-Test and Slug-Test Data," U.S. Geological Survey Open File Report 02-197, U. S. Department of the Interior, Carson City, NV, 51 p.
- Kruseman, G. P. and N. A. de Ridder, 1990. "Analysis and Evaluation of Pumping Test Data," Second Edition International Institute for Land Reclamation and Improvement (ILRI), Publication 47, Wageningen, The Netherlands.
- Ohio Environmental Protection Agency, 2006. Technical Guidance for Ground Water Investigations, accessed October 5, 2007, from the
- Todd and Mays, 2002. Textbook.
- Schlumberger, 2002. "Well Test Interpretation". Obtained from website.



## Tables



**Table 1**  
**Burdock Observation Wells**

Well ID and Stratigraphic Interval	Well Type	Location	Radial Distance from pumping Well (ft)	Depth to top of Screen (ft bgs)	Depth to bottom of Screen (ft bgs)	Water Level Monitoring	Sampling	Field Parameters	Note
<b>Ore Zone (lower Lakota Sand)</b>									
DB 07-11-11C	Pumping Well	SWQ Sec. 11	0	426	436	Datalogger	2X	2X Daily	
DB 07-11-15	Obs. Well #1	SWQ Sec. 11	243	418	428	Datalogger	1X	1X	
DB 07-11-14C	Obs. Well #2	SWQ Sec. 11	250	413	423	Datalogger	1X	1X	
DB 07-11-02	Obs. Well #3	NWQ Sec. 11	1,292	450	460	Datalogger	1X	1X	
<b>Upper Lakota Sand</b>									
DB 07-11-19	Obs. Well	SWQ Sec. 11	50	325	335	Datalogger	1X	1X	DENR
<b>Fall River (lower Sand layer)</b>									
DB 07-11-17	Obs. Well	SWQ Sec. 11	50	245	255	Datalogger	1X	1X	DENR
<b>Unkpapa Formation</b>									
DB07-11-18	Obs Well	SWQ Sec. 11	<100	621	631	Datalogger	1X	1X	
<b>Additional Distant Wells</b>									
None									
Additional Barometric Datalogger									
						Datalogger	NA	NA	



Table 2  
Time, Distance, Drawdown Calculations

Lakota Aquifer

Q = 18 gpm, S=3.5 e-4, b = 35 ft		b = 50'		b = 20'		1 and 2 day tests @ R = 1100 Ft	
K= 1.2 <sup>b</sup>		Sensitivity on b					
time (hr)	D.D. at PW	D.D. (ft)	D.D. at PW	D.D. (ft)	D.D. at PW	D.D. (ft)	
24	235	0.2	160	0.3	410	0	
48	235	1.0	160	1.3	410	0.5	
K = 2.1 <sup>c</sup>							
time (hr)	D.D. at PW	D.D. (ft)					
24	135	0.4					
48	135	1.4					
Q = 16 gpm, S= 1 e-4, b = 35 ft							
K= 1.2 <sup>b</sup>		Range of K, Average S					
time (hr)	D.D. at PW	D.D. (ft)	Find Pumping Rate to Generate Response				
24	210	0.2					
48	210	1.0					
Q = 14 gpm, S= 1 e-4, b = 35 ft							
K = 2.1 <sup>c</sup>							
time (hr)	D.D. at PW	D.D. (ft)					
24	105	0.4					
48	105	1.1					
Q = 18 gpm, S=1e-4, b = 35 ft, K = 1.5 <sup>a</sup>		1 day test, average K and S, Leaky					
K' = 2.7 e -3 ft/d, b' = 28 ft		Hantush Leaky Confining Layer					
		D.D. = Drawdown at Pumping Well (ft)					
		R = Evaluation Radius (ft distance)					
		D.D. #1 = Theis					
		D.D. #2 = Hantush					
time (hr)	D.D. at PW	R	D.D. #1	D.D. #2			
24	185	1100	2.5	1.36			

Fall River Aquifer

Q = 8 gpm, S=1.4 e-5, b = 35 ft		b = 20'		b = 35', S = 1 e-4		1 to 3 day tests @ R = 2000 Ft	
K = 0.5 <sup>c</sup>		Sensitivity on b		Sensitivity on s			
time (hr)	D.D. at PW	D.D. (ft)	D.D. at PW	D.D. (ft)	D.D. at PW	D.D. (ft)	
24	250	2.2	435	1.4	250	0	
48	250	4.9	435	4.6	250	0.1	

Hydraulic Conductivity Sources		Hantush Leaking Confining Layer Sources Table 5, TVA Burdock test	
a	Table 6, TVA Lakota final modeling results.	K'	Vertical K, ft/day
b	TVA, overall T of 1,400 gpd/ft over 150 ft screen	b'	Vertical layer thickness
c	TVA, early T of 2,400 gpd/ft over 150 ft screen		
d	Table 6, TVA Fall River final modeling results.		



**Table 3**  
**Intervals for Water Level Measurements**

<b>Time Since Pumping Started (or Stopped)</b>	<b>Location</b>	
<b>Pumping Well (modified from Driscoll, 1987)</b>		
0 to 10 minutes	30 sec	
10 to 15 minutes	1 minute	
15 to 60 minutes	5 minutes	
1 to 5 hours	30 minutes	
5 to 24 hours	1 hour	
24 hours to end	8 hours	
<b>Observation Wells (modified from Kruseman and de Ridder, 1990)</b>		
0 to 2 minutes	10 sec	
2 to 5 minutes	30 sec	
5 to 15 minutes	1 minute	
15 to 60 minutes	5 minutes	
1 to 5 hours	30 minutes	
5 to 24 hours	1 hour	
24 hours to end	8 hours	
<b>Example Datalogger Settings</b>		<b>Datapoints</b>
-1 hour to +1 hour	1 sec	7,200
>120 minutes to end (72 hours)	10 sec	25,920



**Table 4**  
**Dewey Observation Wells**

Well ID and Stratigraphic Interval	Well Type	Location	Radial Distance from pumping Well (ft)	Depth to top of Screen (ft bgs)	Depth to bottom of Screen (ft bgs)	Water Level Monitoring	Sampling	Field Parameters	Note
<b>Ore Zone (lower Fall River Sand)</b>									
DB 07-32-3C	Pumping Well	NWQ Sec. 32	0	585	600	Datalogger	2X	2X Dally	
DB 07-32-05	Obs. Well #1	NWQ Sec. 32	265	593	608	Datalogger	1X	1X	
DB 07-32-4C	Obs. Well #2	NWQ Sec. 32	467	580	585	Datalogger	1X	1X	
DB 07-29-7	Obs. Well #3	SEQ Sec. 29	2,400	635	650	Datalogger	1X	1X	
<b>Upper Fall River Sand</b>									
DB 08-32-9C	Obs. Well	NWQ Sec. 32	41	490	505	Datalogger	1X	1X	DENR
<b>Lakota Sand Layer</b>									
DB 08-32-10	Obs. Well	NWQ Sec. 32	61	715	730	Datalogger	1X	1X	
<b>Unkpapa Formation</b>									
DB 07-32-11	Obs. Well	NWQ Sec. 32	50	910	930	Datalogger	1X	1X	
<b>Additional Distant Wells</b>									
GW49	Fall River Stock Well	NEQ Sec. 29	1,433	?	?	Datalogger Or Manual	0	0	
<b>Additional Barometric Datalogger</b>									
						Datalogger	NA	NA	

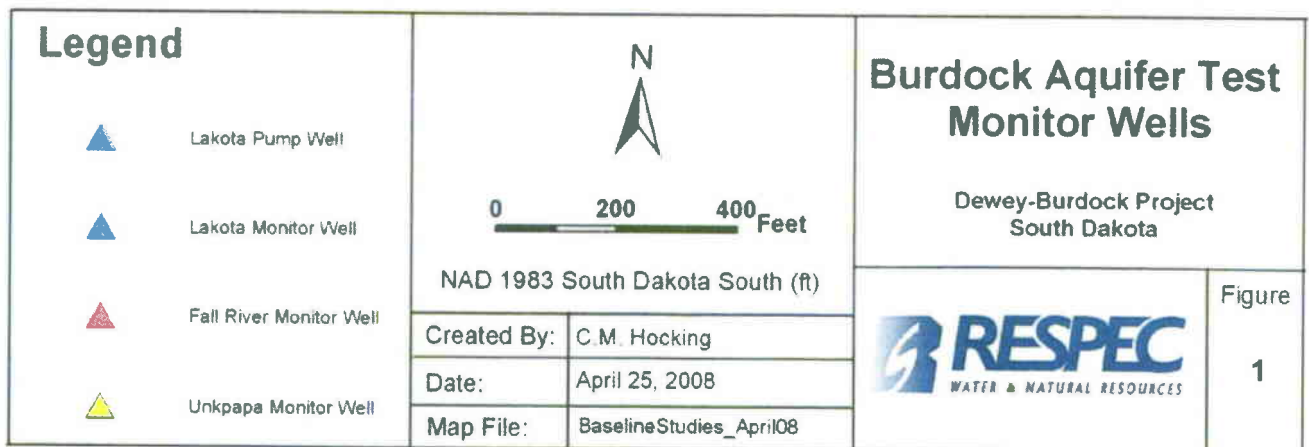
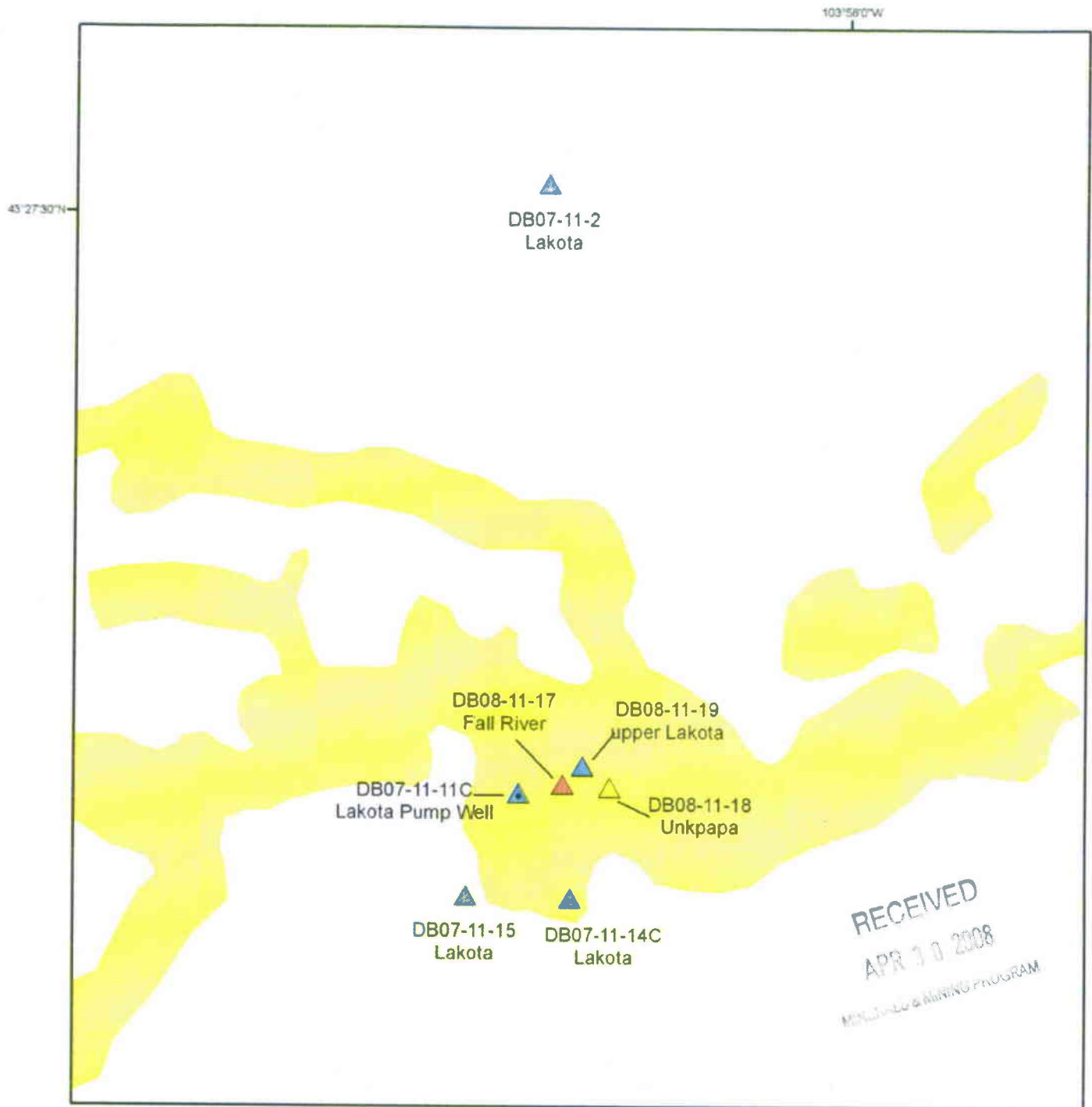
G:\102100279 01\A\Reports Specs\KPI\Pump Test Workplan\Table 4.xls

4/25/2008

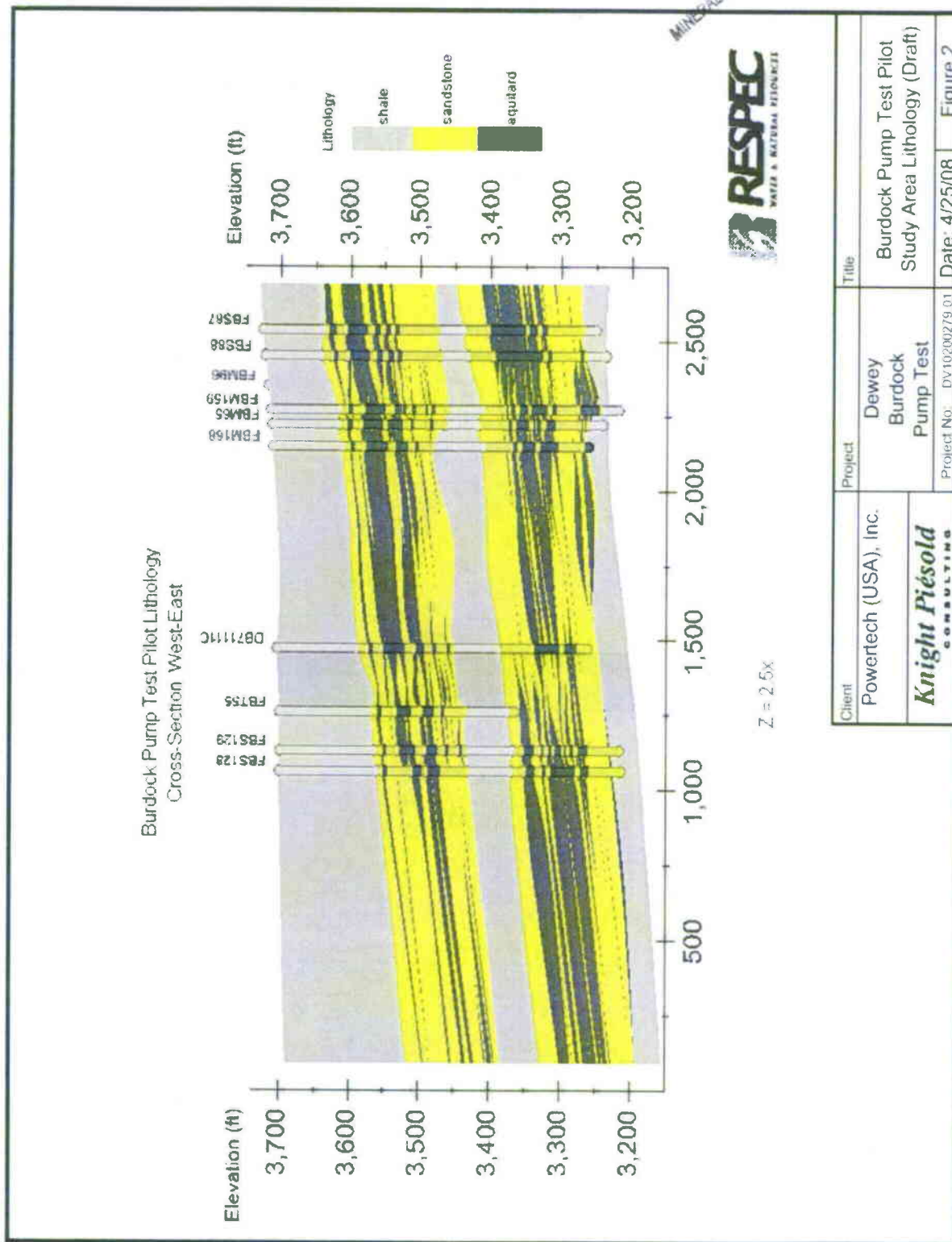


## Figures







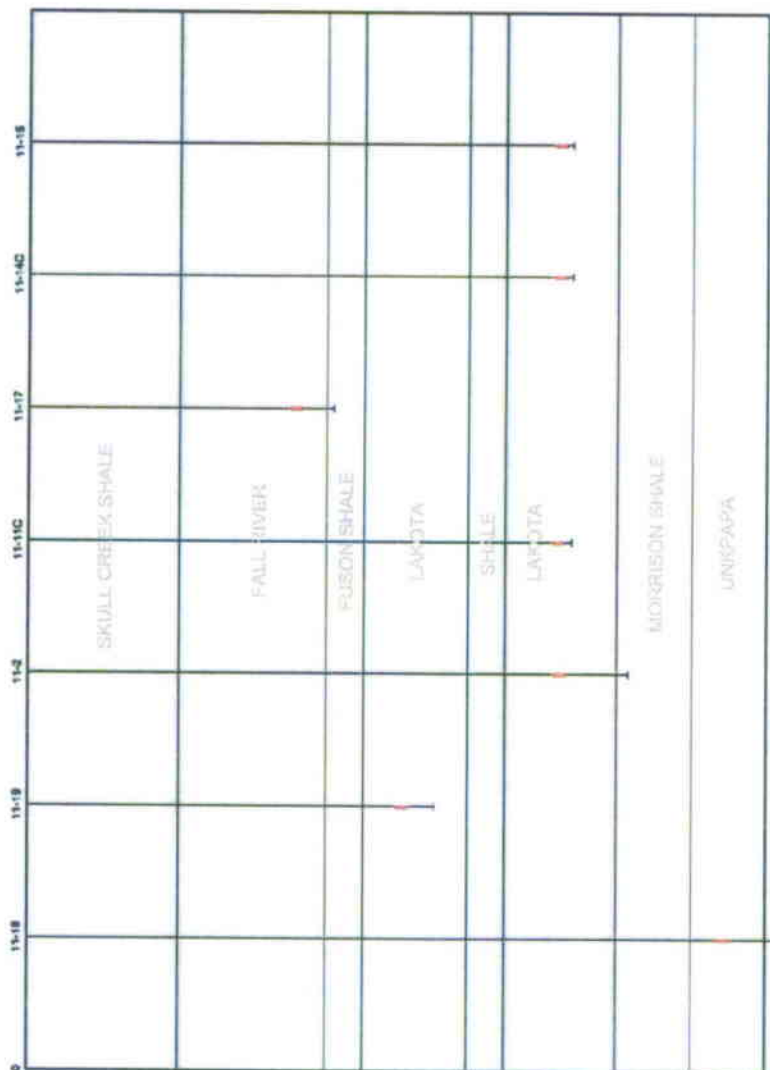


G:\10200279.01\Reports Specs\KP\Pump Test Workplan\Figure 2.xls

4/25/2008



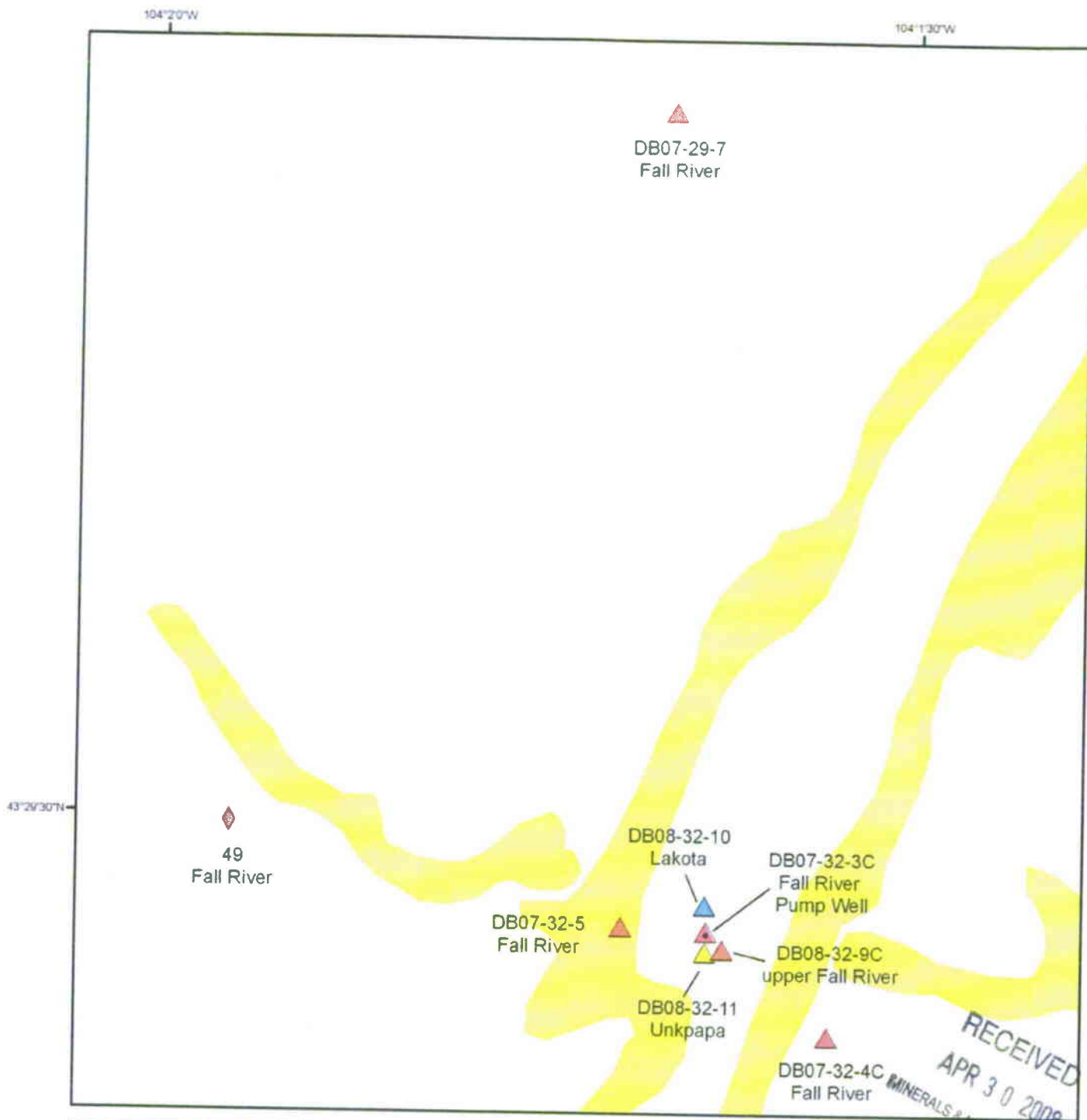
# DEWEY - BURDOCK PROJECT BURDOCK PUMP TEST



RECEIVED  
APR 30 2008  
MINERALS & MINING PROGRAM

Client	Project	Title
Powertech (USA), Inc.	Dewey Burdock Pump Test	Burdock Test Schematic Hydrostratigraphy and Well Completions
<b>Knight Piésold</b> CONSULTING		Date: 4/25/08 Figure 3
Project No: DV10200279.01		





RECEIVED  
APR 30 2008  
MINERALS & MINING PROGRAM

- Legend**
- Fall River Pump Well
  - Fall River Monitor Well
  - Fall River Stock Well
  - Lakota Monitor Well
  - Unkpapa Monitor Well

N

0 200 400 600 Feet

NAD 1983 South Dakota South (ft)

Created By:	C.M. Hocking
Date:	April 25, 2008
Map File:	BaselineStudies_April08

## Dewey Aquifer Test Monitor Wells

Dewey-Burdock Project  
South Dakota

Figure

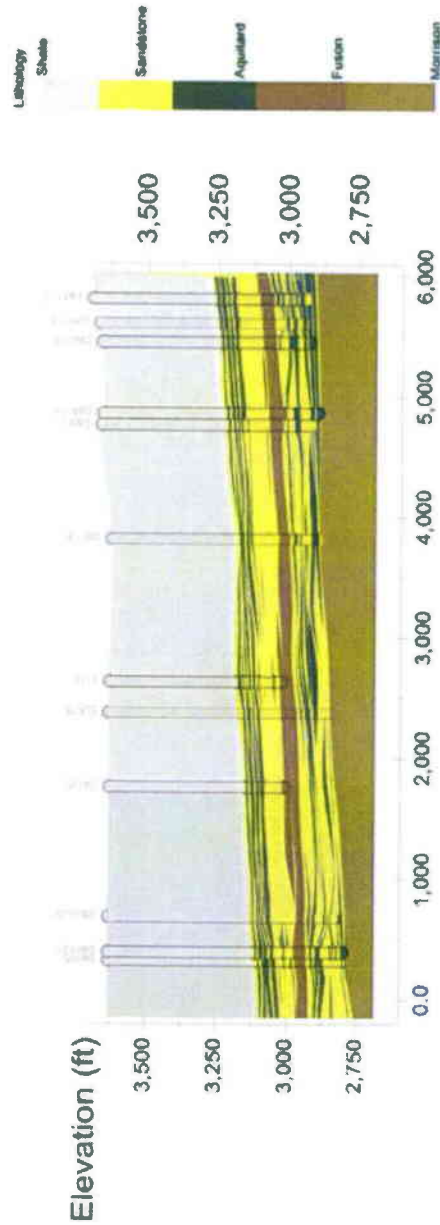
4



RECEIVED  
APR 30 2008  
MINERALS & MINING PROGRAM

4/25/2008

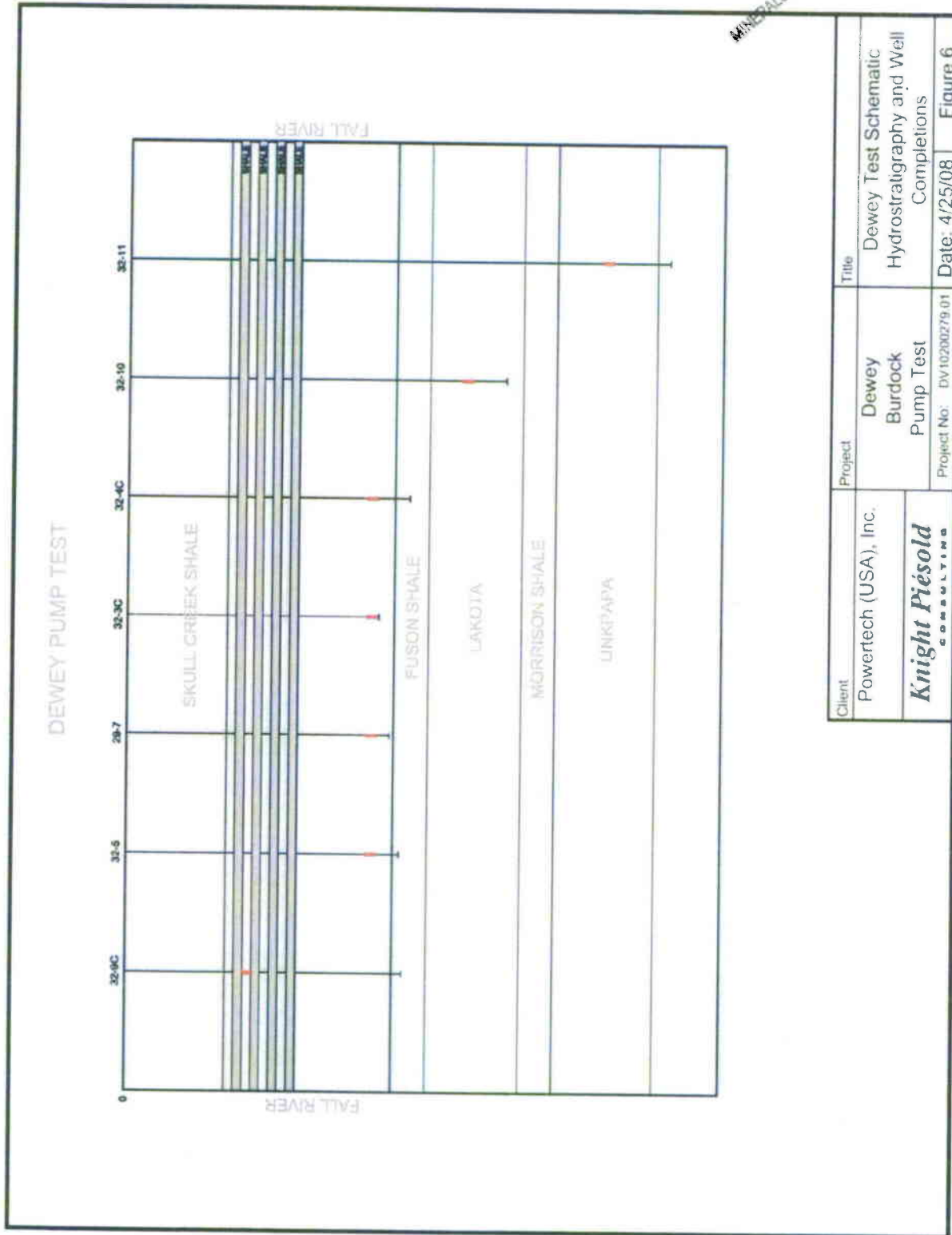
Dewey Pump Test Lithology  
Cross Section A - A'



Client	Project	Title
Powertech (USA), Inc.	Dewey Burdock Pump Test	Dewey Pump Test Pilot Area Lithology (Draft)
<b>Knight Piesold</b> CONSULTING	Project No: DV10200279.01	Date: 4/25/08
		Figure 5



RECEIVED  
APR 30 2008  
MINERALS & MINING PROGRAM



G:\10200279.01\A\Reports Specs\KPi\Pump Test Workplan\Figure 6.xls

4/25/2008



*Powertech (USA), Inc.*  
*Pre-Permit Baseline*

Dewey-Burdock In Situ  
Groundwater  
Monitoring





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 1  
**RECEIVED**  
JUN 17 2013

MINERALS & MINING PROGRAM

Sample Site: DC-2  
Sampled: 06/03/13 at 10:05 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20130603401  
Received: 06/03/13 at 04:40 PM  
by Bobbie Laurenz  
Account: W1008 - DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	Method	Analyst/Date
<b>Radiological</b>					
Radon-222	533	pCi/L	1	SM 7500Rn-B	SYS 06/06/13
<b>Precision Data</b>					
Radon-222 Precision	± 108	pCi/L	1	MC-Radon 222 precision	SYS 06/06/13
<b>MDA Data</b>					
Radon-222 MDA	53.0	pCi/L	1	MC - Radon 222 MDA	SYS 06/06/13

Approved By: 

Approved On: 6/13/2013 7:26:48 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 1

RECEIVED  
JUN 17 2013

Sample Site: BC-3 MINERALS & MINING PROGRAM  
Sampled: 06/03/13 at 11:40 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20130603402  
Received: 06/03/13 at 04:40 PM  
by Bobbie Laurenz  
Account: W1008 - DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	Method	Analyst/Date
<b>Radiological</b>					
Radon-222	594	pCi/L	1	SM 7500Rn-B	SYS 06/06/13
<b>Precision Data</b>					
Radon-222 Precision	± 119	pCi/L	1	MC-Radon 222 precision	SYS 06/06/13
<b>MDA Data</b>					
Radon-222 MDA	52.6	pCi/L	1	MC - Radon 222 MDA	SYS 06/06/13

Approved By: 

Approved On: 6/13/2013 7:26:48 AM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

Page 1 of 1

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: BC-1  
Sampled: 06/03/13 at 12:35 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20130603403  
Received: 06/03/13 at 04:40 PM  
by Bobbie Laurenz  
Account: W1008 - DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	Method	Analyst/Date
<b>Radiological</b>					
Radon-222	772	pCi/L	1	SM 7500Rn-B	SYS 06/06/13
<b>Precision Data</b>					
Radon-222 Precision	± 150	pCi/L	1	MC-Radon 222 precision	SYS 06/06/13
<b>MDA Data</b>					
Radon-222 MDA	52.4	pCi/L	1	MC - Radon 222 MDA	SYS 06/06/13

Approved By: 

Approved On: 6/13/2013 7:26:48 AM





**MIDCONTINENT**  
TESTING LABORATORIES INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 1

RECEIVED  
JUN 17 2013

MINERALS & MINING PROGRAM

Sample Site: BC-2  
Sampled: 06/03/13 at 02:05 PM  
by Mark Keenihan

Sample Matrix: Water

Lab ID#: 20130603404

Received: 06/03/13 at 04:40 PM  
by Bobbie Laurenz

Account: W1008 - DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	Method	Analyst/Date
<b>Radiological</b>					
Radon-222	1060	pCi/L	1	SM 7500Rn-B	SYS 06/06/13
<b>Precision Data</b>					
Radon-222 Precision	± 200	pCi/L	1	MC-Radon 222 precision	SYS 06/06/13
<b>MDA Data</b>					
Radon-222 MDA	52.1	pCi/L	1	MC - Radon 222 MDA	SYS 06/06/13

Approved By:

Approved On: 6/13/2013 7:26:48 AM





2081 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

## CHAIN OF CUSTODY RECORD

Met

FOR LAB USE ONLY	
Seal Intact (Y/N)	Number
4	
Sample Condition	
good	
Temperature of Container	5.2°C

REQUESTED TURN AROUND	
STANDARD	RUSH

PRESERVED WITH	NA
FILTERED (Y/N)	NA
REFRIGERATED (Y/N)	X
ANALYSES REQUESTED	As per 222
RECEIVED JUN 17 2013 MINERALS & MINING PROGRAM	

Company	SD-DENR
Project Name / Mgr.	POWER TECH
Project Number	
Sampled by	Mark Kellenman
Sampled by	

	SAMPLE NAME	DATE	TIME	MATRIX	NO OF CONTAINERS	COMMENTS	LAB #
1	DC-2	6/13/13	1005		2	7.4pH 10.6°C 5.54us EC	
2							
3	DC-2	6/13/13	1005		2	7.3pH 9.2°C 3.25us EC	
4							
5	BC-3	"	1140		2	7.2pH 10.9°C 3.73us EC	
6							
7	BC-1	"	1235		2	7.3pH 9.9°C 3.93us EC	
8							
9	BC-2	"	1405		2		
0							
1							
2							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
AD	SD-DENR	6/3/13	1640	Blee		6-3-13	1640



### SAMPLE RECEIPT CHECKLIST

Company Name SD DENR

Date/Time Received 6-3-13 1640  
Date / Time

Project PowerTech

Received by BZ

Lab Number(s) 401-404 6-3-13

Carrier Name Haul Keenihan

Yes No

#### UNPACKING

Initials

- ☒ ☐ 1. Shipping container in good condition?
- ☒ ☐ 2. Custody seals present on shipping container?  
Condition: Intact Broken
- ☒ ☐ 3. Ice / Blue ice (circle one) present in shipping container?  
Container(s) Temp. 1. 5.2°C 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_
- ☐ ☒ 4. Bottles broken and/or leaking? (Photograph broken bottles.)
- ☐ ☐ 5. Custody seals on sample bottles?  
Condition: Intact Broken MZ

**RECEIVED**  
JUN 17 2013  
MINERALS & MINING PROGRAM

Yes No

#### LABELING

Initials

- ☒ ☐ 6. Chain of custody Present?
- ☒ ☐ 7. Chain of custody includes signatures, dates, and times when relinquished and received?
- ☒ ☐ 8. Chain of custody agrees with bottle count?
- ☒ ☐ 9. Chain of custody agrees with labels?
- ☒ ☐ 10. Samples received within holding times?
- ☒ ☐ 11. Samples in proper container?
- ☒ ☐ 12. Sufficient sample volume for indicated tests?

#### PRESERVATIVE

Yes No

Initials

Yes No

Initials

- |   |   |
|---|---|
| <input type="checkbox"/> <input type="checkbox"/> 13. Metals bottle(s) pH < 2? _____<br><input type="checkbox"/> <input type="checkbox"/> 14. Nutrient bottle(s) pH < 2? _____<br><input type="checkbox"/> <input type="checkbox"/> 15. Cyanide bottle(s) pH > 12? _____<br><input type="checkbox"/> <input type="checkbox"/> 16. Sulfide bottle(s) pH > 9? _____ | <input type="checkbox"/> <input type="checkbox"/> 17. TOC bottle(s) pH < 2? _____<br><input type="checkbox"/> <input type="checkbox"/> 18. Oil & Grease bottle(s) pH < 2? _____<br><input type="checkbox"/> <input type="checkbox"/> 19. DRO bottle(s) pH < 2? _____<br><input type="checkbox"/> <input type="checkbox"/> 20. Volatiles pH < 2? _____ |
|---|---|

COMMENTS:

Radon, ~~\_\_\_\_\_~~





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

RECEIVED

FEB 01 2011

Page 1 of 2

MINERALS & MINING PROGRAM

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB09-21-1  
Sampled: 09/28/10 at 11:30 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20100929301  
Received: 09/28/10 at 04:03 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1420	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	09/29/10
pH	7.95	SU	1			SM 4500-H+ B	JAM	09/29/10
Total Dissolved Solids	957	mg/L	100ml	23.1	50.0	SM 2540 C	TMN	09/30/10
Non-Metallics								
Alkalinity	172	mg/L	1	0.274	10.0	SM 2320 B	JAM	09/29/10
Bicarbonate	210	mg/L	1	0.334	10.0	SM 2320 B	JAM	09/29/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	09/29/10
Chloride (Cl-)	6.48	mg/L	1	0.196	0.500	SM 4500-Cl E	BLL	09/29/10
Nitrogen, Ammonia (NH3)	0.194	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	09/29/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	09/29/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	09/29/10
Sulfate (SO4)	578	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	09/29/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	09/29/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	09/29/10
Calcium (Ca)	102	mg/L	10	1.47	10.0	SM 3111 B	NMA	09/30/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	09/29/10
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	09/29/10
Iron (Fe)	0.056	mg/L	10	0.005	0.050	EPA 200.8	SAC	09/29/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	09/29/10
Magnesium (Mg)	34.0	mg/L	5	0.157	2.50	SM 3111 B	NMA	09/29/10
Molybdenum (Mo)	< 0.001	mg/L	10			EPA 200.8	SAC	09/29/10
Potassium (K)	11.4	mg/L	5	0.620	2.50	SM 3111 B	NMA	09/29/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	09/29/10
Sodium (Na)	179	mg/L	5	0.610	2.50	SM 3111 B	NMA	09/29/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	09/29/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	09/29/10



RECEIVED

FEB 01 2011

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Uranium	< 0.001	mg/L	10			EPA 200.8	SAC 09/29/10
<b>Anion - Cation Balance</b>							
Anions	15.6	meq/L	1			Calculation	GAM 09/30/10
Anion - Cation Balance	1.03	%	1			Calculation	GAM 09/30/10
Cations	16.0	meq/L	1			Calculation	GAM 09/30/10
<b>Radiological</b>							
Gross Alpha	14.6	pCi/L	1			EPA 900.0	SYS 01/24/11
Gross Beta	15.3	pCi/L	1			EPA 900.0	SYS 01/24/11
Radium-226	1.70	pCi/L	1			EPA 903.1	SYS 01/24/11
Radium-228	< 0.80	pCi/L	1			Brooks-Blanchard	SYS 01/24/11
Radon-222	226	pCi/L	1			SM 7500-Rn B	SYS 10/08/10

**Notes:**

Nutrient and Filtered Metal bottles made in lab.

Approved By: \_\_\_\_\_



Approved On: 1/31/2011 2:49:29 PM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

RECEIVED

FEB 01 2011

Page 1 of 2

MINERALS &amp; MINING PROGRAM

Sample Site: DB09-21-2

Sampled: 09/28/10 at 12:00 PM  
by Mark Keenihan

Sample Matrix: Water

Lab ID#: 20100929302

Received: 09/28/10 at 04:03 PM  
by Greg McDougallAccount: W1008  
DENR - Minerals & MiningMIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1630	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	09/29/10
pH	7.78	SU	1			SM 4500-H+ B	JAM	09/29/10
Total Dissolved Solids	1190	mg/L	100ml	23.1	50.0	SM 2540 C	TMN	09/30/10
Non-Metallics								
Alkalinity	199	mg/L	1	0.274	10.0	SM 2320 B	JAM	09/29/10
Bicarbonate	243	mg/L	1	0.334	10.0	SM 2320 B	JAM	09/29/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	09/29/10
Chloride (Cl-)	9.04	mg/L	1	0.196	0.500	SM 4500-Cl E	BLL	09/29/10
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	09/29/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	09/29/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	09/29/10
Sulfate (SO4)	709	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	09/29/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	09/29/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	09/29/10
Calcium (Ca)	170	mg/L	10	1.47	10.0	SM 3111 B	NMA	09/30/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	09/29/10
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	09/29/10
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	09/29/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	09/29/10
Magnesium (Mg)	46.8	mg/L	5	0.157	2.50	SM 3111 B	NMA	09/29/10
Molybdenum (Mo)	< 0.001	mg/L	10			EPA 200.8	SAC	09/29/10
Potassium (K)	11.5	mg/L	5	0.620	2.50	SM 3111 B	NMA	09/29/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	09/29/10
Sodium (Na)	152	mg/L	5	0.610	2.50	SM 3111 B	NMA	09/29/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	09/29/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	09/29/10



RECEIVED  
FEB 01 2011  
MINERALS & MINING

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Uranium	0.008	mg/L	10			EPA 200.8	SAC 09/29/10
<b>Anion - Cation Balance</b>							
Anions	19.0	meq/L	1			Calculation	GAM 09/30/10
Anion - Cation Balance	0.652	%	1			Calculation	GAM 09/30/10
Cations	19.2	meq/L	1			Calculation	GAM 09/30/10
<b>Radiological</b>							
Gross Alpha	35.3	pCi/L	1			EPA 900.0	SYS 01/24/11
Gross Beta	27.0	pCi/L	1			EPA 900.0	SYS 01/24/11
Radium-226	1.40	pCi/L	1			EPA 903.1	SYS 01/24/11
Radium-228	6.5	pCi/L	1			Brooks-Blanchard	SYS 01/24/11
Radon-222	301	pCi/L	1			SM 7500-Rn B	SYS 10/08/10

**Notes:**

Nutrient and Filtered Metal bottles made in lab.

Approved By: *Eric Fischer*

Approved On: 1/31/2011 2:49:29 PM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
FEB 01 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 1/24/2011

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC006240  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 10/1/2010  
Time Rcvd: 1025  
Date Coll: 9/28/2010

Time Coll: 1200  
Spec Type: WATER  
Tap Location: 20100929302

---

Final Results

---

Radium-226  
radium-228  
Gross Alpha  
Uranium

1.4 +/- 0.2 pCi/L  
6.5 +/- 0.6 pCi/L  
35.3 +/- 6.4 pCi/L  
8.4 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta

29.7 pCi/L  
27.0 +/- 4.6 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
FEB 01 2011

\* Page 1 of 1\*  
Date: 1/24/2011

MINERALS & MINING PROGRAM

Submitter copy to:

MIDCONTINENT TESTING-93484  
GREG MCDUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC006239  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 10/1/2010  
Time Rcvd: 1025  
Date Coll: 9/28/2010

Time Coll: 1130  
Spec Type: WATER  
Tap Location: 20100929301

Final Results

Radium-226  
radium-228  
Gross Alpha  
Gross Beta

1.7 +/- 0.2 pCi/L  
<0.8 +/- 0.4 pCi/L  
14.6 +/- 4.0 pCi/L  
15.3 +/- 3.2 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
FEB 01 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 10/8/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC006124  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 9/29/2010  
Time Rcvd: 1032  
Date Coll: 9/28/2010  
Time Coll: 1130

Spec Type: WATER  
Coll By: ERIC FUEHRER  
Tap Location: 20100929301

Final Results

Radon-Water

226 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
FEB 01 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 10/8/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC006125  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 9/29/2010  
Time Rcvd: 1032  
Date Coll: 9/28/2010  
Time Coll: 1200

Spec Type: WATER  
Coll By: ERIC FUEHRER  
Tap Location: 20100929302

Final Results

Radon-Water

301 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

RECEIVED

FEB 01 2011

MINERALS & MINING PROGRAM

FOR LAB USE ONLY
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

REQUESTED TURN AROUND
STANDARD
RUSH

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	

Company	SD-DENR
Project Name / Mgr.	/
Project Number	
Sampled by	POWELL, R. T. E. H.
Sampled by	M. M. G. L. E. A. N. E. R.

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2	DDOXY-21-01	9/24/10	1130		5	2	
3							
4	DDOXY-21-02	9/24/10	1300		5	2	
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
MR. DENR	9/24/10	1605	MR. DENR	9/24/10	1605





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

RECEIVED  
JAN 06 2011  
MINERALS & MINING PROGRAM

Page 1 of 2

Sample Site: DB09-21-1  
Sampled: 12/21/09 at 11:45 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20091222201  
Received: 12/21/09 at 01:45 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1200	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	12/22/09
pH	9.55	SU	1			SM 4500-H+ B	JAM	12/22/09
Total Dissolved Solids	741	mg/L	100ml	13.7	50.0	SM 2540 C	TMN	12/22/09
Non-Metallics								
Alkalinity	144	mg/L	1	0.274	10.0	SM 2320 B	JAM	12/22/09
Bicarbonate	142	mg/L	1	0.334	10.0	SM 2320 B	JAM	12/22/09
Carbonate	16.8	mg/L	1	0.137	5.00	SM 2320 B	JAM	12/22/09
Chloride (Cl-)	7.75	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	12/22/09
Nitrogen, Ammonia (NH3)	0.232	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	12/22/09
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	12/22/09
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	12/22/09
Sulfate (SO4)	470	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	12/22/09
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	12/22/09
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	12/22/09
Calcium (Ca)	61.3	mg/L	5	0.325	5.00	SM 3111 B	EJF	12/22/09
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	12/22/09
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	12/22/09
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	12/22/09
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	12/22/09
Magnesium (Mg)	26.9	mg/L	1	0.022	0.500	SM 3111 B	EJF	12/22/09
Molybdenum (Mo)	0.003	mg/L	10	0.000503	0.001	EPA 200.8	SAC	12/22/09
Potassium (K)	14.2	mg/L	5	1.07	2.50	SM 3111 B	EJF	12/22/09
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	12/22/09
Sodium (Na)	160	mg/L	10	2.06	5.00	SM 3111 B	EJF	12/22/09
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	12/22/09
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	12/22/09



RECEIVED

JAN 06 2011

MINERALS &amp; MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC	12/22/09
<b>Anion - Cation Balance</b>								
Anions	12.9	meq/L	1			Calculation	GAM	12/23/09
Anion - Cation Balance	-1.08	%	1			Calculation	GAM	12/23/09
Cations	12.6	meq/L	1			Calculation	GAM	12/23/09
<b>Radiological</b>								
Gross Alpha	4.80	pCi/L	1			EPA 900.0	SYS	04/02/10
Gross Beta	12.7	pCi/L	1			EPA 900.0	SYS	12/22/10
Radium-226	< 0.300	pCi/L	1			EPA 903.1	SYS	04/02/10
Radium-228	< 0.80	pCi/L	1			Brooks-Blanchard	SYS	04/02/10
Radon-222	227	pCi/L	1			SM 7500-Rn B	SYS	04/02/10

Approved By: *Eric Fischer*

Approved On: 1/4/2011 1:11:34 PM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

RECEIVED  
JAN 06 2011  
MINERALS & MINING PROGRAM

Sample Site: DB09-21-2  
Sampled: 12/21/09 at 12:15 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20091222202  
Received: 12/21/09 at 01:45 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1690	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	12/22/09
pH	8.12	SU	1			SM 4500-H+ B	JAM	12/22/09
Total Dissolved Solids	1210	mg/L	100ml	13.7	50.0	SM 2540 C	TMN	12/22/09
Non-Metallics								
Alkalinity	209	mg/L	1	0.274	10.0	SM 2320 B	JAM	12/22/09
Bicarbonate	255	mg/L	1	0.334	10.0	SM 2320 B	JAM	12/22/09
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	12/22/09
Chloride (Cl-)	10.3	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	12/22/09
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	12/22/09
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	12/22/09
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	12/22/09
Sulfate (SO4)	718	mg/L	20	5.68	20.0	SM 4500-SO4 E	BLL	12/22/09
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	12/22/09
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	12/22/09
Calcium (Ca)	171	mg/L	5	0.325	5.00	SM 3111 B	EJF	12/22/09
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	12/22/09
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	12/22/09
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	12/22/09
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	12/22/09
Magnesium (Mg)	54.2	mg/L	5	0.108	2.50	SM 3111 B	EJF	12/22/09
Molybdenum (Mo)	0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC	12/22/09
Potassium (K)	12.3	mg/L	5	1.07	2.50	SM 3111 B	EJF	12/22/09
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	12/22/09
Sodium (Na)	125	mg/L	10	2.06	5.00	SM 3111 B	EJF	12/22/09
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	12/22/09
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	12/22/09



RECEIVED

JAN 06 2011

MINERALS &amp; MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Uranium	0.009	mg/L	10	0.000027	0.001	EPA 200.8	SAC 12/22/09
<b>Anion - Cation Balance</b>							
Anions	19.4	meq/L	1			Calculation	GAM 12/23/09
Anion - Cation Balance	-1.75	%	1			Calculation	GAM 12/23/09
Cations	18.7	meq/L	1			Calculation	GAM 12/23/09
<b>Radiological</b>							
Gross Alpha	31.6	pCi/L	1			EPA 900.0	SYS 04/02/10
Gross Beta	25.1	pCi/L	1			EPA 900.0	SYS 12/22/10
Radium-226	0.700	pCi/L	1			EPA 903.1	SYS 04/02/10
Radium-228	8.4	pCi/L	1			Brooks-Blanchard	SYS 04/02/10
Radon-222	328	pCi/L	1			SM 7500-Rn B	SYS 04/02/10

Approved By: Eric Fischer

Approved On: 1/4/2011 1:11:34 PM





SOUTH DAKOTA  
DEPARTMENT OF HEALTH

Division of Administration  
Public Health Laboratory

December 22, 2010

Mid-Continent Testing Laboratories  
Greg McDougall  
PO Box 3388  
2381 S Plaza Dr  
Rapid City SD 57709

RECEIVED  
JAN 06 2011  
MINERALS & MINING PROGRAM

Dear Mr. McDougall:

It has come to our attention that an error was made in calculating some Gross Beta results.

We have taken steps to correct this error and have implemented additional Quality Control measures to prevent its recurrence.

Results for the affected samples have been recalculated and your amended reports are enclosed. We apologize for any inconvenience. If you have questions, please contact either Stacy Ellwanger or Rea Riggle at the telephone number above.

Sincerely,

A handwritten signature in black ink, appearing to read 'Michael Smith'.

Michael Smith

Administrator, Laboratory Services Program

cc: Stacy Ellwanger  
Rea Riggle





**DIVISION OF  
ADMINISTRATION**

**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JAN 06 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 12/22/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007782  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 12/28/2009  
Time Rcvd: 1035  
Date Coll: 12/21/2009

Time Coll: 1145  
Spec Type: WATER  
Tap Location: 20091222201

Final Results

Gross Alpha

4.8 +/-2.6 pCi/L

<< Results previously reported on 3/22/2010 >>

Gross Beta

12.7 +/-3.1 pCi/L

Radium-226

<0.3 +/- 0.2 pCi/L

<< Results previously reported on 3/22/2010 >>

radium-228

<0.8 +/-0.4 pCi/L

<< Results previously reported on 3/22/2010 >>





# DIVISION OF ADMINISTRATION

Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JAN 06 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 12/22/2010

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007783  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 12/28/2009  
Time Rcvd: 1035  
Date Coll: 12/21/2009

Time Coll: 1215  
Spec Type: WATER  
Tap Location: 20091222202

## Final Results

Gross Alpha

31.6 +/-6.2 pCi/L

<< Results previously reported on 4/27/2010 >>

Uranium

9.7 ug/L

EPA Method 200.8

<< Results previously reported on 4/27/2010 >>

NET ALPHA

25.1 pCi/L

<< Results previously reported on 4/27/2010 >>

Gross Beta

30.7 +/-4.7 pCi/L

Radium-226

0.7 +/- 0.4 pCi/L

<< Results previously reported on 4/27/2010 >>

radium-228

8.4 +/-0.5 pCi/L

<< Results previously reported on 4/27/2010 >>





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

RECEIVED  
JAN 03 2011

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

MINERALS & MINING PROGRAM

Sample Site: DB07-21-1  
Sampled: 03/15/10 at 11:30 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20100317101  
Received: 03/15/10 at 04:20 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1400	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	03/17/10
pH	8.10	SU	1			SM 4500-H+ B	JAM	03/17/10
Total Dissolved Solids	996	mg/L	50ml	27.3	100	SM 2540 C	NDM	03/17/10
Non-Metallics								
Alkalinity	171	mg/L	1	0.274	10.0	SM 2320 B	JAM	03/17/10
Bicarbonate	209	mg/L	1	0.334	10.0	SM 2320 B	JAM	03/17/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	03/17/10
Chloride (Cl-)	7.75	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	03/17/10
Nitrogen, Ammonia (NH3)	0.172	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	03/17/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	03/17/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	03/17/10
Sulfate (SO4)	590	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	03/17/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	03/17/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	03/17/10
Calcium (Ca)	99.8	mg/L	5	0.325	5.00	SM 3111 B	NMA	03/17/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	03/17/10
Copper (Cu)	0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	03/17/10
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	03/17/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	03/17/10
Magnesium (Mg)	33.9	mg/L	5	0.108	2.50	SM 3111 B	NMA	03/17/10
Molybdenum (Mo)	< 0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC	03/17/10
Potassium (K)	11.9	mg/L	5	1.07	2.50	SM 3111 B	NMA	03/17/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	03/17/10
Sodium (Na)	164	mg/L	5	1.03	2.50	SM 3111 B	NMA	03/17/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	03/17/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	03/17/10



MINERAL & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC	03/17/10
<b>Anion - Cation Balance</b>								
Anions	15.9	meq/L	1			Calculation	GAM	03/18/10
Anion - Cation Balance	-2.26	%	1			Calculation	GAM	03/18/10
Cations	15.2	meq/L	1			Calculation	GAM	03/18/10
<b>Radiological</b>								
Gross Alpha	6.10	pCi/L	1			EPA 900.0	SYS	07/16/10
Gross Beta	15	pCi/L	1			EPA 900.0	SYS	07/16/10
Radium-226	< 0.300	pCi/L	1			EPA 903.1	SYS	07/16/10
Radium-228	1.0	pCi/L	1			Brooks-Blanchard	SYS	07/16/10
Radon-222	236	pCi/L	1			SM 7500-Rn B	SYS	03/19/10

Approved By:



Approved On: 12/29/2010 9:56:02 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

RECEIVED  
JAN 03 2011

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

MINERALS & MINING PROGRAM

Sample Site: DB07-21-2  
Sampled: 03/15/10 at 12:05 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20100317102  
Received: 03/15/10 at 04:20 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1630	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	03/17/10
pH	7.98	SU	1			SM 4500-H+ B	JAM	03/17/10
Total Dissolved Solids	1190	mg/L	100ml	13.7	50.0	SM 2540 C	NDM	03/17/10
Non-Metallics								
Alkalinity	200	mg/L	1	0.274	10.0	SM 2320 B	JAM	03/17/10
Bicarbonate	244	mg/L	1	0.334	10.0	SM 2320 B	JAM	03/17/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	03/17/10
Chloride (Cl-)	10.3	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	03/17/10
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	03/17/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	03/17/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	03/17/10
Sulfate (SO4)	760	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	03/17/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	03/17/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	03/17/10
Calcium (Ca)	177	mg/L	5	0.325	5.00	SM 3111 B	NMA	03/17/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	03/17/10
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	03/17/10
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	03/17/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	03/17/10
Magnesium (Mg)	54.5	mg/L	25	0.542	12.5	SM 3111 B	NMA	03/17/10
Molybdenum (Mo)	< 0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC	03/17/10
Potassium (K)	11.6	mg/L	5	1.07	2.50	SM 3111 B	NMA	03/17/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	03/17/10
Sodium (Na)	128	mg/L	5	1.03	2.50	SM 3111 B	NMA	03/17/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	03/17/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	03/17/10



JAN 03 2011

Parameter	Result	Units	DF	MDL	PQL	Method	MINERALS & MINING PROGRAM Analyst/Date	
<b>Metals - Total</b>								
Uranium	0.009	mg/L	10	0.000027	0.001	EPA 200.8	SAC	03/17/10
<b>Anion - Cation Balance</b>								
Anions	20.1	meq/L	1			Calculation	GAM	03/18/10
Anion - Cation Balance	-2.35	%	1			Calculation	GAM	03/18/10
Cations	19.2	meq/L	1			Calculation	GAM	03/18/10
<b>Radiological</b>								
Gross Alpha	35.0	pCi/L	1			EPA 900.0	SYS	07/16/10
Gross Beta	23	pCi/L	1			EPA 900.0	SYS	07/16/10
Radium-226	0.900	pCi/L	1			EPA 903.1	SYS	07/16/10
Radium-228	6.5	pCi/L	1			Brooks-Blanchard	SYS	07/16/10
Radon-222	325	pCi/L	1			SM 7500-Rn B	SYS	03/19/10

Approved By:



Approved On: 12/29/2010 9:56:02 AM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JAN 03 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 3/19/2010

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC000964  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 3/16/2010  
Time Rcvd: 1100  
Date Coll: 3/15/2010

Time Coll: 1130  
Spec Type: WATER 7  
Tap Location: 20100315/101

Final Results

Radon-Water

236 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JAN 03 2011

\* Page 1 of 1  
Date: 3/19/2010  
MINERALS & MINING PROGRAM

Submitter copy to:

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC000965  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 3/16/2010  
Time Rcvd: 1100  
Date Coll: 3/15/2010

Time Coll: 1205  
Spec Type: WATER  
Tap Location: 2010031<sup>7</sup>102

Final Results

Radon-Water

325 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JAN 03 2011  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 12/23/2010

MIDCONTINENT TESTING-93484  
GREG MCDUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC001068  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 3/18/2010  
Time Rcvd: 0954  
Date Coll: 3/15/2010

Time Coll: 1205  
Spec Type: WATER 1  
Tap Location: 2010031/102

Final Results

Gross Alpha 35.0 +/-6.5 pCi/L

<< Results previously reported on 7/16/2010 >>

Uranium 8.4 ug/L

EPA Method 200.8

<< Results previously reported on 7/16/2010 >>

NET ALPHA 29.4 pCi/L

<< Results previously reported on 7/16/2010 >>

Gross Beta 23.4 +/-4.6 pCi/L  
Radium-226 0.9 +/- 0.2 pCi/L

<< Results previously reported on 7/16/2010 >>

radium-228 6.5 +/-0.6 pCi/L

<< Results previously reported on 7/16/2010 >>





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JAN 03 2011

Submitter copy to:

\* Page 1 of 1  
Date: 12/23/2010  
MINERALS & MINING PROGRAM

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC001067  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID CONTINENT

Date Rcvd: 3/18/2010  
Time Rcvd: 0954  
Date Coll: 3/15/2010

Time Coll: 1130  
Spec Type: WATER 1  
Tap Location: 2010031/101

Final Results

Gross Alpha

6.1 +/-3.1 pCi/L

<< Results previously reported on 7/16/2010 >>

Gross Beta

15.3 +/-3.5 pCi/L

Radium-226

<0.3 +/- 0.2 pCi/L

<< Results previously reported on 7/16/2010 >>

radium-228

1.0 +/-0.5 pCi/L

<< Results previously reported on 7/16/2010 >>





RECEIVED  
JAN 0 1968  
MINERALS

[illegible]

FOR LAB USE ONLY
Seal Integrity (Y/N) Number
Sample Container
Temperature of Container

SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

[illegible]

FORM 113C





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB09-21-1 MINERALS & MINING PROJ.  
Sampled: 06/22/10 at 11:30 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20100623301  
Received: 06/22/10 at 04:00 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1410	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	06/23/10
pH	8.04	SU	1			SM 4500-H+ B	JAM	06/23/10
Total Dissolved Solids	928	mg/L	100ml	13.7	50.0	SM 2540 C	WAA	06/23/10
Non-Metallics								
Alkalinity	166	mg/L	1	0.274	10.0	SM 2320 B	JAM	06/23/10
Bicarbonate	203	mg/L	1	0.334	10.0	SM 2320 B	JAM	06/23/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	06/23/10
Chloride (Cl-)	7.25	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	06/23/10
Nitrogen, Ammonia (NH3)	0.165	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	06/23/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	06/23/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	06/23/10
Sulfate (SO4)	575	mg/L	10	2.84	10.0	SM 4500-SO4 E	BLL	06/23/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	06/23/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	06/23/10
Calcium (Ca)	103	mg/L	5	0.325	5.00	SM 3111 B	NMA	06/23/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	06/23/10
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	06/23/10
Iron (Fe)	0.064	mg/L	10	0.005	0.050	EPA 200.8	SAC	06/23/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	06/23/10
Magnesium (Mg)	32.2	mg/L	5	0.108	2.50	SM 3111 B	NMA	06/23/10
Molybdenum (Mo)	< 0.001	mg/L	10			EPA 200.8	SAC	06/23/10
Potassium (K)	11.9	mg/L	5	1.07	2.50	SM 3111 B	NMA	06/23/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	06/23/10
Sodium (Na)	167	mg/L	5	1.03	2.50	SM 3111 B	NMA	06/23/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	06/23/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	06/23/10



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Uranium	< 0.001	mg/L	10			EPA 200.8	SAC 06/23/10
<b>Anion - Cation Balance</b>							
Anions	15.5	meq/L	1			Calculation	GAM 06/24/10
Anion - Cation Balance	-0.417	%	1			Calculation	GAM 06/24/10
Cations	15.4	meq/L	1			Calculation	GAM 06/24/10
<b>Radiological</b>							
Gross Alpha	5.90	pCi/L	1			EPA 900.0	SYS 12/14/10
Gross Beta	18	pCi/L	1			EPA 900.0	SYS 12/14/10
Radium-226	1.80	pCi/L	1			EPA 903.1	SYS 12/14/10
Radium-228	1.0	pCi/L	1			Brooks-Blanchard	SYS 12/14/10
Radon-222	233	pCi/L	1			SM 7500-Rn B	SYS 07/09/10

Approved By: Eric Fischer

Approved On: 12/29/2010 9:57:22 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB09-21-2  
Sampled: 06/22/10 at 12:00 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20100623302  
Received: 06/22/10 at 04:00 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

Page 1 of 2  
RECEIVED  
JAN 03 2011  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1610	µmhos/cm	1	0.349	5.00	EPA 120.1	JAM	06/23/10
pH	7.96	SU	1			SM 4500-H+ B	JAM	06/23/10
Total Dissolved Solids	1150	mg/L	100ml	13.7	50.0	SM 2540 C	WAA	06/23/10
Non-Metallics								
Alkalinity	202	mg/L	1	0.274	10.0	SM 2320 B	JAM	06/23/10
Bicarbonate	246	mg/L	1	0.334	10.0	SM 2320 B	JAM	06/23/10
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	06/23/10
Chloride (Cl-)	10.0	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	06/23/10
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	06/23/10
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.008	0.050	SM 4500-NO3 F	BLL	06/23/10
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	06/23/10
Sulfate (SO4)	725	mg/L	20	5.68	20.0	SM 4500-SO4 E	BLL	06/23/10
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	06/23/10
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	06/23/10
Calcium (Ca)	191	mg/L	5	0.325	5.00	SM 3111 B	NMA	06/23/10
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	06/23/10
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	06/23/10
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	06/23/10
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	06/23/10
Magnesium (Mg)	44.5	mg/L	5	0.108	2.50	SM 3111 B	NMA	06/23/10
Molybdenum (Mo)	< 0.001	mg/L	10			EPA 200.8	SAC	06/23/10
Potassium (K)	11.4	mg/L	5	1.07	2.50	SM 3111 B	NMA	06/23/10
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	06/23/10
Sodium (Na)	142	mg/L	5	1.03	2.50	SM 3111 B	NMA	06/23/10
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	06/23/10
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	06/23/10



RECEIVED  
JAN 03 2011MINERALS & MINING PROGRAM  
Analyst/Date

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Uranium	0.007	mg/L	10			EPA 200.8	SAC 06/23/10
<b>Anion - Cation Balance</b>							
Anions	19.4	meq/L	1			Calculation	GAM 06/24/10
Anion - Cation Balance	0.669	%	1			Calculation	GAM 06/24/10
Cations	19.7	meq/L	1			Calculation	GAM 06/24/10
<b>Radiological</b>							
Gross Alpha	26.2	pCi/L	1			EPA 900.0	SYS 12/14/10
Gross Beta	23	pCi/L	1			EPA 900.0	SYS 12/14/10
Radium-226	1.00	pCi/L	1			EPA 903.1	SYS 12/14/10
Radium-228	9.4	pCi/L	1			Brooks-Blanchard	SYS 12/14/10
Radon-222	315	pCi/L	1			SM 7500-Rn B	SYS 07/09/10

Approved By:



Approved On: 12/29/2010 9:57:22 AM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JAN 03 2011

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 12/23/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC003524  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID CONTINENT

Date Rcvd: 6/29/2010  
Time Rcvd: 0903  
Date Coll: 6/22/2010

Time Coll: 1130  
Spec Type: WATER  
Tap Location: 20100623301

Final Results

Gross Alpha

5.9 +/-3.0 pCi/L

<< Results previously reported on 12/14/2010 >>

Gross Beta

18.0 +/-3.3 pCi/L

Radium-226

1.8 +/- 0.2 pCi/L

<< Results previously reported on 12/14/2010 >>

radium-228

1.0 +/-0.4 pCi/L

<< Results previously reported on 12/14/2010 >>





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JAN 03 2011

MINERALOGY PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 12/23/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC003525  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source

MID CONTINENT

Date Rcvd: 6/29/2010  
Time Rcvd: 0903  
Date Coll: 6/22/2010

Time Coll: 1200  
Spec Type: WATER  
Tap Location: 20100623302

Final Results

Gross Alpha 26.2 +/-5.6 pCi/L

<< Results previously reported on 12/14/2010 >>

Uranium 8.9 ug/L

EPA Method 200.8

<< Results previously reported on 12/14/2010 >>

NET ALPHA 20.2 pCi/L

<< Results previously reported on 12/14/2010 >>

Gross Beta 23.3 +/-4.4 pCi/L  
Radium-226 1.0 +/- 0.3 pCi/L

<< Results previously reported on 12/14/2010 >>

radium-228 9.4 +/-0.6 pCi/L

<< Results previously reported on 12/14/2010 >>





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JAN 03 2011  
MID-CONTINENT TESTING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 7/9/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC003403  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 6/23/2010  
Time Rcvd: 0938  
Date Coll: 6/22/2010

Time Coll: 1130  
Spec Type: WATER  
Tap Location: 20100623301

Final Results

Radon-Water

233 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JAN 03 2011

WATER SAMPLING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 7/9/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E10EC003404  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source

MID CONTINENT

Date Rcvd: 6/23/2010  
Time Rcvd: 0938  
Date Coll: 6/22/2010

Time Coll: 1200  
Spec Type: WATER  
Tap Location: 20100623302

Final Results

Radon-Water

315 pCi/L





RECEIVED  
JAN 03 2011

FOR LAB USE ONLY
Serial Interval (Y/N) Number
Sample Condition
Temperature of Container 15°C

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
	DJR	6/22/10	1:07			6-22-10	1:00

Wild Horse - Response to Second Set - Request for Production # 8

01182





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB09-21-1  
Sampled: 12/21/09 at 11:45 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20091222201  
Received: 12/21/09 at 01:45 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1200	µmhos/cm	1	0.349	10.0	EPA 120.1	JAM	12/22/09
pH	9.55	SU	1			SM 4500-H+ B	JAM	12/22/09
Total Dissolved Solids	741	mg/L	100ml	13.7	50.0	SM 2540 C	TMN	12/22/09
Non-Metallics								
Alkalinity	144	mg/L	1	0.274	10.0	SM 2320 B	JAM	12/22/09
Bicarbonate	142	mg/L	1	0.334	10.0	SM 2320 B	JAM	12/22/09
Carbonate	16.8	mg/L	1	0.137	5.00	SM 2320 B	JAM	12/22/09
Chloride (Cl-)	7.75	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	12/22/09
Nitrogen, Ammonia (NH3)	0.232	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	12/22/09
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	12/22/09
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	12/22/09
Sulfate (SO4)	470	mg/L	10	3.62	10.0	SM 4500-SO4 E	BLL	12/22/09
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	12/22/09
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	12/22/09
Calcium (Ca)	61.3	mg/L	5	0.325	5.00	SM 3111 B	EJF	12/22/09
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	12/22/09
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	12/22/09
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	12/22/09
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	12/22/09
Magnesium (Mg)	26.9	mg/L	1	0.022	0.500	SM 3111 B	EJF	12/22/09
Molybdenum (Mo)	0.003	mg/L	10	0.000503	0.001	EPA 200.8	SAC	12/22/09
Potassium (K)	14.2	mg/L	5	1.07	2.50	SM 3111 B	EJF	12/22/09
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	12/22/09
Sodium (Na)	160	mg/L	10	2.06	5.00	SM 3111 B	EJF	12/22/09
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	12/22/09
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	12/22/09



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC	12/22/09
<b>Anion - Cation Balance</b>								
Anions	12.9	meq/L	1			Calculation	GAM	12/23/09
Anion - Cation Balance	-1.08	%	1			Calculation	GAM	12/23/09
Cations	12.6	meq/L	1			Calculation	GAM	12/23/09
<b>Radiological</b>								
Gross Alpha	4.80	pCi/L	1			EPA 900.0	SYS	04/02/10
Gross Beta	6.3	pCi/L	1			EPA 900.0	SYS	04/02/10
Radium-226	< 0.300	pCi/L	1			EPA 903.1	SYS	04/02/10
Radium-228	< 0.80	pCi/L	1			Brooks-Blanchard	SYS	04/02/10
Radon-222	227	pCi/L	1			SM 7500-Rn B	SYS	04/02/10

Approved By: *Eric Fischer*

Approved On: 4/2/2010 2:23:27 PM

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 - www.thechemistrylab.com

Sample Site: DB09-21-2  
Sampled: 12/21/09 at 12:15 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20091222202  
Received: 12/21/09 at 01:45 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Page 1 of 2  
**RECEIVED**  
APR 05 2010  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1690	µmhos/cm	1	0.349	10.0	EPA 120.1	JAM	12/22/09
pH	8.12	SU	1			SM 4500-H+ B	JAM	12/22/09
Total Dissolved Solids	1210	mg/L	100ml	13.7	50.0	SM 2540 C	TMN	12/22/09
Non-Metallics								
Alkalinity	209	mg/L	1	0.274	10.0	SM 2320 B	JAM	12/22/09
Bicarbonate	255	mg/L	1	0.334	10.0	SM 2320 B	JAM	12/22/09
Carbonate	0.00	mg/L	1	0.137	5.00	SM 2320 B	JAM	12/22/09
Chloride (Cl-)	10.3	mg/L	1	0.372	0.500	SM 4500-Cl B	PAT	12/22/09
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.007	0.050	SM 4500-NH3 D	JAM	12/22/09
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO3 F	BLL	12/22/09
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	12/22/09
Sulfate (SO4)	718	mg/L	20	7.25	20.0	SM 4500-SO4 E	BLL	12/22/09
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0008	0.005	EPA 200.8	SAC	12/22/09
Cadmium (Cd)	< 0.001	mg/L	10	0.00007	0.001	EPA 200.8	SAC	12/22/09
Calcium (Ca)	171	mg/L	5	0.325	5.00	SM 3111 B	EJF	12/22/09
Chromium (Cr)	< 0.001	mg/L	10	0.00005	0.001	EPA 200.8 DRC	SAC	12/22/09
Copper (Cu)	< 0.005	mg/L	10	0.0004	0.005	EPA 200.8	SAC	12/22/09
Iron (Fe)	< 0.050	mg/L	10	0.005	0.050	EPA 200.8	SAC	12/22/09
Lead (Pb)	< 0.001	mg/L	10	0.00002	0.001	EPA 200.8	SAC	12/22/09
Magnesium (Mg)	54.2	mg/L	5	0.108	2.50	SM 3111 B	EJF	12/22/09
Molybdenum (Mo)	0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC	12/22/09
Potassium (K)	12.3	mg/L	5	1.07	2.50	SM 3111 B	EJF	12/22/09
Selenium (Se)	< 0.005	mg/L	10	0.002	0.005	EPA 200.8	SAC	12/22/09
Sodium (Na)	125	mg/L	10	2.06	5.00	SM 3111 B	EJF	12/22/09
Vanadium (V)	< 0.005	mg/L	10	0.00007	0.005	EPA 200.8	SAC	12/22/09
Zinc (Zn)	< 0.050	mg/L	10	0.003	0.050	EPA 200.8	SAC	12/22/09



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Uranium	0.009	mg/L	10	0.000027	0.001	EPA 200.8	SAC	12/22/09
Anion - Cation Balance								
Anions	19.4	meq/L	1			Calculation	GAM	12/23/09
Anion - Cation Balance	-1.75	%	1			Calculation	GAM	12/23/09
Cations	18.7	meq/L	1			Calculation	GAM	12/23/09
Radiological								
Gross Alpha	31.6	pCi/L	1			EPA 900.0	SYS	04/02/10
Gross Beta	15	pCi/L	1			EPA 900.0	SYS	04/02/10
Radium-226	0.700	pCi/L	1			EPA 903.1	SYS	04/02/10
Radium-228	8.4	pCi/L	1			Brooks-Blanchard	SYS	04/02/10
Radon-222	328	pCi/L	1			SM 7500-Rn B	SYS	04/02/10

Approved By: *Eric Fischer*

Approved On: 4/2/2010 2:23:27 PM

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
APR 05 2010

MINERALS & MINING PROGRAM

\* Page 1 of 1\*  
Date: 1/26/2010

Submitter copy to:

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007760  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source

MID CONTINENT

Date Rcvd: 12/22/2009  
Time Rcvd: 1117  
Date Coll: 12/21/2009

Time Coll: 1145  
Spec Type: WATER  
Tap Location: 20091222201

Final Results

Radon-Water

227 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 1/26/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007761  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 12/22/2009  
Time Rcvd: 1117  
Date Coll: 12/21/2009

Time Coll: 1215  
Spec Type: WATER  
Tap Location: 20091222202

Final Results

Radon-Water

328 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 3/22/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007782  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 12/28/2009  
Time Rcvd: 1035  
Date Coll: 12/21/2009

Time Coll: 1145  
Spec Type: WATER  
Tap Location: 20091222201

Final Results

Gross Alpha  
Gross Beta  
Radium-226  
radium-228

4.8 +/-2.6 pCi/L  
6.3 +/-1.5 pCi/L  
<0.3 +/- 0.2 pCi/L  
<0.8 +/-0.4 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 3/30/2010

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC007783  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 12/28/2009  
Time Rcvd: 1035  
Date Coll: 12/21/2009

Time Coll: 1215  
Spec Type: WATER  
Tap Location: 20091222202

Final Results

Gross Alpha  
Uranium

31.6 +/-6.2 pCi/L  
9.7 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta  
Radium-226  
radium-228

25.1 pCi/L  
15.4 +/-2.4 pCi/L  
0.7 +/- 0.4 pCi/L  
8.4 +/-0.5 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

RECEIVED  
APR 05 2010  
MINERALS & MINING PROGRAM

FOR LAB USE ONLY

Seal Intact (Y/N)/Number

Sample Condition

Temperature of Container

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	

Company	SD-DEAR
Project Name	POWER TECH
Project Number	
Sampled by	<i>[Signature]</i>
Sampled by	<i>[Signature]</i>

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2	0009-21-1	12/10/09	1444		5	1 2	
3							
4							
5	0009-21-2	12/10/09	1715		5	1 2	
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
<i>[Signature]</i>	DEAR	12/10/09		<i>[Signature]</i>	DEAR	12/10/09	





# MIDCONTINENT TESTING LABORATORY INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-11-17  
Project Name: POWERTECH  
Sampled: 11/18/08 at 10:00 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20081120601  
Received: 11/18/08 at 03:30 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Page 1 of 2  
RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1230	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	11/20/08
pH	7.99	SU	1			SM 4500-H+ B	JAM	11/20/08
Total Dissolved Solids	773	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	11/19/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN	11/19/08
Non-Metallics								
Alkalinity	163	mg/L	1	0.510	10.0	SM 2320 B	JAM	11/20/08
Bicarbonate	199	mg/L	1	0.622	10.0	SM 2320 B	JAM	11/20/08
Chloride (Cl-)	11.3	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	11/19/08
Fluoride	0.522	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS	11/19/08
Nitrogen, Ammonia (NH3)	0.425	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	11/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	11/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	11/20/08
Sulfate (SO4)	401	mg/L	2	10.5	20.0	EPA 375.2	BLL	11/20/08
Metals - Dissolved								
Aluminum (Al)	0.026	mg/L	10	0.004	0.010	EPA 200.8	SAC	11/20/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	11/20/08
Barium (Ba)	0.010	mg/L	10	0.00012	0.005	EPA 200.8	SAC	11/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	11/20/08
Calcium (Ca)	52.3	mg/L	5	0.312	5.00	SM 3111 B	NMA	11/20/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	11/20/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	11/20/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC	11/20/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	11/20/08
Magnesium (Mg)	19.8	mg/L	5	0.487	2.50	SM 3111 B	NMA	11/20/08
Manganese (Mn)	0.062	mg/L	10	0.00012	0.010	EPA 200.8	SAC	11/20/08
Potassium (K)	12.0	mg/L	5	0.524	2.50	SM 3111 B	NMA	11/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	11/20/08
Sodium (Na)	168	mg/L	5	0.810	2.50	SM 3111 B	NMA	11/20/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	11/20/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Dissolved</b>							
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC 11/20/08
<b>Metals - Total</b>							
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA 11/20/08
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC 11/20/08
<b>Anion - Cation Balance</b>							
Anions	11.9	meq/L	1			Calculation	GAM 11/25/08
Anion - Cation Balance	-0.297	%	1			Calculation	GAM 11/25/08
Cations	11.9	meq/L	1			Calculation	GAM 11/25/08
<b>Radiological</b>							
Gross Alpha	42.4	pCi/L	1			EPA 900.0	SYS 09/09/09
Gross Beta	25	pCi/L	1			EPA 900.0	SYS 09/09/09
Radium-226	2.2	pCi/L	1			EPA 903.1	SYS 09/09/09
Radium-228	4.4	pCi/L	1			Brooks-Blanchard	SYS 09/09/09
Radon-222	< 1.00	pCi/L	1			SM 7500-Rn B	SYS 11/19/08

Approved By: *Eric Fuchner*

Approved On: 9/9/2009 10:39:19 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-11-116  
Project Name: POWERTECH  
Sampled: 11/18/08 at 10:15 AM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20081120602  
Received: 11/18/08 at 03:30 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2660	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	11/20/08
pH	7.70	SU	1			SM 4500-H+ B	JAM	11/20/08
Total Dissolved Solids	2380	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	11/19/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN	11/19/08
Non-Metallics								
Alkalinity	252	mg/L	1	0.510	10.0	SM 2320 B	JAM	11/20/08
Bicarbonate	308	mg/L	1	0.622	10.0	SM 2320 B	JAM	11/20/08
Chloride (Cl-)	12.0	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	11/19/08
Fluoride	0.335	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS	11/19/08
Nitrogen, Ammonia (NH3)	0.117	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	11/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	11/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	11/20/08
Sulfate (SO4)	1370	mg/L	10	52.3	100	EPA 375.2	BLL	11/20/08
Metals - Dissolved								
Aluminum (Al)	0.011	mg/L	10	0.004	0.010	EPA 200.8	SAC	11/20/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	11/20/08
Barium (Ba)	0.011	mg/L	10	0.00012	0.005	EPA 200.8	SAC	11/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	11/20/08
Calcium (Ca)	347	mg/L	25	1.56	25.0	SM 3111 B	NMA	11/21/08
Chromium (Cr)	0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	11/20/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	11/20/08
Iron (Fe)	0.201	mg/L	10	0.010	0.050	EPA 200.8	SAC	11/20/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	11/20/08
Magnesium (Mg)	116	mg/L	5	0.487	2.50	SM 3111 B	NMA	11/20/08
Manganese (Mn)	0.431	mg/L	10	0.00012	0.010	EPA 200.8	SAC	11/20/08
Potassium (K)	18.5	mg/L	5	0.524	2.50	SM 3111 B	NMA	11/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	11/20/08
Sodium (Na)	128	mg/L	5	0.810	2.50	SM 3111 B	NMA	11/20/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	11/20/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Dissolved</b>							
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC 11/20/08
<b>Metals - Total</b>							
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA 11/20/08
Uranium	0.021	mg/L	10	0.000027	0.001	EPA 200.8	SAC 11/20/08
<b>Anion - Cation Balance</b>							
Anions	34.0	meq/L	1			Calculation	GAM 11/25/08
Anion - Cation Balance	-1.60	%	1			Calculation	GAM 11/25/08
Cations	32.9	meq/L	1			Calculation	GAM 11/25/08
<b>Radiological</b>							
Gross Alpha	4480	pCi/L	1			EPA 900.0	SYS 07/17/09
Gross Beta	3500	pCi/L	1			EPA 900.0	SCR 07/17/09
Radium-226	1100	pCi/L	1			EPA 903.1	SYS 07/17/09
Radium-228	15	pCi/L	1			Brooks-Blanchard	SYS 07/17/09
Radon-222	231000	pCi/L	1			SM 7500-Rn B	SYS 11/19/08

Approved By: *Eric Fuchsner*

Approved On: 9/9/2009 10:50:35 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-6-1  
Project Name: POWERTECH MINING PROGRAM  
Sampled: 11/18/08 at 11:35 AM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
SEP 10 2009

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20081120603  
Received: 11/18/08 at 03:30 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	2770	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 11/20/08
pH	7.42	SU	1			SM 4500-H+ B	JAM 11/20/08
Total Dissolved Solids	2370	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 11/19/08
Total Suspended Solids	37.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN 11/19/08
<b>Non-Metallics</b>							
Alkalinity	187	mg/L	1	0.510	10.0	SM 2320 B	JAM 11/20/08
Bicarbonate	228	mg/L	1	0.622	10.0	SM 2320 B	JAM 11/20/08
Chloride (Cl-)	11.5	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 11/19/08
Fluoride	0.410	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS 11/19/08
Nitrogen, Ammonia (NH3)	0.365	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 11/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL 11/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 11/20/08
Sulfate (SO4)	1390	mg/L	10	52.3	100	EPA 375.2	BLL 11/20/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.012	mg/L	10	0.004	0.010	EPA 200.8	SAC 11/20/08
Arsenic (As)	0.008	mg/L	10	0.0003	0.005	EPA 200.8	SAC 11/20/08
Barium (Ba)	0.013	mg/L	10	0.00012	0.005	EPA 200.8	SAC 11/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC 11/20/08
Calcium (Ca)	347	mg/L	5	0.312	5.00	SM 3111 B	NMA 11/20/08
Chromium (Cr)	0.002	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC 11/20/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 11/20/08
Iron (Fe)	13.8	mg/L	10	0.010	0.050	EPA 200.8	SAC 11/20/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC 11/20/08
Magnesium (Mg)	116	mg/L	5	0.487	2.50	SM 3111 B	NMA 11/20/08
Manganese (Mn)	1.20	mg/L	10	0.00012	0.010	EPA 200.8	SAC 11/20/08
Potassium (K)	18.9	mg/L	5	0.524	2.50	SM 3111 B	NMA 11/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 11/20/08
Sodium (Na)	148	mg/L	5	0.810	2.50	SM 3111 B	NMA 11/20/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 11/20/08



RECEIVED

SEP 10 2009

MINERALS & MINING PROGRAM  
Analyst/Date

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Dissolved</b>							
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC 11/20/08
<b>Metals - Total</b>							
Mercury (Hg)	0.0006	mg/L	1	0.000027	0.0002	EPA 245.1	NMA 11/25/08
Uranium	0.006	mg/L	10	0.000027	0.001	EPA 200.8	SAC 11/20/08
<b>Anion - Cation Balance</b>							
Anions	33.0	meq/L	1			Calculation	GAM 11/25/08
Anion - Cation Balance	1.22	%	1			Calculation	GAM 11/25/08
Cations	33.8	meq/L	1			Calculation	GAM 11/25/08
<b>Radiological</b>							
Gross Alpha	123	pCi/L	1			EPA 900.0	SYS 07/17/09
Gross Beta	58	pCi/L	1			EPA 900.0	SCR 07/17/09
Radium-226	5.7	pCi/L	1			EPA 903.1	SYS 07/17/09
Radium-228	3.1	pCi/L	1			Brooks-Blanchard	SYS 07/17/09
Radon-222	1180	pCi/L	1			SM 7500-Rn B	SYS 11/19/08

Approved By: *Eric Fischer*

Approved On: 9/9/2009 10:50:35 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-2-1  
Project Name: POWERTECH  
Sampled: 11/18/08 at 12:05 PM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20081120604  
Received: 11/18/08 at 03:30 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	2470	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 11/20/08
pH	7.43	SU	1			SM 4500-H+ B	JAM 11/20/08
Total Dissolved Solids	2190	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 11/19/08
Total Suspended Solids	18.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN 11/19/08
<b>Non-Metallics</b>							
Alkalinity	114	mg/L	1	0.510	10.0	SM 2320 B	JAM 11/20/08
Bicarbonate	139	mg/L	1	0.622	10.0	SM 2320 B	JAM 11/20/08
Chloride (Cl-)	9.25	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 11/19/08
Fluoride	0.321	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS 11/19/08
Nitrogen, Ammonia (NH3)	0.141	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 11/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL 11/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 11/20/08
Sulfate (SO4)	1300	mg/L	10	52.3	100	EPA 375.2	BLL 11/20/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.012	mg/L	10	0.004	0.010	EPA 200.8	SAC 11/20/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 11/20/08
Barium (Ba)	0.009	mg/L	10	0.00012	0.005	EPA 200.8	SAC 11/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC 11/20/08
Calcium (Ca)	314	mg/L	5	0.312	5.00	SM 3111 B	NMA 11/20/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC 11/20/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 11/20/08
Iron (Fe)	3.42	mg/L	10	0.010	0.050	EPA 200.8	SAC 11/20/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC 11/20/08
Magnesium (Mg)	123	mg/L	5	0.487	2.50	SM 3111 B	NMA 11/20/08
Manganese (Mn)	2.37	mg/L	10	0.00012	0.010	EPA 200.8	SAC 11/20/08
Potassium (K)	13.1	mg/L	5	0.524	2.50	SM 3111 B	NMA 11/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 11/20/08
Sodium (Na)	74.1	mg/L	5	0.810	2.50	SM 3111 B	NMA 11/20/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 11/20/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC	11/20/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA	11/20/08
Uranium	0.107	mg/L	10	0.000027	0.001	EPA 200.8	SAC	11/20/08
<b>Anion - Cation Balance</b>								
Anions	29.7	meq/L	1			Calculation	GAM	11/25/08
Anion - Cation Balance	-0.386	%	1			Calculation	GAM	11/25/08
Cations	29.4	meq/L	1			Calculation	GAM	11/25/08
<b>Radiological</b>								
Gross Alpha	1730	pCi/L	1			EPA 900.0	SYS	07/17/09
Gross Beta	1300	pCi/L	1			EPA 900.0	SCR	07/17/09
Radium-226	320	pCi/L	1			EPA 903.1	SYS	07/17/09
Radium-228	6.0	pCi/L	1			Brooks-Blanchard	SYS	07/17/09
Radon-222	103000	pCi/L	1			SM 7500-Rn B	SYS	11/19/08

Approved By: *Eric Fischer*

Approved On: 9/9/2009 10:50:35 AM





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

RECEIVED  
SEP 10 2009  
615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\* Page 1 of 1\*  
\*\* DUPLICATE REPORT \*\* Date: 7/10/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008516  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID CONTINENT

Date Rcvd: 11/21/2008  
Time Rcvd: 1035  
Date Coll: 11/18/2008

Time Coll: 1000  
Spec Type: WATER  
Tap Location: 20081120601

Final Results

Gross Alpha  
Uranium

42.4 +/-4.2 pCi/L  
<0.1 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta  
Radium-226  
radium-228

42.3 pCi/L  
25.4 +/-3.9 pCi/L  
2.2 +/- 0.4 pCi/L  
4.4 +/-0.4 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

RECEIVED  
SEP 10 2009  
615 East Fourth Street  
Pierre, South Dakota 57501-4700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\*\* DUPLICATE REPORT \*\*

\* Page 1 of 1 \*

Date: 7/10/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008517  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source

MID CONTINENT

Date Rcvd: 11/21/2008  
Time Rcvd: 1035  
Date Coll: 11/18/2008

Time Coll: 1015  
Spec Type: WATER  
Tap Location: 20081120602

Final Results

Gross Alpha  
Uranium

4483 +/-68.3 pCi/L  
21.7 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta  
Radium-226  
radium-228

4469 pCi/L  
3537 +/-51.3 pCi/L  
1060 +/- 10.8 pCi/L  
14.6 +/-0.6 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
\*\* DUPLICATE REPORT \*\* Date: 7/10/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008518  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID CONTINENT

Date Rcvd: 11/21/2008  
Time Rcvd: 1035  
Date Coll: 11/18/2008

Time Coll: 1135  
Spec Type: WATER  
Tap Location: 20081120603

Final Results

Gross Alpha  
Uranium

123 +/-13.8 pCi/L  
6.3 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta  
radium-228  
Radium-226

119 pCi/L  
58.3 +/-12.4 pCi/L  
3.1 +/-0.4 pCi/L  
5.7 +/- 0.6 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\* Page 1 of 1\*  
\*\* DUPLICATE REPORT \*\* Date: 7/10/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: B08EC008519  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID CONTINENT

Date Rcvd: 11/21/2008  
Time Rcvd: 1035  
Date Coll: 11/18/2008

Time Coll: 1205  
Spec Type: WATER  
Tap Location: 20081120604

Final Results

Gross Alpha  
Uranium

1734 +/-42.8 pCi/L  
111 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta  
radium-228  
Radium-226

1660 pCi/L  
1273 +/-31.7 pCi/L  
6.0 +/-0.4 pCi/L  
319.6 +/- 7.5 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM  
615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008423  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 11/19/2008  
Time Rcvd: 0920  
Date Coll: 11/18/2008

Time Coll: 1000  
Spec Type: WATER

2008 1120 601

Final Results

Radon-Water

<1 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

RECEIVED  
SEP 10 2009  
615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008424  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 11/19/2008  
Time Rcvd: 0920  
Date Coll: 11/18/2008

Time Coll: 1015  
Spec Type: WATER  
2008 1120 602

Final Results

Radon-Water

231000 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

RECEIVED  
SEP 10 2009  
615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008425  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 11/19/2008  
Time Rcvd: 0920  
Date Coll: 11/18/2008

Time Coll: 1135  
Spec Type: WATER

20081120603

Final Results

Radon-Water

1180 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
SEP 10 2009

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC008426  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 11/19/2008  
Time Rcvd: 0920  
Date Coll: 11/18/2008

Time Coll: 1205  
Spec Type: WATER

2008 1120 604

Final Results

Radon-Water

103000 pCi/L



(605) 348-0111 • [www.TheChemistryLab.com](http://www.TheChemistryLab.com)

## RECEIVED

SEP 10 2009

MINERALS &amp; MINING PROGRAM

<b>FOR LAB USE ONLY</b>	
Seal Intact (Y/N)	Number
Sample Condition	
Temperature of Container	

[illegible][illegible]

FORM 113C





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 1

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-2  
Project Name: POWERTECH  
Sampled: 02/17/09 at 12:15 PM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20090218304  
Received: 02/17/09 at 04:40 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1410	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 02/18/09
pH	7.90	SU	1			SM 4500-H+ B	JAM 02/18/09
Total Dissolved Solids	927	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 02/19/09
<b>Non-Metallics</b>							
Alkalinity	207	mg/L	1	0.510	10.0	SM 2320 B	JAM 02/18/09
Bicarbonate	253	mg/L	1	0.622	10.0	SM 2320 B	JAM 02/18/09
Chloride (Cl-)	9.25	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 02/18/09
Sulfate (SO4)	520	mg/L	4	20.9	40.0	EPA 375.2	BLL 02/18/09
<b>Metals - Dissolved</b>							
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 02/18/09
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 02/18/09
Molybdenum (Mo)	< 0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC 02/18/09
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 02/18/09
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 02/18/09
<b>Metals - Total</b>							
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC 02/18/09
<b>Radiological</b>							
Gross Alpha	7.20	pCi/L	1			EPA 900.0	SYS 09/09/09
Gross Beta	21	pCi/L	1			EPA 900.0	SYS 09/09/09
Radium-226	1.3	pCi/L	1			EPA 903.1	SYS 09/09/09
Radon-222	81.0	pCi/L	1			SM 7500-Rn B	EJF 06/12/09

Approved By: Eini Fischer

Approved On: 9/9/2009 10:39:19 AM





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 9/4/2009

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC000772  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 2/20/2009  
Time Rcvd: 1029  
Date Coll: 2/17/2009

Time Coll: 1215  
Spec Type: WATER  
Tap Location: 20090218304

Final Results

Radium-226  
Gross Alpha  
Gross Beta

1.3 +/- 0.5 pCi/L  
7.2 +/- 3.7 pCi/L  
20.8 +/- 7.2 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

## CHAIN OF CUSTODY RECORD

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

FOR LAB USE ONLY

Seal Intact (Y/N) Number  
Sample Condition  
Temperature of Container

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	

Company	SD-DEFAR
Project Name	Power Plant
Project Number	
Sampled by	Signature: [Signature]
Sampled by	Print: [Name]

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2	WATER 2	9/10/09			2	PT 43511	
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
[Signature]	Drill 217-9	9/10/09	16:35	[Signature]	AC	9-17-09	



**MIDCONTINENT**

TESTING LABORATORIES, INC.

Page 1 of 1

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-9  
Project Name: POWERTECH  
Sampled: 03/17/09 at 11:45 AM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
SEP 10 2009  
MINERALS & MINING PROGRAM

Lab ID#: 20090318313  
Received: 03/17/09 at 04:20 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1440	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 03/18/09
pH	8.17	SU	1			SM 4500-H+ B	JAM 03/18/09
Total Dissolved Solids	907	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 03/18/09
<b>Non-Metallics</b>							
Alkalinity	181	mg/L	1	0.510	10.0	SM 2320 B	JAM 03/18/09
Bicarbonate	221	mg/L	1	0.622	10.0	SM 2320 B	JAM 03/18/09
Chloride (Cl <sup>-</sup> )	12.5	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 03/18/09
Sulfate (SO <sub>4</sub> )	444	mg/L	4	20.9	40.0	EPA 375.2	BLL 03/18/09
<b>Metals - Dissolved</b>							
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 03/18/09
Copper (Cu)	0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 03/18/09
Molybdenum (Mo)	0.003	mg/L	10	0.000503	0.001	EPA 200.8	SAC 03/18/09
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 03/18/09
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 03/18/09
<b>Metals - Total</b>							
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC 03/18/09
<b>Radiological</b>							
Gross Alpha	4.50	pCi/L	1			EPA 900.0	SYS 09/09/09
Gross Beta	12	pCi/L	1			EPA 900.0	SYS 09/09/09
Radium-226	0.70	pCi/L	1			EPA 903.1	EJF 09/09/09
Radon-222	< 1.00	pCi/L	1			SM 7500-Rn B	SYS 03/19/09

Approved By: Eric Fischer

Approved On: 9/9/2009 10:39:19 AM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

RECEIVED  
SEP 10 2009  
615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm  
RADON MONITORING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 9/3/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC001245  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 3/20/2009  
Time Rcvd: 1015  
Date Coll: 3/18/2009

Time Coll: 0620  
Spec Type: WATER  
Tap Location: 20090318313

Final Results

Radium-226  
Gross Alpha  
Gross Beta

0.7 +/- 0.1 pCi/L  
4.5 +/- 3.0 pCi/L  
12.1 +/- 4.3 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

RECEIVED  
SEP 10 2009  
MINERALS & MINING DEPT.

FOR LAB USE ONLY	
Soil Inlet (Y/N)	Number
Sample Condition	
Temperature of Container	

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	

Company	
Project Name	
Project Number	
Sampled by	Signature
Sampled by	Print

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

RECEIVED  
SEP 04 2009  
MINERALS & MINING PROGRAM

September 2, 2009

Mr. Cepak:

I am writing in regards to the Powertech samples DB08-35-3C, DB08-32-10, and #615 that were taken on 12/17/08. We received these samples on 12/17/08. When we received the samples the two (2) vials for each sample to be tested for radon were shipped overnight to the South Dakota State Health Lab. The two (2) 4-liter cubes for each sample were set aside to be shipped the next day, however they were never shipped for testing. I failed to catch the error until now.

I apologize for any inconvenience this may have caused. If you have any questions or need further assistance in this matter please don't hesitate to contact me.

Best regards,

Eric Fuehrer  
Mid-Continent Testing Laboratories, Inc  
2381 South Plaza Drive  
Rapid City, SD 57702  
(605) 348-0111  
eric@thechemistrylab.com

2381 South Plaza Drive  
P.O. Box 3388  
Rapid City, SD 57709  
Ph 605/348-0111  
[www.TheChemistryLab.com](http://www.TheChemistryLab.com)





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 2

RECEIVED  
SEP 04 2009  
MINERALS & MINING PROGRAM

Sample Site: DB08-32-3C  
Project Name: POWERTECH  
Sampled: 12/17/08 at 10:40 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20081218206  
Received: 12/17/08 at 03:35 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
<b>Physical Properties</b>								
Electrical Conductivity	1360	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	12/18/08
pH	7.96	SU	1			SM 4500-H+ B	JAM	12/18/08
Total Dissolved Solids	838	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	12/19/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN	12/18/08
<b>Non-Metallics</b>								
Alkalinity	175	mg/L	1	0.510	10.0	SM 2320 B	JAM	12/18/08
Bicarbonate	213	mg/L	1	0.622	10.0	SM 2320 B	JAM	12/18/08
Chloride (Cl-)	15.5	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	12/18/08
Fluoride	0.408	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS	12/18/08
Nitrogen, Ammonia (NH3)	0.101	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	12/18/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	12/18/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	12/18/08
Sulfate (SO4)	428	mg/L	4	20.9	40.0	EPA 375.2	BLL	12/18/08
<b>Metals - Dissolved</b>								
Aluminum (Al)	0.017	mg/L	10	0.004	0.010	EPA 200.8	SAC	12/18/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	12/18/08
Barium (Ba)	0.010	mg/L	10	0.00012	0.005	EPA 200.8	SAC	12/18/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	12/18/08
Calcium (Ca)	63.3	mg/L	5	0.312	5.00	SM 3111 B	NMA	12/18/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	12/18/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	12/18/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC	12/18/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	12/18/08
Magnesium (Mg)	21.5	mg/L	5	0.487	2.50	SM 3111 B	NMA	12/18/08
Manganese (Mn)	0.080	mg/L	10	0.00012	0.010	EPA 200.8	SAC	12/18/08
Potassium (K)	9.59	mg/L	5	0.524	2.50	SM 3111 B	NMA	12/18/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	12/18/08
Sodium (Na)	176	mg/L	5	0.810	2.50	SM 3111 B	NMA	12/18/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	12/18/08



**RECEIVED**  
SEP 04 2009

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC	12/18/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA	12/18/08
Uranium	0.009	mg/L	10	0.000027	0.001	EPA 200.8	SAC	12/18/08
<b>Anion - Cation Balance</b>								
Anions	12.9	meq/L	1			Calculation	GAM	12/19/08
Anion - Cation Balance	-0.071	%	1			Calculation	GAM	12/19/08
Cations	12.8	meq/L	1			Calculation	GAM	12/19/08
<b>Radiological</b>								
Radon-222	6420	pCi/L	1			SM 7500-Rn B	SYS	12/18/08

Approved By: Eric Fischer

Approved On: 9/2/2009 4:28:49 PM





# MIDCONTINENT

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 2

RECEIVED  
SEP 04 2009  
MINERALS & MINING PROGRAM

Sample Site: DB08-32-10  
Project Name: POWERTECH  
Sampled: 12/17/08 at 11:00 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20081218207  
Received: 12/17/08 at 03:35 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1050	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	12/18/08
pH	7.92	SU	1			SM 4500-H+ B	JAM	12/18/08
Total Dissolved Solids	670	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	12/19/08
Total Suspended Solids	372	mg/L	100ml	4.00	10.0	SM 2540 D	TMN	12/18/08
Non-Metallics								
Alkalinity	143	mg/L	1	0.510	10.0	SM 2320 B	JAM	12/18/08
Bicarbonate	175	mg/L	1	0.622	10.0	SM 2320 B	JAM	12/18/08
Chloride (Cl-)	3.50	mg/L	2	0.906	1.00	SM 4500-Cl B	AJS	12/18/08
Fluoride	0.491	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS	12/18/08
Nitrogen, Ammonia (NH3)	0.082	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	12/18/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	12/18/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	12/18/08
Sulfate (SO4)	358	mg/L	2	10.5	20.0	EPA 375.2	BLL	12/18/08
Metals - Dissolved								
Aluminum (Al)	0.019	mg/L	10	0.004	0.010	EPA 200.8	SAC	12/18/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	12/18/08
Barium (Ba)	0.013	mg/L	10	0.00012	0.005	EPA 200.8	SAC	12/18/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	12/18/08
Calcium (Ca)	45.7	mg/L	5	0.312	5.00	SM 3111 B	NMA	12/18/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	12/18/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	12/18/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC	12/18/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	12/18/08
Magnesium (Mg)	14.1	mg/L	5	0.487	2.50	SM 3111 B	NMA	12/18/08
Manganese (Mn)	0.032	mg/L	10	0.00012	0.010	EPA 200.8	SAC	12/18/08
Potassium (K)	8.18	mg/L	5	0.524	2.50	SM 3111 B	NMA	12/18/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	12/18/08
Sodium (Na)	147	mg/L	5	0.810	2.50	SM 3111 B	NMA	12/18/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	12/18/08



SEP 04 2009

MINERALS & MINING PROGRAM  
Analyst/Date

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Dissolved</b>							
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC 12/18/08
<b>Metals - Total</b>							
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA 12/18/08
Uranium	0.003	mg/L	10	0.000027	0.001	EPA 200.8	SAC 12/18/08
<b>Anion - Cation Balance</b>							
Anions	10.4	meq/L	1			Calculation	GAM 12/19/08
Anion - Cation Balance	-1.91	%	1			Calculation	GAM 12/19/08
Cations	10.0	meq/L	1			Calculation	GAM 12/19/08
<b>Radiological</b>							
Radon-222	1940	pCi/L	1			SM 7500-Rn B	SYS 12/18/08

Approved By: \_\_\_\_\_



Approved On: 9/2/2009 4:28:49 PM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Page 1 of 2  
**RECEIVED**  
SEP 04 2009

MINERALS & MINING PROGRAM

Sample Site: #615  
Project Name: POWERTECH  
Sampled: 12/17/08 at 11:40 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20081218208  
Received: 12/17/08 at 03:35 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1070	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	12/18/08
pH	7.76	SU	1			SM 4500-H+ B	JAM	12/18/08
Total Dissolved Solids	693	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	12/19/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN	12/18/08
Non-Metallics								
Alkalinity	139	mg/L	1	0.510	10.0	SM 2320 B	JAM	12/18/08
Bicarbonate	170	mg/L	1	0.622	10.0	SM 2320 B	JAM	12/18/08
Chloride (Cl-)	4.80	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	12/18/08
Fluoride	0.492	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS	12/18/08
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	12/18/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	12/18/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	12/18/08
Sulfate (SO4)	407	mg/L	4	20.9	40.0	EPA 375.2	BLL	12/18/08
Metals - Dissolved								
Aluminum (Al)	0.022	mg/L	10	0.004	0.010	EPA 200.8	SAC	12/18/08
Arsenic (As)	0.016	mg/L	10	0.0003	0.005	EPA 200.8	SAC	12/18/08
Barium (Ba)	0.011	mg/L	10	0.00012	0.005	EPA 200.8	SAC	12/18/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	12/18/08
Calcium (Ca)	87.1	mg/L	1	0.062	1.00	SM 3111 B	NMA	12/19/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	12/18/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	12/18/08
Iron (Fe)	0.927	mg/L	10	0.010	0.050	EPA 200.8	SAC	12/18/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	12/18/08
Magnesium (Mg)	20.6	mg/L	5	0.487	2.50	SM 3111 B	NMA	12/18/08
Manganese (Mn)	0.061	mg/L	10	0.00012	0.010	EPA 200.8	SAC	12/18/08
Potassium (K)	8.46	mg/L	5	0.524	2.50	SM 3111 B	NMA	12/18/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	12/18/08
Sodium (Na)	117	mg/L	5	0.810	2.50	SM 3111 B	NMA	12/18/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	12/18/08



RECEIVED  
SEP 04 2009  
Page 2 of 2

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst	Date
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC	12/18/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA	12/18/08
Uranium	0.002	mg/L	10	0.000027	0.001	EPA 200.8	SAC	12/18/08
<b>Anion - Cation Balance</b>								
Anions	11.4	meq/L	1			Calculation	GAM	12/19/08
Anion - Cation Balance	-0.294	%	1			Calculation	GAM	12/19/08
Cations	11.3	meq/L	1			Calculation	GAM	12/19/08
<b>Radiological</b>								
Radon-222	5760	pCi/L	1			SM 7500-Rn B	SYS	12/18/08

Approved By: *Eric Fischer*

Approved On: 9/2/2009 4:28:49 PM





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

RECEIVED  
SEP 04 2009

MINERALS & MINING PROGRAM

FOR LAB USE ONLY

Seal Intact (Y/N) Number

Sample Condition

Temperature of Container

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	Asst Biot Mn

Company	SD-DEAR
Project Name	Powder
Project Number	
Sampled by	Signature: [Signature]
Sampled by	Print: [Name]

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2	Dye-33-30	11/10/08	1440		5	2	
3							
4	Dye-33-10	11/10/08	1440		5	2	
5							
6	Dye-33-10	11/10/08	1440		5	2	
7							
8	Dye-33-10	11/10/08	1440		5	2	
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
[Signature]	DEAR	11/10/08	1440	[Signature]	DEAR	11/10/08	1440





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
SEP 04 2009

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC009207  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 12/18/2008  
Time Rcvd: 0946  
Date Coll: 12/18/2008

Spec Type: WATER  
Tap Location: 20081218206

Final Results

Radon-Water

6420 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
SEP 04 2009

MINERALS & MINING PROGRAM

\* Page 1 of 1\*  
Date: 6/2/2009

Submitter copy to:

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC009208  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 12/18/2008  
Time Rcvd: 0946  
Date Coll: 12/18/2008

Spec Type: WATER  
Tap Location: 20081218207

Final Results

Radon-Water

1940 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
SEP 04 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC009209  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 12/18/2008  
Time Rcvd: 0946  
Date Coll: 12/18/2008

Spec Type: WATER  
Tap Location: 20081218208

Final Results

Radon-Water

5760 pCi/L





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 1

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: #622  
Project Name: POWERTECH  
Sampled: 01/20/09 at 10:45 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20090121109  
Received: 01/20/09 at 03:10 PM  
by Bobbie Laurenz  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1360	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	01/21/09
pH	7.92	SU	1			SM 4500-H+ B	JAM	01/21/09
Total Dissolved Solids	916	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	01/21/09
Non-Metallics								
Alkalinity	180	mg/L	1	0.510	10.0	SM 2320 B	JAM	01/21/09
Bicarbonate	220	mg/L	1	0.622	10.0	SM 2320 B	JAM	01/21/09
Chloride (Cl-)	10.5	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	01/22/09
Sulfate (SO4)	476	mg/L	4	20.9	40.0	EPA 375.2	BLL	01/21/09
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	01/21/09
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	01/21/09
Molybdenum (Mo)	0.002	mg/L	10	0.000503	0.001	EPA 200.8	SAC	01/21/09
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	01/21/09
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC	01/21/09
Metals - Total								
Uranium	0.006	mg/L	10	0.000027	0.001	EPA 200.8	SAC	01/21/09
Radiological								
Gross Alpha	17.9	pCi/L	1			EPA 900.0	SYS	07/13/09
Gross Beta	26	pCi/L	1			EPA 900.0	SCR	07/13/09
Radium-226	3.4	pCi/L	1			EPA 903.1	SCR	07/13/09
Radium-228	1.5	pCi/L	1			Brooks-Blanchard	SYS	07/13/09
Radon-222	1210	pCi/L	1			SM 7500-Rn B	SYS	01/21/09

Approved By:

*Eric Fischer*

Approved On: 7/17/2009 11:05:28 AM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC000280  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 1/21/2009  
Time Rcvd: 0933  
Date Coll: 1/20/2009

Time Coll: 1045  
Spec Type: WATER  
Tap Location: 20090121109

Final Results

Radon-Water

1210 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 7/9/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E09EC000348  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source

MID CONTINENT

Date Rcvd: 1/23/2009  
Time Rcvd: 1034  
Date Coll: 1/20/2009

Time Coll: 1045  
Spec Type: WATER  
Remarks: 20090121109

Final Results

radium-228	1.5 +/-0.4 pCi/L
Radium-226	3.4 +/- 0.7 pCi/L
Gross Alpha	17.9 +/-3.1 pCi/L
Uranium	6.3 ug/L
EPA Method 200.8	
NET ALPHA	13.7 pCi/L
Gross Beta	25.5 +/-4.3 pCi/L









**FOR LAB USE ONLY**

Company	Mid Continent Testing
Project Name	
Project Number	
Sampled by	Signature
Sampled by	Print

PRESERVED WITH	FILTERED (Y/N)	REFRIGERATED (Y/N)	ANALYSES REQUESTED
H <sub>2</sub> O <sub>2</sub>	N	N	Radium 226
H <sub>2</sub> O <sub>2</sub>	N	N	Radium 228
H <sub>2</sub> O <sub>2</sub>	N	N	Gross Alpha
H <sub>2</sub> O <sub>2</sub>	N	N	Gross Beta

FOR LAB USE ONLY	
Seal Intact (Y/N)/Number	
Sample Condition	
Temperature of Container	

REQUESTED TURN AROUND

STANDARD \_\_\_\_\_ RUSH \_\_\_\_\_

SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS			COMMENTS	LAB #
20090121109	1/20/09	1045	H <sub>2</sub> O	1	X	Y	X	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

[illegible]

FORM 113D





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

FOR LAB USE ONLY	
Seal Intact (Y/N) Number	
Sample Condition	
Temperature of Container	

REQUESTED TURN AROUND	
STANDARD	RUSH

PRESERVED WITH	NAME
FILTERED (Y/N)	N
REFRIGERATED (Y/N)	X
ANALYSES REQUESTED	Radon 222

Company	Mid Continent Testing
Project Name	
Project Number	
Sampled by	Signature
Sampled by	Print

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	20090121 109	1/20/09	1045	H <sub>2</sub> O	2	X	
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Eric Leber	McT	1/20/09	1615				

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-12  
Project Name: POWERTECH  
Sampled: 10/21/08 at 10:55 AM  
by Mark Kennihan  
Sample Matrix: Water

Lab ID#: 20081022601  
Received: 10/21/08 at 03:05 PM  
by Julie Muzzy  
Account: W1008

DENR - Minerals &amp; Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1270	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 10/22/08
pH	7.96	SU	1			SM 4500-H+ B	JAM 10/22/08
Total Dissolved Solids	823	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 10/21/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN 10/23/08
<b>Non-Metallics</b>							
Alkalinity	167	mg/L	1	0.510	10.0	SM 2320 B	JAM 10/22/08
Bicarbonate	204	mg/L	1	0.622	10.0	SM 2320 B	JAM 10/22/08
Chloride (Cl-)	9.25	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 10/22/08
Fluoride	0.539	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS 10/22/08
Nitrogen, Ammonia (NH3)	0.217	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 10/22/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL 10/22/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 10/22/08
Sulfate (SO4)	406	mg/L	4	20.9	40.0	EPA 375.2	BLL 10/22/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.023	mg/L	10	0.004	0.010	EPA 200.8	SAC 10/22/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 10/22/08
Barium (Ba)	0.020	mg/L	10	0.00012	0.005	EPA 200.8	SAC 10/22/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC 10/22/08
Calcium (Ca)	56.6	mg/L	5	0.312	5.00	SM 3111 B	NMA 10/22/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC 10/22/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 10/22/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC 10/22/08
Lead (Pb)	0.002	mg/L	10	0.0001	0.001	EPA 200.8	SAC 10/22/08
Magnesium (Mg)	16.3	mg/L	5	0.487	2.50	SM 3111 B	NMA 10/22/08
Manganese (Mn)	0.084	mg/L	10	0.00012	0.010	EPA 200.8	SAC 10/22/08
Potassium (K)	8.75	mg/L	5	0.524	2.50	SM 3111 B	NMA 10/22/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 10/22/08
Sodium (Na)	183	mg/L	5	0.810	2.50	SM 3111 B	NMA 10/22/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 10/22/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC	10/22/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA	10/22/08
Uranium	< 0.001	mg/L	10	0.000027	0.001	EPA 200.8	SAC	10/22/08
<b>Anion - Cation Balance</b>								
Anions	12.1	meq/L	1			Calculation	GAM	10/29/08
Anion - Cation Balance	1.16	%	1			Calculation	GAM	10/29/08
Cations	12.4	meq/L	1			Calculation	GAM	10/29/08
<b>Radiological</b>								
Gross Alpha	2.50	pCi/L	1			EPA 900.0	SYS	06/22/09
Gross Beta	9.8	pCi/L	1			EPA 900.0	SYS	06/22/09
Radium-226	0.90	pCi/L	1			EPA 903.1	SYS	06/22/09
Radium-228	0.90	pCi/L	1			Brooks-Blanchard	SYS	06/22/09
Radon-222	453	pCi/L	1			SM 7500-Rn B	SYS	10/22/08

Approved By: *Eiri Fuchner*

Approved On: 7/17/2009 9:35:23 AM

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-13  
Project Name: POWERTECH  
Sampled: 10/21/08 at 11:15 AM  
by Mark Kennihan  
Sample Matrix: Water

Lab ID#: 20081022602  
Received: 10/21/08 at 03:05 PM  
by Julie Muzzy  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1410	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM 10/22/08
pH	8.01	SU	1			SM 4500-H+ B	JAM 10/22/08
Total Dissolved Solids	899	mg/L	100ml	11.0	50.0	SM 2540 C	TMN 10/21/08
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN 10/23/08
<b>Non-Metallics</b>							
Alkalinity	177	mg/L	1	0.510	10.0	SM 2320 B	JAM 10/22/08
Bicarbonate	216	mg/L	1	0.622	10.0	SM 2320 B	JAM 10/22/08
Chloride (Cl-)	12.8	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS 10/22/08
Fluoride	0.430	mg/L	1	0.00066	0.050	SM 4500 F-C	AJS 10/22/08
Nitrogen, Ammonia (NH3)	0.219	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 10/22/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL 10/22/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL 10/22/08
Sulfate (SO4)	484	mg/L	4	20.9	40.0	EPA 375.2	BLL 10/22/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.016	mg/L	10	0.004	0.010	EPA 200.8	SAC 10/22/08
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 10/22/08
Barium (Ba)	0.020	mg/L	10	0.00012	0.005	EPA 200.8	SAC 10/22/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC 10/22/08
Calcium (Ca)	60.0	mg/L	1	0.062	1.00	SM 3111 B	NMA 10/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC 10/22/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC 10/22/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC 10/22/08
Lead (Pb)	0.002	mg/L	10	0.0001	0.001	EPA 200.8	SAC 10/22/08
Magnesium (Mg)	18.0	mg/L	1	0.097	0.500	SM 3111 B	NMA 10/23/08
Manganese (Mn)	0.078	mg/L	10	0.00012	0.010	EPA 200.8	SAC 10/22/08
Potassium (K)	9.21	mg/L	5	0.524	2.50	SM 3111 B	NMA 10/22/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC 10/22/08
Sodium (Na)	213	mg/L	5	0.810	2.50	SM 3111 B	NMA 10/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 10/22/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC	10/22/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA	10/22/08
Uranium	0.003	mg/L	10	0.000027	0.001	EPA 200.8	SAC	10/22/08
<b>Anion - Cation Balance</b>								
Anions	14.0	meq/L	1			Calculation	GAM	10/29/08
Anion - Cation Balance	-0.007	%	1			Calculation	GAM	10/29/08
Cations	14.0	meq/L	1			Calculation	GAM	10/29/08
<b>Radiological</b>								
Gross Alpha	11.3	pCi/L	1			EPA 900.0	SYS	05/06/09
Gross Beta	14	pCi/L	1			EPA 900.0	SYS	05/06/09
Radium-226	4.9	pCi/L	1			EPA 903.1	SYS	05/06/09
Radium-228	< 0.60	pCi/L	1			Brooks-Blanchard	SYS	05/06/09
Radon-222	4840	pCi/L	1			SM 7500-Rn B	SYS	10/22/08

Approved By: *Eric Fischer*

Approved On: 7/17/2009 9:35:23 AM

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 1

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: Peterson Stock Tank  
Project Name: POWERTECH  
Sampled: 10/21/08 at 12:45 PM  
by Mark Kennihan  
Sample Matrix: Water

Lab ID#: 20081022603  
Received: 10/21/08 at 03:05 PM  
by Julie Muzzy  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Total Suspended Solids	< 10.0	mg/L	100ml	4.00	10.0	SM 2540 D	TMN 10/23/08
<b>Metals - Total</b>							
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC 10/23/08
Barium (Ba)	0.021	mg/L	10	0.00012	0.005	EPA 200.8	SAC 10/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC 10/23/08
Calcium (Ca)	163	mg/L	5	0.312	5.00	SM 3111 B	NMA 10/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC 10/23/08
Iron (Fe)	3.06	mg/L	10	0.010	0.050	EPA 200.8	SAC 10/23/08
Lead (Pb)	0.002	mg/L	10	0.0001	0.001	EPA 200.8	SAC 10/23/08
Magnesium (Mg)	58.2	mg/L	5	0.487	2.50	SM 3111 B	NMA 10/23/08
Manganese (Mn)	0.319	mg/L	10	0.00012	0.010	EPA 200.8	SAC 10/23/08
Mercury (Hg)	< 0.0002	mg/L	1	0.000027	0.0002	EPA 245.1	NMA 10/23/08
Potassium (K)	14.7	mg/L	5	0.524	2.50	SM 3111 B	NMA 10/23/08
Sodium (Na)	98.4	mg/L	5	0.810	2.50	SM 3111 B	NMA 10/23/08
Uranium	0.010	mg/L	10	0.000027	0.001	EPA 200.8	SAC 10/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000073	0.005	EPA 200.8	SAC 10/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.008	0.050	EPA 200.8	SAC 10/23/08
<b>Radiological</b>							
Gross Alpha	530	pCi/L	1			EPA 900.0	SYS 05/06/09
Gross Beta	460	pCi/L	1			EPA 900.0	SYS 05/06/09
Radium-226	170	pCi/L	1			EPA 903.1	SYS 05/06/09
Radium-228	3.8	pCi/L	1			Brooks-Blanchard	SYS 05/06/09
Radon-222	179000	pCi/L	1			SM 7500-Rn B	SYS 10/22/08

Approved By: Eric Fischer

Approved On: 7/17/2009 9:35:23 AM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007728  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 10/22/2008  
Time Rcvd: 0924  
Date Coll: 10/21/2008

Time Coll: 1055  
Spec Type: WATER  
Tap Location: 20081022601

Final Results

Radon-Water

453 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JUL 20 2009

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*

Date: 6/22/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007778  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 10/23/2008  
Time Rcvd: 0923  
Date Coll: 10/21/2008

Time Coll: 1055  
Spec Type: WATER  
Tap Location: 20081022601

---

Final Results

---

Radium-226  
radium-228  
Gross Alpha  
Gross Beta

0.9 +/- 0.1 pCi/L  
0.9 +/- 0.3 pCi/L  
2.5 +/- 1.4 pCi/L  
9.8 +/- 3.2 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JUL 20 2009

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 6/2/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007729  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 10/22/2008  
Time Rcvd: 0924  
Date Coll: 10/22/2008

Time Coll: 1115  
Spec Type: WATER  
Tap Location: 20081022602

---

Final Results

---

Radon-Water

4840 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
JUL 20 2009

MINERALS & MINING PROGRAM

\* Page 1 of 1\*  
Date: 6/2/2009

Submitter copy to:

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007730  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 10/22/2008  
Time Rcvd: 0924  
Date Coll: 10/21/2008

Time Coll: 1245  
Spec Type: WATER  
Tap Location: 20081022603

---

Final Results

---

Radon-Water

179000 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JUL 20 2009

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 5/6/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007779  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

**Source**

MID-CONTINENT TESTING LAB

Date Rcvd: 10/23/2008  
Time Rcvd: 0923  
Date Coll: 10/21/2008

Time Coll: 1115  
Spec Type: WATER  
Tap Location: 20081022602

**Final Results**

Radium-226  
radium-228  
Gross Alpha  
Gross Beta

4.9 +/- 0.7 pCi/L  
<0.6 +/-0.3 pCi/L  
11.3 +/-2.6 pCi/L  
13.6 +/-4.0 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
JUL 20 2009

MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 5/6/2009

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007780  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 10/23/2008  
Time Rcvd: 0923  
Date Coll: 10/21/2008

Time Coll: 1245  
Spec Type: WATER  
Tap Location: 20081022603

Final Results

Radium-226  
radium-228  
Gross Alpha  
Uranium

165.1 +/- 3.6 pCi/L  
3.8 +/- 0.4 pCi/L  
530 +/- 16.5 pCi/L  
10.7 ug/L

EPA Method 200.8  
NET ALPHA  
Gross Beta

523 pCi/L  
459 +/- 13.2 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

FOR LAB USE ONLY
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

REQUESTED TURN AROUND
STANDARD _____ RUSH _____

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	Radon 222

Company	M.J. Cond. and Test. Co.
Project Name	
Project Number	
Sampled by	Signature
Sampled by	Print

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	20081022601	10/21/08	1055	Water	2	X	
2	20081022602	10/21/08	1115	I	1	X	
3	20081022603	10/21/08	1245	I	1	X	
4							
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Eric T. [Signature]	PCT	10/21/08	1550				

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM





<b>FOR LAB USE ONLY</b>
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

REQUESTED TURN AROUND

STANDARD	RUSH
1.00	1.00
1.01	1.01
1.02	1.02
1.03	1.03
1.04	1.04
1.05	1.05
1.06	1.06
1.07	1.07
1.08	1.08
1.09	1.09
1.10	1.10
1.11	1.11
1.12	1.12
1.13	1.13
1.14	1.14
1.15	1.15
1.16	1.16
1.17	1.17
1.18	1.18
1.19	1.19
1.20	1.20
1.21	1.21
1.22	1.22
1.23	1.23
1.24	1.24
1.25	1.25
1.26	1.26
1.27	1.27
1.28	1.28
1.29	1.29
1.30	1.30
1.31	1.31
1.32	1.32
1.33	1.33
1.34	1.34
1.35	1.35
1.36	1.36
1.37	1.37
1.38	1.38
1.39	1.39
1.40	1.40
1.41	1.41
1.42	1.42
1.43	1.43
1.44	1.44
1.45	1.45
1.46	1.46
1.47	1.47
1.48	1.48
1.49	1.49
1.50	1.50
1.51	1.51
1.52	1.52
1.53	1.53
1.54	1.54
1.55	1.55
1.56	1.56
1.57	1.57
1.58	1.58
1.59	1.59
1.60	1.60
1.61	1.61
1.62	1.62
1.63	1.63
1.64	1.64
1.65	1.65
1.66	1.66
1.67	1.67
1.68	1.68
1.69	1.69
1.70	1.70
1.71	1.71
1.72	1.72
1.73	1.73
1.74	1.74
1.75	1.75
1.76	1.76
1.77	1.77
1.78	1.78
1.79	1.79
1.80	1.80
1.81	1.81
1.82	1.82
1.83	1.83
1.84	1.84
1.85	1.85
1.86	1.86
1.87	1.87
1.88	1.88
1.89	1.89
1.90	1.90
1.91	1.91
1.92	1.92
1.93	1.93
1.94	1.94
1.95	1.95
1.96	1.96
1.97	1.97
1.98	1.98
1.99	1.99
2.00	2.00
2.01	2.01
2.02	2.02
2.03	2.03
2.04	2.04
2.05	2.05
2.06	2.06
2.07	2.07
2.08	2.08
2.09	2.09
2.10	2.10
2.11	2.11
2.12	2.12
2.13	2.13
2.14	2.14
2.15	2.15
2.16	2.16
2.17	2.17
2.18	2.18
2.19	2.19
2.20	2.20
2.21	2.21
2.22	2.22
2.23	2.23
2.24	2.24
2.25	2.25
2.26	2.26
2.27	2.27
2.28	2.28
2.29	2.29
2.30	2.30
2.31	2.31
2.32	2.32
2.33	2.33
2.34	2.34
2.35	2.35
2.36	2.36
2.37	2.37
2.38	2.38
2.39	2.39
2.40	2.40
2.41	2.41
2.42	2.42
2.43	2.43
2.44	2.44
2.45	2.45
2.46	2.46
2.47	2.47
2.48	2.48
2.49	2.49
2.5	

HISTON

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM

FORM 113D





2381 S. Plaza Dr. • P.O. Box 3088 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

Company	SD-DENR
Project Name	POWER TECH
Project Number	
Sampled by	Mark Keenihan
Sampled by	MARK KEENIHAN

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	BAD HIL RADDS

FOR LAB USE ONLY	
Seal Intact (Y/N) Number	
Sample Condition	good
Temperature of Container	12°C

	SAMPLE NAME	DATE	TIME	MATRIX	NO OF CONTAINERS	COMMENTS	LAB #
1							
2	DB08-32-12	10/24/08	1055		5	2 1 2	
3							
4	DB08-32-13	10/24/08	1115		5	2 1 2	
5							
6	PETROBRAS STICK TANK	10/24/08	1245		4	2 3	
7							
8							
9							
10							
11							
12							

10-22-08

Butch 6

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Mark Keenihan	SD-DENR	10-24-08	1505	[Signature]	MCT	10-21-08	3:05p

RECEIVED  
JUL 20 2009  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-2  
Project Name: POWERTECH  
Sampled: 09/23/08 at 10:00 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080924308  
Received: 09/23/08 at 02:45 PM  
by Greg McDougall

Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1420	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	09/24/08
pH	7.92	SU	1			SM 4500-H+ B	JAM	09/24/08
Total Dissolved Solids	898	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	09/24/08
Non-Metallics								
Alkalinity	206	mg/L	1	0.510	10.0	SM 2320 B	JAM	09/24/08
Bicarbonate	252	mg/L	1	0.622	10.0	SM 2320 B	JAM	09/24/08
Carbonate	0.00	mg/L	1	0.255	5.00	SM 2320 B	JAM	09/24/08
Chloride (Cl-)	10.3	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	09/24/08
Nitrogen, Ammonia (NH3)	0.304	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	09/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	09/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	09/24/08
Sulfate (SO4)	474	mg/L	5	26.2	50.0	EPA 375.2	BLL	09/24/08
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	09/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	09/24/08
Calcium (Ca)	95.6	mg/L	10	0.624	10.0	SM 3111 B	NMA	09/24/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	09/25/08
Copper (Cu)	0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	09/24/08
Iron (Fe)	0.055	mg/L	10	0.010	0.050	EPA 200.8	SAC	09/24/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	09/24/08
Magnesium (Mg)	33.7	mg/L	5	0.487	2.50	SM 3111 B	NMA	09/25/08
Molybdenum (Mo)	0.001	mg/L	10	0.000503	0.001	EPA 200.8	SAC	09/24/08
Potassium (K)	12.6	mg/L	10	1.05	5.00	SM 3111 B	NMA	09/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	09/24/08
Sodium (Na)	158	mg/L	5	0.810	2.50	SM 3111 B	NMA	09/25/08
Metals - Total								
Uranium	< 0.001	µg/L	10	0.027	1.00	EPA 200.8	SAC	09/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Anion - Cation Balance</b>								
Anions	14.3	meq/L	1			Calculation	GAM	09/25/08
Anion - Cation Balance	1.63	%	1			Calculation	GAM	09/25/08
Cations	14.8	meq/L	1			Calculation	GAM	09/25/08
<b>Radiological</b>								
Radium-226	1.9	pCi/L	1			EPA 903.1	SYS	03/26/09
Radium-228	< 0.60	pCi/L	1			Brooks-Blanchard	SYS	03/26/09
Radon-222	539	pCi/L	1			SM 7500-Rn B	SYS	12/05/08

Approved By: \_\_\_\_\_



Approved On: 3/27/2009 10:05:44 AM

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-3  
Project Name: POWERTECH  
Sampled: 09/23/08 at 09:10 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080924307  
Received: 09/23/08 at 02:45 PM  
by Greg McDougall  
Account: W1008

DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1440	µmhos/cm	1	0.299	5.00	EPA 120.1	JAM	09/24/08
pH	8.16	SU	1			SM 4500-H+ B	JAM	09/24/08
Total Dissolved Solids	871	mg/L	100ml	11.0	50.0	SM 2540 C	TMN	09/24/08
Non-Metallics								
Alkalinity	182	mg/L	1	0.510	10.0	SM 2320 B	JAM	09/24/08
Bicarbonate	222	mg/L	1	0.622	10.0	SM 2320 B	JAM	09/24/08
Carbonate	0.00	mg/L	1	0.255	5.00	SM 2320 B	JAM	09/24/08
Chloride (Cl-)	14.3	mg/L	1	0.453	0.500	SM 4500-Cl B	AJS	09/24/08
Nitrogen, Ammonia (NH3)	0.466	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	09/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.012	0.050	SM 4500-NO3 F	BLL	09/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.004	0.050	SM 4500-NO2 B	BLL	09/24/08
Sulfate (SO4)	509	mg/L	5	26.2	50.0	EPA 375.2	BLL	09/24/08
Metals - Dissolved								
Arsenic (As)	< 0.005	mg/L	10	0.0003	0.005	EPA 200.8	SAC	09/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.0002	0.001	EPA 200.8	SAC	09/24/08
Calcium (Ca)	37.7	mg/L	5	0.312	5.00	SM 3111 B	NMA	09/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8 DRC	SAC	09/25/08
Copper (Cu)	< 0.005	mg/L	10	0.00015	0.005	EPA 200.8	SAC	09/24/08
Iron (Fe)	< 0.050	mg/L	10	0.010	0.050	EPA 200.8	SAC	09/24/08
Lead (Pb)	< 0.001	mg/L	10	0.0001	0.001	EPA 200.8	SAC	09/24/08
Magnesium (Mg)	10.7	mg/L	1	0.097	0.500	SM 3111 B	NMA	09/25/08
Molybdenum (Mo)	0.003	mg/L	10	0.000503	0.001	EPA 200.8	SAC	09/24/08
Potassium (K)	10.7	mg/L	5	0.524	2.50	SM 3111 B	NMA	09/25/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	SAC	09/24/08
Sodium (Na)	253	mg/L	10	1.62	5.00	SM 3111 B	NMA	09/24/08
Metals - Total								
Uranium	< 0.001	µg/L	10	0.027	1.00	EPA 200.8	SAC	09/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Anion - Cation Balance								
Anions	14.6	meq/L	1			Calculation	GAM	09/25/08
Anion - Cation Balance	-2.04	%	1			Calculation	GAM	09/25/08
Cations	14.0	meq/L	1			Calculation	GAM	09/25/08
Radiological								
Radium-226	0.50	pCi/L	1			EPA 903.1	SYS	03/26/09
Radium-228	1.2	pCi/L	1			Brooks-Blanchard	SYS	03/26/09
Radon-222	303	pCi/L	1			SM 7500-Rn B	SYS	12/05/08

Approved By: Eric Fischer

Approved On: 3/27/2009 10:05:44 AM

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
MAR 30 2009

MINERALS & MINING PROGRAM

\* Page 1 of 1\*  
Date: 12/5/2008

Submitter copy to:

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC006937  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MIDCONTINENT TESTING

---

Date Rcvd: 9/24/2008  
Time Rcvd: 0952  
Date Coll: 9/23/2008  
Time Coll: 0910

Spec Type: WATER  
Coll By: GREG  
Tap Location: 20080924307

---

Final Results

---

Radon-Water

303 pCi/L





**DIVISION OF  
ADMINISTRATION**  
**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
MAR 30 2009

Submitter copy to:

MINERALS & MINING PROGRAM\* Page 1 of 1\*  
Date: 12/5/2008

MIDCONTINENT TESTING-93484  
GREG MCDOUGALL  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC006938  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MIDCONTINENT TESTING

Date Rcvd: 9/24/2008  
Time Rcvd: 0952  
Date Coll: 9/23/2008  
Time Coll: 1000

Spec Type: WATER  
Coll By: GREG MCDOUGALL  
Tap Location: 20080924308

Final Results

Radon-Water

539 pCi/L





**DIVISION OF  
ADMINISTRATION**

**Public Health Laboratory**

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED

MAR 30 2009

MINERALS & MINING PROGRAM

\* Page 1 of 1\*  
Date: 3/26/2009

Submitter copy to:

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007071  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605)773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 9/26/2008  
Time Rcvd: 0959  
Date Coll: 9/23/2008

Spec Type: WATER  
Tap Location: 20080924307

---

Final Results

---

radium-228  
Radium-226

1.2 +/- 0.3 pCi/L  
0.5 +/- 0.2 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED

MAR 30 2009

MINERALS & MINING PROGRAM

\* Page 1 of 1\*

Date: 3/26/2009

Submitter copy to:

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC007072  
Subm #:  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

Source  
MID-CONTINENT TESTING LAB

Date Rcvd: 9/26/2008  
Time Rcvd: 0959  
Date Coll: 9/23/2008

Spec Type: WATER  
Tap Location: 20080924308

Final Results

radium-228  
Radium-226

<0.6 +/- 0.3 pCi/L  
1.9 +/- 0.5 pCi/L





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

## CHAIN OF CUSTODY RECORD

Company	SD-DEAR
Project Name	Powder River
Project Number	
Sampled by	<i>[Signature]</i>
Sampled by	<i>[Signature]</i>

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	

FOR LAB USE ONLY
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1							
2	0808-15-3	9/24/08	0810		5	2	
3							
4	0808-15-7	9/24/08	1200		5	7	
5							
6							
7							
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
<i>[Signature]</i>	Deer	9/24/08	1405	<i>[Signature]</i>	Deer	9/24/08	1411





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

Company	SD-DEAR
Project Name	Powertrain
Project Number	
Sampled by	Signature: Mark K. Korman
Sampled by	Print: MARK K. KORMAN

PRESERVED WITH	
FILTERED (Y/N)	
REFRIGERATED (Y/N)	
ANALYSES REQUESTED	Rad HPLC BAPC

FOR LAB USE ONLY	
Seal Intact (Y/N)/Number	
Sample Condition	
Temperature of Container	13°C

RECEIVED  
MAR 30 2009  
MINERALS & MINING PROGRAM

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	RE-SPEC 615	7-14-08	1200		5	2 1 2	
2							
3	RE-SPEC 622	7-14-08	1230		5	2 1 2	
4							
5	DBO8-32-13	7-14-08	1330		5	2 1 2	
6							
7	DO 08-32-13	7-14-08	1400		5	2 1 2	
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Mark Korman	DEAR	7-14-08	1730	Dean	DEAR	7-14-08	1730





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

Company	50-DRWR
Project Name	POWER TECH
Project Number	
Sampled by	<i>[Signature]</i>
Sampled by	<i>[Signature]</i>

PRESERVED WITH	
FILTERED (Y/N)	(Y/N)
REFRIGERATED (Y/N)	(Y/N)
ANALYSES REQUESTED	

FOR LAB USE ONLY
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

RECEIVED  
MAR 30 2003

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	MINERALS & METALS COMMENTS	LAB #
1							
2	D0008-15-3	3/24/03	1200		5		
3					1		
4	D0007-11-11C				2		
5	Power Plant Test 1	3/13/00			5		
6					2		
7	P+O Samples						
8							
9							
10							
11							
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
<i>[Signature]</i>	DERR	3/24/03	1530	<i>[Signature]</i>	Midco	3/28/03	1530





2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-2  
Project Name: POWERTECH  
Sampled: 06/24/08 at 03:00 PM  
by Mark Keenihan  
Sample Matrix: Water

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20080626102  
Received: 06/25/08 at 07:25 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Physical Properties</b>								
Electrical Conductivity	1440	µmhos/cm	1	0.400	5.00	EPA 120.1	EJF	06/26/08
pH	7.90	SU	1			SM 4500-H+ B	EJF	06/26/08
Total Dissolved Solids	941	mg/L	100ml	8.28	50.0	SM 2540 C	TMN	06/26/08
<b>Non-Metallics</b>								
Alkalinity	206	mg/L	1	0.414	10.0	SM 2320 B	EJF	06/26/08
Bicarbonate	252	mg/L	1	0.505	10.0	SM 2320 B	EJF	06/26/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	EJF	06/26/08
Chloride (Cl-)	9.50	mg/L	1	0.453	0.500	SM 4500-Cl B	LAF	06/26/08
Nitrogen, Ammonia (NH3)	0.322	mg/L	1	0.005	0.050	SM 4500-NH3 D	EJF	06/25/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	BLL	06/26/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	06/26/08
Sulfate (SO4)	545	mg/L	5	13.1	50.0	EPA 375.2	BLL	06/26/08
<b>Metals - Dissolved</b>								
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	06/26/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	06/26/08
Calcium (Ca)	117	mg/L	5	1.10	5.00	SM 3111 B	SAC	06/27/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	06/26/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	06/26/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	06/26/08
Magnesium (Mg)	34.7	mg/L	5	0.108	2.50	SM 3111 B	SAC	06/26/08
Molybdenum (Mo)	< 0.001	mg/L	10	0.000385	0.001	EPA 200.8	PAT	06/26/08
Potassium (K)	13.2	mg/L	5	0.890	2.50	SM 3111 B	SAC	06/26/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	06/26/08
Sodium (Na)	151	mg/L	5	0.741	2.50	SM 3111 B	SAC	06/26/08
<b>Metals - Total</b>								
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	06/26/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Anion - Cation Balance</b>								
Anions	15.7	meq/L	1			Calculation	GAM	06/27/08
Anion - Cation Balance	-0.388	%	1			Calculation	GAM	06/27/08
Cations	15.6	meq/L	1			Calculation	GAM	06/27/08
<b>Radiological</b>								
Radium-226	2.2	pCi/L	1			EPA 903.1	SYS	11/12/08
Radium-228	1.5	pCi/L	1			Brooks-Blanchard	SYS	11/12/08
Radon-222	210	pCi/L	1			SM 7500-Rn B	SYS	10/21/08

Approved By: 

Approved On: 11/24/2008 11:02:21 AM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-3  
Project Name: POWERTECH  
Sampled: 06/24/08 at 02:30 PM  
by Mark Keenihan  
Sample Matrix: Water

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Lab ID#: 20080626101  
Received: 06/25/08 at 07:25 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Physical Properties</b>								
Electrical Conductivity	1460	µmhos/cm	1	0.400	5.00	EPA 120.1	EJF	06/26/08
pH	8.18	SU	1			SM 4500-H+ B	EJF	06/26/08
Total Dissolved Solids	915	mg/L	100ml	8.28	50.0	SM 2540 C	TMN	06/26/08
<b>Non-Metallics</b>								
Alkalinity	183	mg/L	1	0.414	10.0	SM 2320 B	EJF	06/26/08
Bicarbonate	223	mg/L	1	0.505	10.0	SM 2320 B	EJF	06/26/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	EJF	06/26/08
Chloride (Cl-)	12.8	mg/L	1	0.453	0.500	SM 4500-Cl B	LAF	06/26/08
Nitrogen, Ammonia (NH3)	0.525	mg/L	1	0.005	0.050	SM 4500-NH3 D	EJF	06/25/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	BLL	06/26/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	BLL	06/26/08
Sulfate (SO4)	507	mg/L	5	13.1	50.0	EPA 375.2	BLL	06/26/08
<b>Metals - Dissolved</b>								
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	06/26/08
Cadmium (Cd)	0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	06/26/08
Calcium (Ca)	44.3	mg/L	5	1.10	5.00	SM 3111 B	SAC	06/27/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	06/26/08
Copper (Cu)	0.012	mg/L	10	0.000478	0.005	EPA 200.8	PAT	06/26/08
Iron (Fe)	0.102	mg/L	10	0.009	0.050	EPA 200.8	PAT	06/26/08
Magnesium (Mg)	9.64	mg/L	1	0.022	0.500	SM 3111 B	SAC	06/26/08
Molybdenum (Mo)	0.003	mg/L	10	0.000385	0.001	EPA 200.8	PAT	06/26/08
Potassium (K)	10.4	mg/L	1	0.178	0.500	SM 3111 B	SAC	06/26/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	06/26/08
Sodium (Na)	249	mg/L	5	0.741	2.50	SM 3111 B	SAC	06/27/08
<b>Metals - Total</b>								
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	06/26/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Anion - Cation Balance</b>								
Anions	14.6	meq/L	1			Calculation	GAM	06/27/08
Anion - Cation Balance	-1.51	%	1			Calculation	GAM	06/27/08
Cations	14.1	meq/L	1			Calculation	GAM	06/27/08
<b>Radiological</b>								
Radium-226	0.70	pCi/L	1			EPA 903.1	SYS	11/12/08
Radium-228	0.60	pCi/L	1			Brooks-Blanchard	SYS	11/12/08
Radon-222	140	pCi/L	1			SM 7500-Rn B	SYS	10/21/08

Approved By: 

Approved On: 11/24/2008 11:02:21 AM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-3

Project Name: POWERTECH

Sampled: 05/21/08 at 12:00 PM  
by Mark Keenihan

Sample Matrix: Water

Lab ID#: 20080523301

Received: 05/21/08 at 03:30 PM  
by Greg McDougall

Account: W1008

DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
OCT 22 2008  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1450	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 05/23/08
pH	8.30	SU	1			SM 4500-H+ B	JAM 05/23/08
Total Dissolved Solids	914	mg/L	100ml	8.28	50.0	SM 2540 C	TMN 05/23/08
<b>Non-Metallics</b>							
Bicarbonate	219	mg/L	1	0.505	10.0	SM 2320 B	JAM 05/23/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM 05/23/08
Chloride (Cl-)	13.0	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA 05/23/08
Nitrogen, Ammonia (NH3)	0.470	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 05/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 05/23/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 05/23/08
Sulfate (SO4)	495	mg/L	4	10.5	40.0	EPA 375.2	DES 05/23/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.026	mg/L	10	0.003	0.010	EPA 200.8	PAT 05/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT 05/23/08
Calcium (Ca)	33.3	mg/L	5	1.10	5.00	SM 3111 B	SAC 05/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 05/23/08
Copper (Cu)	0.006	mg/L	10	0.000478	0.005	EPA 200.8	PAT 05/23/08
Iron (Fe)	0.102	mg/L	10	0.009	0.050	EPA 200.8	PAT 05/23/08
Magnesium (Mg)	9.75	mg/L	5	0.108	2.50	SM 3111 B	SAC 05/23/08
Molybdenum (Mo)	0.003	mg/L	10	0.000385	0.001	EPA 200.8	PAT 05/23/08
Potassium (K)	11.6	mg/L	5	0.890	2.50	SM 3111 B	SAC 05/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT 05/23/08
Sodium (Na)	253	mg/L	5	0.741	2.50	SM 3111 B	SAC 05/23/08
<b>Metals - Total</b>							
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT 05/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Anion - Cation Balance								
Anions	14.3	meq/L	1			Calculation	GAM	05/27/08
Anion - Cation Balance	-1.65	%	1			Calculation	GAM	05/27/08
Cations	13.8	meq/L	1			Calculation	GAM	05/27/08
Radiological								
Radium-226	1.3	pCi/L	1			E903.0	SYS	10/21/08
Radon-222	143	pCi/L	1			ASTM D5072-92	SYS	10/21/08

**Notes:**

Radon and Radium test performed by the State Health Lab.

Approved By: \_\_\_\_\_



Approved On: 10/21/2008 3:36:00 PM

RECEIVED  
OCT 22 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB07-11-11C  
Sampled: 05/21/08 at 01:00 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080523302  
Received: 05/21/08 at 03:30 PM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
OCT 22 2008

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2620	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	05/23/08
pH	7.50	SU	1			SM 4500-H+ B	JAM	05/23/08
Total Dissolved Solids	2280	mg/L	100ml	8.28	50.0	SM 2540 C	TMN	05/23/08
Non-Metallics								
Bicarbonate	306	mg/L	1	0.505	10.0	SM 2320 B	JAM	05/23/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM	05/23/08
Chloride (Cl-)	13.0	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	05/23/08
Nitrogen, Ammonia (NH3)	0.119	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	05/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	05/23/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	05/23/08
Sulfate (SO4)	1420	mg/L	10	26.2	100	EPA 375.2	DES	05/23/08
Metals - Dissolved								
Aluminum (Al)	0.026	mg/L	10	0.003	0.010	EPA 200.8	PAT	05/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	05/23/08
Calcium (Ca)	400	mg/L	5	1.10	5.00	SM 3111 B	SAC	05/27/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	05/23/08
Copper (Cu)	0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	05/23/08
Iron (Fe)	0.276	mg/L	10	0.009	0.050	EPA 200.8	PAT	05/23/08
Magnesium (Mg)	120	mg/L	5	0.108	2.50	SM 3111 B	SAC	05/23/08
Molybdenum (Mo)	< 0.001	mg/L	10	0.000385	0.001	EPA 200.8	PAT	05/23/08
Potassium (K)	19.4	mg/L	5	0.890	2.50	SM 3111 B	SAC	05/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	05/23/08
Sodium (Na)	116	mg/L	5	0.741	2.50	SM 3111 B	SAC	05/23/08
Metals - Total								
Uranium	0.025	mg/L	10	0.000041	0.001	EPA 200.8	PAT	05/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Anion - Cation Balance</b>								
Anions	34.8	meq/L	1			Calculation	GAM	05/27/08
Anion - Cation Balance	0.763	%	1			Calculation	GAM	05/27/08
Cations	35.4	meq/L	1			Calculation	GAM	05/27/08
<b>Radiological</b>								
Radium-226	1400	pCi/L	1			E903.0	SYS	10/21/08
Radon-222	1380	pCi/L	1			ASTM D5072-92	SYS	10/21/08

**Notes:**

Radon and Radium test performed by the State Health Lab.

Approved By: \_\_\_\_\_



Approved On: 10/21/2008 3:36:00 PM

RECEIVED  
OCT 22 2008  
MINERALS & MINING PROGRAM



COMPANY DENR / Powertech  
SAMPLE LOCATION PB08-15-3 , PB07-11-11C 302  
SAMPLING DATE 301 (Burdock Pump Test End Samples)  
SAMPLING TIME \_\_\_\_\_

CHECK THE TESTS TO BE PERFORMED

PHYSICAL PROPERTIES

- ☒ CONDUCTIVITY  
☐ HARDNESS  
☒ pH  
☒ SOLIDS, DISSOLVED  
☐ SOLIDS, SUSPENDED  
☐ TURBIDITY

INORGANIC & NONMETALLIC

- ☐ ACIDITY  
☐ ALKALINITY  
☒ BICARBONATE  
☐ BOD, 5-DAY  
☒ CARBONATE  
☐ CBOD, 5-DAY  
☒ CHLORIDE  
☐ CYANIDE, TOTAL  
☐ CYANIDE, WAD  
☐ CYANIDE, FREE  
☐ FLUORIDE  
☒ NITROGEN, AMMONIA  
☒ NITROGEN, NITRATE  
☒ NITROGEN, NITRITE  
☒ SULFATE

SPECIAL TESTS

- ☒ Uranium  
☒ Radium 226  
☒ Radon 222  
☐ \_\_\_\_\_  
☐ \_\_\_\_\_

METALS

- | DISS.                               | TOTAL                               |
|-------------------------------------|-------------------------------------|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> ALUMINUM   |
| <input type="checkbox"/>            | <input type="checkbox"/> ANTIMONY   |
| <input type="checkbox"/>            | <input type="checkbox"/> ARSENIC    |
| <input type="checkbox"/>            | <input type="checkbox"/> BARIUM     |
| <input type="checkbox"/>            | <input type="checkbox"/> BERYLLIUM  |
| <input type="checkbox"/>            | <input type="checkbox"/> BORON      |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> CADMIUM    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> CALCIUM    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> CHROMIUM   |
| <input type="checkbox"/>            | <input type="checkbox"/> COBALT     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> COPPER     |
| <input type="checkbox"/>            | <input type="checkbox"/> GOLD       |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> IRON       |
| <input type="checkbox"/>            | <input type="checkbox"/> LEAD       |
| <input type="checkbox"/>            | <input type="checkbox"/> LITHIUM    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> MAGNESIUM  |
| <input type="checkbox"/>            | <input type="checkbox"/> MANGANESE  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> MERCURY    |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> MOLYBDENUM |
| <input type="checkbox"/>            | <input type="checkbox"/> NICKEL     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> POTASSIUM  |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> SELENIUM   |
| <input type="checkbox"/>            | <input type="checkbox"/> SILICON    |
| <input type="checkbox"/>            | <input type="checkbox"/> SILVER     |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> SODIUM     |
| <input type="checkbox"/>            | <input type="checkbox"/> STRONTIUM  |
| <input type="checkbox"/>            | <input type="checkbox"/> VANADIUM   |
| <input type="checkbox"/>            | <input type="checkbox"/> ZINC       |

Batch 3  
5/23/08





## CHAIN OF CUSTODY RECORD

ANALYSES REQUESTED	4000 ML	4000 ML	4000 ML
PRESERVED WITH	(HIN)	(HIN)	(HIN)
FILTERED (Y/N)			
REFRIGERATED (Y/N)			

**FOR LAB USE ONLY**

Seal Intact (Y/N) 7/10/2008

### Sampling Condition

Temperature of Container

SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
D008-15-3 301	5/24/08	1200		5		
D007-11-11C 302						
Burdax Pump Test	11	1300		5		
F.O. Samples						
Batch 3						
5/23/08						

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
	DEAR	7/21/08	1530		McL	5-21-08	15:30

FORM 4-90C





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
www.state.sd.us/doh/lab/index.htm

RECEIVED  
OCT 22 2008  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 10/16/2008

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC002868  
Subm #: 2008523301  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 5/23/2008  
Time Rcvd: 0945  
Date Coll: 5/21/2008  
Time Coll: 1200

Spec Type: WATER  
Site Location: DB08-15-3  
medium WATER

---

Final Results

---

Radium-226  
Radon-Water

1.3 +/- 0.3 pCi/L  
143 pCi/L





**DIVISION OF  
ADMINISTRATION**  
Public Health Laboratory

615 East Fourth Street  
Pierre, South Dakota 57501-1700  
605/773-3368 FAX: 605/773-6129  
[www.state.sd.us/doh/lab/index.htm](http://www.state.sd.us/doh/lab/index.htm)

RECEIVED  
OCT 22 2008  
MINERALS & MINING PROGRAM

Submitter copy to:

\* Page 1 of 1\*  
Date: 10/16/2008

MID-CONTINENT TESTING LAB-92942  
2381 S PLAZA DR  
PO BOX 3388  
RAPID CITY, SD 57709

Spec #: E08EC002869  
Subm #: 20080523302  
Lab: ENV CHEMISTRY  
Tel #: (605) 773-3368

---

Source  
MID-CONTINENT TESTING LAB

---

Date Rcvd: 5/23/2008  
Time Rcvd: 0945  
Date Coll: 5/21/2008  
Time Coll: 1300

Spec Type: WATER  
Site Location: DB07-11-11C  
medium WATER

---

Final Results

---

Radium-226  
Radon-Water

1382.8 +/- 9.7 pCi/L  
665351 pCi/L





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-2  
Project Name: POWERTECH  
Sampled: 04/21/08 at 01:00 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423101  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall  
Account: W1008

DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1440	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/23/08
pH	8.01	SU	1			SM 4500-H+ B	JAM	04/23/08
Total Dissolved Solids	959	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/23/08
Non-Metallics								
Alkalinity	203	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/23/08
Bicarbonate	248	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/23/08
Chloride (Cl-)	14.0	mg/L	4	1.81	2.00	SM 4500-Cl B	NMA	04/23/08
Fluoride	0.254	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.268	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	525	mg/L	4	10.5	40.0	EPA 375.2	DES	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.014	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/23/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Barium (Ba)	0.010	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/23/08
Calcium (Ca)	106	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/23/08
Magnesium (Mg)	29.6	mg/L	5	0.108	2.50	SM 3111 B	SAC	04/23/08
Manganese (Mn)	0.152	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/23/08
Potassium (K)	14.0	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/23/08
Sodium (Na)	153	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/23/08
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/23/08
Anion - Cation Balance								
Anions	15.4	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-2.12	%	1			Calculation	GAM	04/25/08
Cations	14.8	meq/L	1			Calculation	GAM	04/25/08
Radionuclides - Dissolved								
Gross Alpha	9.10	pCi/L	1			E900.0	SYS	06/23/08
Gross Beta	13.7	pCi/L	1			E900.0	SYS	06/23/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/01/08
Radium 226	1.80	pCi/L	1			E903.0	SYS	05/13/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
Radionuclides - Suspended								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/15/08
Radium 226	0.300	pCi/L	1			E903.0	SYS	05/06/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
Radionuclides - Total								
Radon 222	269	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: #622  
Project Name: POWERTECH  
Sampled: 04/21/08 at 03:35 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423102 MINERALS & MINING PROGRAM  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 10 2008

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1370	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/23/08
pH	7.85	SU	1			SM 4500-H+ B	JAM	04/23/08
Total Dissolved Solids	920	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/23/08
Non-Metallics								
Alkalinity	182	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/23/08
Bicarbonate	222	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/23/08
Chloride (Cl-)	11.0	mg/L	4	1.81	2.00	SM 4500-Cl B	NMA	04/23/08
Fluoride	0.401	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.058	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	493	mg/L	4	10.5	40.0	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.013	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/23/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Barium (Ba)	0.011	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/23/08
Calcium (Ca)	99.4	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/23/08
Magnesium (Mg)	20.2	mg/L	1	0.022	0.500	SM 3111 B	SAC	04/23/08
Manganese (Mn)	0.182	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/23/08
Potassium (K)	11.5	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/23/08
Sodium (Na)	159	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC 04/23/08
Uranium	0.006	mg/L	10	0.000041	0.001	EPA 200.8	PAT 04/23/08
<b>Anion - Cation Balance</b>							
Anions	14.2	meq/L	1			Calculation	GAM 04/25/08
Anion - Cation Balance	-1.37	%	1			Calculation	GAM 04/25/08
Cations	13.8	meq/L	1			Calculation	GAM 04/25/08
<b>Radionuclides - Dissolved</b>							
Gross Alpha	29.6	pCi/L	1			E900.0	SYS 06/23/08
Gross Beta	17.1	pCi/L	1			E900.0	SYS 06/23/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS 05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS 05/01/08
Radium 226	6.60	pCi/L	1			E903.0	SYS 05/13/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS 04/28/08
<b>Radionuclides - Suspended</b>							
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS 05/15/08
Radium 226	1.90	pCi/L	1			E903.0	SYS 05/06/08
Thorium 230	3.70	pCi/L	1			E907.0	SYS 05/01/08
<b>Radionuclides - Total</b>							
Radon 222	1230	pCi/L	1			ASTM D5072-92	SYS 04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: #615  
Project Name: POWERTECH  
Sampled: 04/21/08 at 04:30 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423103  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 10 2008

MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1080	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/23/08
pH	7.64	SU	1			SM 4500-H+ B	JAM	04/23/08
Total Dissolved Solids	711	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/23/08
Non-Metallics								
Alkalinity	136	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/23/08
Bicarbonate	166	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/23/08
Chloride (Cl-)	5.50	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	04/23/08
Fluoride	0.511	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	< 0.050	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	397	mg/L	4	10.5	40.0	EPA 375.2	DES	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.012	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/23/08
Arsenic (As)	0.017	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Barium (Ba)	0.017	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/23/08
Calcium (Ca)	74.1	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Iron (Fe)	1.17	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/23/08
Magnesium (Mg)	20.6	mg/L	1	0.022	0.500	SM 3111 B	SAC	04/23/08
Manganese (Mn)	0.069	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/23/08
Potassium (K)	9.76	mg/L	1	0.178	0.500	SM 3111 B	SAC	04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/23/08
Sodium (Na)	120	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/23/08
Uranium	0.003	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/23/08
<b>Anion - Cation Balance</b>								
Anions	11.2	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-1.36	%	1			Calculation	GAM	04/25/08
Cations	10.9	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	14.0	pCi/L	1			E900.0	SYS	06/23/08
Gross Beta	10.6	pCi/L	1			E900.0	SYS	06/23/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/01/08
Radium 226	1.90	pCi/L	1			E903.0	SYS	05/13/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/15/08
Radium 226	0.700	pCi/L	1			E903.0	SYS	05/06/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	1370	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-10  
Project Name: POWERTECH  
Sampled: 04/21/08 at 07:50 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423104  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1140	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 04/23/08
pH	8.07	SU	1			SM 4500-H+ B	JAM 04/23/08
Total Dissolved Solids	737	mg/L	100ml	8.28	50.0	SM 2540 D	TMN 04/23/08
<b>Non-Metallics</b>							
Alkalinity	149	mg/L	1	0.414	10.0	SM 2320 B	JAM 04/23/08
Bicarbonate	182	mg/L	1	0.505	10.0	SM 2320 B	JAM 04/23/08
Chloride (Cl-)	7.00	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA 04/23/08
Fluoride	0.531	mg/L	1	0.001	0.050	SM 4500 F-C	NMA 04/24/08
Nitrogen, Ammonia (NH3)	0.109	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 04/24/08
Sulfate (SO4)	403	mg/L	4	10.5	40.0	EPA 375.2	DES 04/24/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.017	mg/L	10	0.003	0.010	EPA 200.8	PAT 04/23/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/23/08
Barium (Ba)	0.018	mg/L	10	0.000059	0.005	EPA 200.8	PAT 04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT 04/23/08
Calcium (Ca)	52.4	mg/L	1	0.219	1.00	SM 3111 B	SAC 04/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/23/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT 04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT 04/23/08
Magnesium (Mg)	15.4	mg/L	1	0.022	0.500	SM 3111 B	SAC 04/23/08
Manganese (Mn)	0.039	mg/L	10	0.000048	0.001	EPA 200.8	PAT 04/23/08
Potassium (K)	9.72	mg/L	1	0.178	0.500	SM 3111 B	SAC 04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT 04/23/08
Sodium (Na)	160	mg/L	5	0.741	2.50	SM 3111 B	SAC 04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT 04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT 04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/23/08
Uranium	0.004	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/23/08
<b>Anion - Cation Balance</b>								
Anions	11.6	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-2.18	%	1			Calculation	GAM	04/25/08
Cations	11.1	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	40.4	pCi/L	1			E900.0	SYS	06/23/08
Gross Beta	18.9	pCi/L	1			E900.0	SYS	06/23/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/01/08
Radium 226	5.20	pCi/L	1			E903.0	SYS	05/13/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/15/08
Radium 226	0.900	pCi/L	1			E903.0	SYS	05/06/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	1760	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Sample Site: DB08-32-3C  
Project Name: POWERTECH  
Sampled: 04/21/08 at 08:30 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423105  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 10 2008

MINERAL MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1370	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/23/08
pH	8.09	SU	1			SM 4500-H+ B	JAM	04/23/08
Total Dissolved Solids	919	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/23/08
Non-Metallics								
Alkalinity	173	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/23/08
Bicarbonate	211	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/23/08
Chloride (Cl-)	16.0	mg/L	4	1.81	2.00	SM 4500-Cl B	NMA	04/23/08
Fluoride	0.439	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.085	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	507	mg/L	4	10.5	40.0	EPA 375.2	DES	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.013	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/23/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Barium (Ba)	0.012	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/23/08
Calcium (Ca)	67.4	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/23/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/23/08
Magnesium (Mg)	22.9	mg/L	1	0.022	0.500	SM 3111 B	SAC	04/23/08
Manganese (Mn)	0.091	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/23/08
Potassium (K)	11.1	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/23/08
Sodium (Na)	190	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Metals - Total</b>							
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC 04/23/08
Uranium	0.010	mg/L	10	0.000041	0.001	EPA 200.8	PAT 04/23/08
<b>Anion - Cation Balance</b>							
Anions	14.5	meq/L	1			Calculation	GAM 04/25/08
Anion - Cation Balance	-2.40	%	1			Calculation	GAM 04/25/08
Cations	13.8	meq/L	1			Calculation	GAM 04/25/08
<b>Radionuclides - Dissolved</b>							
Gross Alpha	1890	pCi/L	1			E900.0	SYS 06/23/08
Gross Beta	533	pCi/L	1			E900.0	SYS 06/23/08
Gross Gamma	440	pCi/L	1			E901.1	SYS 05/01/08
Lead 210	35.7	pCi/L	1			E909.0M	SYS 05/21/08
Radium 226	383	pCi/L	1			E903.0	SYS 05/14/08
Thorium 230	0.200	pCi/L	1			E907.0	SYS 04/28/08
<b>Radionuclides - Suspended</b>							
Lead 210	16.4	pCi/L	1			E909.0M	SYS 05/15/08
Radium 226	1.20	pCi/L	1			E903.0	SYS 05/06/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS 05/01/08
<b>Radionuclides - Total</b>							
Radon 222	271000	pCi/L	1			ASTM D5072-92	SYS 04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-11-11C  
Project Name: POWERTECH  
Sampled: 04/21/08 at 09:45 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080423106  
Received: 04/22/08 at 07:45 AM  
by Greg McDougall

Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2600	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/23/08
pH	7.73	SU	1			SM 4500-H+ B	JAM	04/23/08
Total Dissolved Solids	2260	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/23/08
Non-Metallics								
Alkalinity	263	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/23/08
Bicarbonate	321	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/23/08
Chloride (Cl-)	15.0	mg/L	4	1.81	2.00	SM 4500-Cl B	NMA	04/23/08
Fluoride	0.294	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.174	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/23/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	1380	mg/L	10	26.2	100	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.011	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/23/08
Arsenic (As)	0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Barium (Ba)	0.014	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/23/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/23/08
Calcium (Ca)	367	mg/L	5	1.10	5.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/23/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/23/08
Iron (Fe)	0.323	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/23/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/23/08
Magnesium (Mg)	117	mg/L	5	0.108	2.50	SM 3111 B	SAC	04/23/08
Manganese (Mn)	0.438	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/23/08
Potassium (K)	18.6	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/23/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/23/08
Sodium (Na)	120	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/23/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/23/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/23/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/23/08
Uranium	0.030	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/23/08
<b>Anion - Cation Balance</b>								
Anions	34.4	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-1.14	%	1			Calculation	GAM	04/25/08
Cations	33.7	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	5130	pCi/L	1			E900.0	SYS	06/23/08
Gross Beta	1720	pCi/L	1			E900.0	SYS	06/23/08
Gross Gamma	540	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	29.3	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	1270	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	0.300	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/15/08
Radium 226	1.70	pCi/L	1			E903.0	SYS	05/06/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	93000	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/3/2008 3:21:47 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-2-1  
Project Name: POWERTECH  
Sampled: 04/22/08 at 11:35 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080424101  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008

DENR - Minerals &amp; Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
JUL 10 2008  
DENR - MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2490	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/24/08
pH	7.58	SU	1			SM 4500-H+ B	JAM	04/24/08
Total Dissolved Solids	2210	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/25/08
Non-Metallics								
Alkalinity	117	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/24/08
Bicarbonate	143	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/24/08
Chloride (Cl-)	11.5	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	04/24/08
Fluoride	0.288	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.158	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	1440	mg/L	10	26.2	100	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.018	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/24/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Barium (Ba)	0.011	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/24/08
Calcium (Ca)	370	mg/L	5	1.10	5.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/24/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Iron (Fe)	3.94	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/24/08
Magnesium (Mg)	122	mg/L	5	0.108	2.50	SM 3111 B	SAC	04/24/08
Manganese (Mn)	2.23	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/24/08
Potassium (K)	14.5	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/24/08
Sodium (Na)	79.6	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/24/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/24/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	0.118	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
Anion - Cation Balance								
Anions	32.7	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-0.372	%	1			Calculation	GAM	04/25/08
Cations	32.4	meq/L	1			Calculation	GAM	04/25/08
Radionuclides - Dissolved								
Gross Alpha	1540	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	425	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	420	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	382	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
Radionuclides - Suspended								
Lead 210	7.30	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	4.60	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	0.200	pCi/L	1			E907.0	SYS	05/01/08
Radionuclides - Total								
Radon 222	29100	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-13  
Project Name: POWERTECH  
Sampled: 04/22/08 at 01:00 PM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

Lab ID#: 20080424108  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1420	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 04/24/08
pH	8.17	SU	1			SM 4500-H+ B	JAM 04/24/08
Total Dissolved Solids	901	mg/L	100ml	8.28	50.0	SM 2540 D	TMN 04/25/08
<b>Non-Metallics</b>							
Alkalinity	173	mg/L	1	0.414	10.0	SM 2320 B	JAM 04/24/08
Bicarbonate	211	mg/L	1	0.505	10.0	SM 2320 B	JAM 04/24/08
Chloride (Cl-)	12.5	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA 04/24/08
Fluoride	0.443	mg/L	1	0.001	0.050	SM 4500 F-C	NMA 04/24/08
Nitrogen, Ammonia (NH3)	0.206	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 04/24/08
Sulfate (SO4)	493	mg/L	4	10.5	40.0	EPA 375.2	TMN 04/24/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.014	mg/L	10	0.003	0.010	EPA 200.8	PAT 04/24/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/24/08
Barium (Ba)	0.015	mg/L	10	0.000059	0.005	EPA 200.8	PAT 04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT 04/24/08
Calcium (Ca)	58.4	mg/L	1	0.219	1.00	SM 3111 B	SAC 04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 04/24/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/24/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT 04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT 04/24/08
Magnesium (Mg)	17.0	mg/L	1	0.022	0.500	SM 3111 B	SAC 04/24/08
Manganese (Mn)	0.077	mg/L	10	0.000048	0.001	EPA 200.8	PAT 04/24/08
Potassium (K)	10.2	mg/L	1	0.178	0.500	SM 3111 B	SAC 04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT 04/24/08
Sodium (Na)	209	mg/L	5	0.741	2.50	SM 3111 B	SAC 04/24/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT 04/24/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT 04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	0.003	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
<b>Anion - Cation Balance</b>								
Anions	14.1	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-1.48	%	1			Calculation	GAM	04/25/08
Cations	13.7	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	21.6	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	8.80	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	340	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	4.30	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	< 0.200	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	1340	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-11-17  
Project Name: POWERTECH  
Sampled: 04/22/08 at 01:45 PM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
JUL 10 2008

Lab ID#: 20080424103  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1110	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/24/08
pH	9.18	SU	1			SM 4500-H+ B	JAM	04/24/08
Total Dissolved Solids	714	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/25/08
Non-Metallics								
Alkalinity	90.4	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/24/08
Bicarbonate	78.6	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/24/08
Carbonate	15.6	mg/L	1	0.207	5.00	SM 2320 B	JAM	04/24/08
Chloride (Cl-)	12.0	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	04/24/08
Fluoride	0.258	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.397	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	408	mg/L	4	10.5	40.0	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.018	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/24/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Barium (Ba)	0.021	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/24/08
Calcium (Ca)	40.5	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/24/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/24/08
Magnesium (Mg)	12.7	mg/L	5	0.108	2.50	SM 3111 B	SAC	04/24/08
Manganese (Mn)	< 0.010	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/24/08
Potassium (K)	13.4	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/24/08
Sodium (Na)	164	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/24/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Dissolved								
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/24/08
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
Anion - Cation Balance								
Anions	10.6	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-0.391	%	1			Calculation	GAM	04/25/08
Cations	10.6	meq/L	1			Calculation	GAM	04/25/08
Radionuclides - Dissolved								
Gross Alpha	< 2.80	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	11.5	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	0.200	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
Radionuclides - Suspended								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	< 0.200	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
Radionuclides - Total								
Radon 222	271	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: \_\_\_\_\_



Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-1-6  
Project Name: POWERTECH  
Sampled: 04/22/08 at 02:40 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080424104  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008

DENR - Minerals & Mining

MIKE CEPACK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2810	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/24/08
pH	8.60	SU	1			SM 4500-H+ B	JAM	04/24/08
Total Dissolved Solids	2390	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/25/08
Non-Metallics								
Alkalinity	138	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/24/08
Bicarbonate	147	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/24/08
Carbonate	10.9	mg/L	1	0.207	5.00	SM 2320 B	JAM	04/24/08
Chloride (Cl-)	18.5	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	04/24/08
Fluoride	0.411	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.799	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	1580	mg/L	10	26.2	100	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.018	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/24/08
Arsenic (As)	0.006	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Barium (Ba)	0.030	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/24/08
Calcium (Ca)	336	mg/L	5	1.10	5.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/24/08
Copper (Cu)	0.006	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Iron (Fe)	1.29	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/24/08
Magnesium (Mg)	85.5	mg/L	5	0.108	2.50	SM 3111 B	SAC	04/25/08
Manganese (Mn)	0.304	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/24/08
Potassium (K)	24.3	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/24/08
Sodium (Na)	240	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/24/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Dissolved</b>								
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/24/08
<b>Metals - Total</b>								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	0.014	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
<b>Anion - Cation Balance</b>								
Anions	36.1	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-1.64	%	1			Calculation	GAM	04/25/08
Cations	34.9	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	44.6	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	10.1	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	300	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	2.80	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	0.300	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	1.70	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	384	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-12  
Project Name: POWERTECH  
Sampled: 04/22/08 at 04:15 PM  
by Mark Keenihan  
Sample Matrix: Water

RECEIVED  
JUL 10 2008

Lab ID#: 20080424105  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1280	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 04/24/08
pH	8.14	SU	1			SM 4500-H+ B	JAM 04/24/08
Total Dissolved Solids	827	mg/L	100ml	8.28	50.0	SM 2540 D	TMN 04/25/08
<b>Non-Metallics</b>							
Alkalinity	165	mg/L	1	0.414	10.0	SM 2320 B	JAM 04/24/08
Bicarbonate	201	mg/L	1	0.505	10.0	SM 2320 B	JAM 04/24/08
Chloride (Cl-)	10.0	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA 04/24/08
Fluoride	0.550	mg/L	1	0.001	0.050	SM 4500 F-C	NMA 04/24/08
Nitrogen, Ammonia (NH3)	0.207	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 04/24/08
Sulfate (SO4)	439	mg/L	4	10.5	40.0	EPA 375.2	TMN 04/24/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.014	mg/L	10	0.003	0.010	EPA 200.8	PAT 04/24/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/24/08
Barium (Ba)	0.014	mg/L	10	0.000059	0.005	EPA 200.8	PAT 04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT 04/24/08
Calcium (Ca)	61.3	mg/L	1	0.219	1.00	SM 3111 B	SAC 04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 04/24/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 04/24/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT 04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT 04/24/08
Magnesium (Mg)	15.9	mg/L	1	0.022	0.500	SM 3111 B	SAC 04/24/08
Manganese (Mn)	0.054	mg/L	10	0.000048	0.001	EPA 200.8	PAT 04/24/08
Potassium (K)	9.85	mg/L	1	0.178	0.500	SM 3111 B	SAC 04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT 04/24/08
Sodium (Na)	182	mg/L	5	0.741	2.50	SM 3111 B	SAC 04/24/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT 04/24/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT 04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Metals - Total</b>								
Mercury (Hg)	0.0018	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
<b>Anion - Cation Balance</b>								
Anions	12.7	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-0.752	%	1			Calculation	GAM	04/25/08
Cations	12.5	meq/L	1			Calculation	GAM	04/25/08
<b>Radionuclides - Dissolved</b>								
Gross Alpha	4.20	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	5.20	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	< 20.0	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	1.50	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
<b>Radionuclides - Suspended</b>								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	< 0.200	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
<b>Radionuclides - Total</b>								
Radon 222	299	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-15-3  
Project Name: POWERTECH  
Sampled: 04/22/08 at 05:15 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080424106  
Received: 04/23/08 at 07:55 AM  
by Greg McDougall  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1450	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	04/24/08
pH	8.37	SU	1			SM 4500-H+ B	JAM	04/24/08
Total Dissolved Solids	918	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	04/25/08
Non-Metallics								
Alkalinity	182	mg/L	1	0.414	10.0	SM 2320 B	JAM	04/24/08
Bicarbonate	219	mg/L	1	0.505	10.0	SM 2320 B	JAM	04/24/08
Chloride (Cl-)	14.0	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA	04/24/08
Fluoride	0.368	mg/L	1	0.001	0.050	SM 4500 F-C	NMA	04/24/08
Nitrogen, Ammonia (NH3)	0.425	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	04/24/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	04/24/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	04/24/08
Sulfate (SO4)	487	mg/L	4	10.5	40.0	EPA 375.2	TMN	04/24/08
Metals - Dissolved								
Aluminum (Al)	0.015	mg/L	10	0.003	0.010	EPA 200.8	PAT	04/24/08
Arsenic (As)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Barium (Ba)	0.016	mg/L	10	0.000059	0.005	EPA 200.8	PAT	04/24/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	04/24/08
Calcium (Ca)	37.5	mg/L	1	0.219	1.00	SM 3111 B	SAC	04/25/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	04/24/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT	04/24/08
Iron (Fe)	0.082	mg/L	10	0.009	0.050	EPA 200.8	PAT	04/24/08
Lead (Pb)	< 0.001	mg/L	10	0.000185	0.001	EPA 200.8	PAT	04/24/08
Magnesium (Mg)	9.75	mg/L	1	0.022	0.500	SM 3111 B	SAC	04/24/08
Manganese (Mn)	0.058	mg/L	10	0.000048	0.001	EPA 200.8	PAT	04/24/08
Potassium (K)	11.9	mg/L	5	0.890	2.50	SM 3111 B	SAC	04/24/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	04/24/08
Sodium (Na)	246	mg/L	5	0.741	2.50	SM 3111 B	SAC	04/25/08
Vanadium (V)	< 0.005	mg/L	10	0.000568	0.005	EPA 200.8	PAT	04/24/08
Zinc (Zn)	< 0.050	mg/L	10	0.004	0.050	EPA 200.8	PAT	04/24/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Metals - Total								
Mercury (Hg)	< 0.0002	mg/L	1	0.000047	0.0002	EPA 245.1	SAC	04/24/08
Uranium	< 0.001	mg/L	10	0.000041	0.001	EPA 200.8	PAT	04/24/08
Anion - Cation Balance								
Anions	14.1	meq/L	1			Calculation	GAM	04/25/08
Anion - Cation Balance	-1.55	%	1			Calculation	GAM	04/25/08
Cations	13.7	meq/L	1			Calculation	GAM	04/25/08
Radionuclides - Dissolved								
Gross Alpha	< 3.80	pCi/L	1			E900.0	SYS	05/10/08
Gross Beta	5.70	pCi/L	1			E900.0	SYS	05/10/08
Gross Gamma	240	pCi/L	1			E901.1	SYS	05/01/08
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/21/08
Radium 226	0.800	pCi/L	1			E903.0	SYS	05/14/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	04/28/08
Radionuclides - Suspended								
Lead 210	< 1.00	pCi/L	1			E909.0M	SYS	05/16/08
Radium 226	< 0.200	pCi/L	1			E903.0	SYS	05/16/08
Thorium 230	< 0.200	pCi/L	1			E907.0	SYS	05/01/08
Radionuclides - Total								
Radon 222	216	pCi/L	1			ASTM D5072-92	SYS	04/24/08

Approved By: 

Approved On: 7/7/2008 2:12:17 PM

RECEIVED  
JUL 10 2008  
MINERALS & MINING PROGRAM





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

Company	SD-DENR		RECEIVED	JUL 10 2008		PRESERVED WITH	
Project Name	Power Tech		MINERALS & MINING PROGRAM			FILTERED (Y/N)	
Project Number						ANALYSES REQUESTED	
Sampled by	Signature: Mark Keenan						
Sampled by	Print: MARK KEENAN						

FOR LAB USE ONLY	
Seal Intact (Y/N)/Number	
Sample Condition	
Temperature of Container	1.0

REQUESTED TURN AROUND	
STANDARD	RUSH

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	DB08-2-1	4/24/08	1135		5	2	1
2							
3	DB08-32-13	11	1300		5	2	1
4							
5	DB08-11-17	11	1345		5	2	1
6							
7	DB08-1-6	11	1440		5	2	1
8							
9	DB08-32-12	11	1615		5	2	1
10							
11	DB08-15-3	11	1715		5	2	1
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Mark Keenan	SD-DENR	4/21/08	1305	[Signature]	SD-DENR	07-08	07:55





2381 S. Plaza Dr. • P.O. Box 3388 • Rapid City, SD 57709  
(605) 348-0111 • www.TheChemistryLab.com

# CHAIN OF CUSTODY RECORD

Company	SD-DENR	RECEIVED	PRESERVED WITH
Project Name	POWERTECH	JUL 10 2008	FILTERED (Y/N)
Project Number		MINERALS & MINING PROGRAM	
Sampled by	Signature: Mark Keenihan	ANALYSES REQUESTED	
Sampled by	Print: MARK KEENIHAN		

FOR LAB USE ONLY
Seal Intact (Y/N)/Number
Sample Condition
Temperature of Container

REQUESTED TURN AROUND
STANDARD
RUSH

	SAMPLE NAME	DATE	TIME	MATRIX	NO. OF CONTAINERS	COMMENTS	LAB #
1	DB08-15-2	4-21-08	1300		2		
2							
3	# 622		1535		2		
4							
5	# 615		1630		2		
6							
7	DB08-32-10		1950		2		
8							
9	DB08-32-3C		2030		2		
10							
11	DB08-11-11C		2145		2		
12							

RELINQUISHED BY (Signature)	COMPANY NAME	DATE	TIME	RECEIVED BY (Signature)	COMPANY NAME	DATE	TIME
Mark Keenihan	DENR	4/22/08	0745	[Signature]	Mc Lab	04-22-08	0745





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-3C  
Sampled: 05/15/08 at 02:00 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080519107  
Received: 05/15/08 at 04:45 PM  
by Julie Muzzy  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUN 20 2008  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	1370	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 05/19/08
pH	8.09	SU	1			SM 4500-H+ B	JAM 05/19/08
Total Dissolved Solids	880	mg/L	100ml	8.28	50.0	SM 2540 D	TMN 05/20/08
<b>Non-Metallics</b>							
Bicarbonate	209	mg/L	1	0.505	10.0	SM 2320 B	JAM 05/19/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM 05/19/08
Chloride (Cl-)	17.0	mg/L	4	1.81	2.00	SM 4500-Cl B	NMA 05/19/08
Nitrogen, Ammonia (NH3)	0.109	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM 05/19/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 05/19/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 05/19/08
Sulfate (SO4)	461	mg/L	4	10.5	40.0	EPA 375.2	DES 05/20/08
<b>Metals - Dissolved</b>							
Aluminum (Al)	0.097	mg/L	10	0.003	0.010	EPA 200.8	PAT 05/19/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT 05/19/08
Calcium (Ca)	64.9	mg/L	5	1.10	5.00	SM 3111 B	SAC 05/19/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 05/19/08
Copper (Cu)	< 0.005	mg/L	10	0.000478	0.005	EPA 200.8	PAT 05/19/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT 05/19/08
Magnesium (Mg)	21.8	mg/L	5	0.108	2.50	SM 3111 B	SAC 05/19/08
Molybdenum (Mo)	0.003	mg/L	10	0.000385	0.001	EPA 200.8	PAT 05/19/08
Potassium (K)	10.3	mg/L	5	0.890	2.50	SM 3111 B	SAC 05/19/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT 05/19/08
Sodium (Na)	189	mg/L	5	0.741	2.50	SM 3111 B	SAC 05/19/08
<b>Metals - Total</b>							
Uranium	0.010	mg/L	10	0.000041	0.001	EPA 200.8	PAT 05/20/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Anion - Cation Balance								
Anions	13.5	meq/L	1			Calculation	EJF	05/20/08
Anion - Cation Balance	0.096	%	1			Calculation	EJF	05/20/08
Cations	13.5	meq/L	1			Calculation	EJF	05/20/08
Radiological								
Radium-226	440	pCi/L	1			E903.0	SYS	05/29/08
Radon-222	268000	pCi/L	1			ASTM D5072-92	SYS	05/19/08

**Notes:**

Dewey Pump Test Start Sample

Approved By: *Eric Fischer*

Approved On: 6/19/2008 1:49:57 PM

RECEIVED  
JUN 20 2008  
MINERALS & MINING PROGRAM





**MIDCONTINENT**  
TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB07-11-11C  
Sampled: 05/18/08 at 03:15 PM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 20080520102  
Received: 05/19/08 at 08:10 AM  
by Dana Smith  
Account: W1008

DENR - Minerals & Mining

RECEIVED  
JUN 20 2008  
MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501


Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	2590	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	05/20/08
pH	7.78	SU	1			SM 4500-H+ B	JAM	05/20/08
Total Dissolved Solids	2240	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	05/21/08
Non-Metallics								
Bicarbonate	313	mg/L	1	0.505	10.0	SM 2320 B	JAM	05/20/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM	05/20/08
Chloride (Cl-)	13.5	mg/L	1	0.453	0.500	SM 4500-Cl B	NMA	05/20/08
Nitrogen, Ammonia (NH3)	0.131	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	05/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	05/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	05/20/08
Sulfate (SO4)	1380	mg/L	10	26.2	100	EPA 375.2	DES	05/20/08
Metals - Dissolved								
Aluminum (Al)	0.048	mg/L	10	0.003	0.010	EPA 200.8	PAT	05/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	05/20/08
Calcium (Ca)	394	mg/L	5	1.10	5.00	SM 3111 B	SAC	05/21/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	05/20/08
Copper (Cu)	0.007	mg/L	10	0.000478	0.005	EPA 200.8	PAT	05/20/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	05/20/08
Magnesium (Mg)	116	mg/L	5	0.108	2.50	SM 3111 B	SAC	05/20/08
Molybdenum (Mo)	< 0.001	mg/L	10	0.000385	0.001	EPA 200.8	PAT	05/20/08
Potassium (K)	18.4	mg/L	5	0.890	2.50	SM 3111 B	SAC	05/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	05/20/08
Sodium (Na)	113	mg/L	5	0.741	2.50	SM 3111 B	SAC	05/20/08
Metals - Total								
Uranium	0.026	mg/L	10	0.000041	0.001	EPA 200.8	PAT	05/20/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Anion - Cation Balance								
Anions	34.2	meq/L	1			Calculation	GAM	05/21/08
Anion - Cation Balance	0.540	%	1			Calculation	GAM	05/21/08
Cations	34.6	meq/L	1			Calculation	GAM	05/21/08
Radiological								
Radium-226	1400	pCi/L	1			E903.0	SYS	06/08/08
Radon-222	102000	pCi/L	1			ASTM D5072-92	SYS	05/23/08

**Notes:**

Burdock Pump Test- start sample

Approved By: 

Approved On: 6/19/2008 2:00:55 PM

RECEIVED

JUN 20 2008

MINERALS &amp; MINING PRODUCTION



**MIDCONTINENT**

TESTING LABORATORIES, INC.

Page 1 of 2

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: Darrow Pit

Sampled: 05/12/08 at 03:00 PM

by Mark Keenihan JUN 20 2008

Sample Matrix: Water

Lab ID#: 20080513109

Received: 05/12/08 at 04:20 PM

by Dana Smith

Account: W1008

DENR - Minerals &amp; Mining

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date
<b>Physical Properties</b>							
Electrical Conductivity	5830	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM 05/13/08
pH	3.37	SU	1			SM 4500-H+ B	JAM 05/13/08
Total Dissolved Solids	6950	mg/L	100ml	8.28	50.0	SM 2540 D	TMN 05/13/08
<b>Non-Metallics</b>							
Acidity	1110	mg/L	1	3.63	10.0	SM 2310 B	JAM 05/16/08
Bicarbonate	0.00	mg/L	1	0.505	10.0	SM 2320 B	JAM 05/15/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM 05/15/08
Chloride (Cl-)	12.5	mg/L	2	0.906	1.00	SM 4500-Cl B	NMA 05/13/08
Nitrogen, Ammonia (NH3)	1.55	mg/L	5	0.024	0.250	SM 4500-NH3 D	JAM 05/13/08
Nitrogen, Nitrate (NO3)	0.327	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES 05/13/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES 05/13/08
Sulfate (SO4)	4320	mg/L	20	52.4	200	EPA 375.2	DES 05/13/08
<b>Metals - Dissolved</b>							
Arsenic (As)	0.007	mg/L	10	0.000478	0.005	EPA 200.8	PAT 05/13/08
Cadmium (Cd)	0.031	mg/L	10	0.000202	0.001	EPA 200.8	PAT 05/13/08
Calcium (Ca)	369	mg/L	5	1.10	5.00	SM 3111 B	SAC 05/13/08
Chromium (Cr)	0.018	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT 05/13/08
Copper (Cu)	0.096	mg/L	10	0.000478	0.005	EPA 200.8	PAT 05/13/08
Iron (Fe)	5.60	mg/L	10	0.009	0.050	EPA 200.8	PAT 05/13/08
Magnesium (Mg)	622	mg/L	25	0.542	12.5	SM 3111 B	SAC 05/13/08
Molybdenum (Mo)	< 0.001	mg/L	10	0.000385	0.001	EPA 200.8	PAT 05/13/08
Potassium (K)	21.8	mg/L	5	0.890	2.50	SM 3111 B	SAC 05/13/08
Selenium (Se)	0.033	mg/L	10	0.001	0.005	EPA 200.8	PAT 05/13/08
Sodium (Na)	83.2	mg/L	5	0.741	2.50	SM 3111 B	SAC 05/13/08
<b>Metals - Total</b>							
Uranium	5.53	mg/L	10	0.000041	0.001	EPA 200.8	PAT 05/13/08



Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Anion - Cation Balance								
Anions	90.2	meq/L	1			Calculation	GAM	05/16/08
Anion - Cation Balance	1.11	%	1			Calculation	GAM	05/16/08
Cations	92.2	meq/L	1			Calculation	GAM	05/16/08
Radiological								
Radium-226	1.7	pCi/L	1			E903.0	SYS	06/02/08
Radium-228	< 0.60	pCi/L	1			RA-05	SYS	05/28/08
Radon-222	967	pCi/L	1			ASTM D5072-92	SYS	05/19/08

Approved By: *Eric Fischer*

Approved On: 6/19/2008 1:40:33 PM

RECEIVED  
JUN 20 2008  
MINERALS & MINING PROGRAM





2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Sample Site: DB08-32-3C  
Sampled: 05/18/08 at 11:35 AM  
by Mark Keenihan  
Sample Matrix: Water

Lab ID#: 2008052010  
Received: 05/19/08 at 08:10 AM  
by Dana Smith  
Account: W1008  
DENR - Minerals & Mining

RECEIVED  
JUN 20 2008

MINERALS & MINING PROGRAM

MIKE CEPAK  
DENR - MINERALS AND MINING  
523 E. CAPITOL AVE.  
PIERRE, SD 57501

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
Physical Properties								
Electrical Conductivity	1370	µmhos/cm	1	0.400	5.00	EPA 120.1	JAM	05/20/08
pH	7.91	SU	1			SM 4500-H+ B	JAM	05/20/08
Total Dissolved Solids	902	mg/L	100ml	8.28	50.0	SM 2540 D	TMN	05/21/08
Non-Metallics								
Bicarbonate	211	mg/L	1	0.505	10.0	SM 2320 B	JAM	05/20/08
Carbonate	0.00	mg/L	1	0.207	5.00	SM 2320 B	JAM	05/20/08
Chloride (Cl-)	17.0	mg/L	1	0.453	0.500	SM 4500-Cl B	NMA	05/20/08
Nitrogen, Ammonia (NH3)	0.116	mg/L	1	0.005	0.050	SM 4500-NH3 D	JAM	05/20/08
Nitrogen, Nitrate (NO3)	< 0.050	mg/L	1	0.018	0.050	SM 4500-NO3 F	DES	05/20/08
Nitrogen, Nitrite (NO2)	< 0.050	mg/L	1	0.009	0.050	SM 4500-NO2 B	DES	05/20/08
Sulfate (SO4)	473	mg/L	4	10.5	40.0	EPA 375.2	DES	05/20/08
Metals - Dissolved								
Aluminum (Al)	0.053	mg/L	10	0.003	0.010	EPA 200.8	PAT	05/20/08
Cadmium (Cd)	< 0.001	mg/L	10	0.000202	0.001	EPA 200.8	PAT	05/20/08
Calcium (Ca)	74.8	mg/L	1	0.219	1.00	SM 3111 B	SAC	05/21/08
Chromium (Cr)	< 0.001	mg/L	10	0.000248	0.001	EPA 200.8 DRC	PAT	05/20/08
Copper (Cu)	0.006	mg/L	10	0.000478	0.005	EPA 200.8	PAT	05/20/08
Iron (Fe)	< 0.050	mg/L	10	0.009	0.050	EPA 200.8	PAT	05/20/08
Magnesium (Mg)	21.3	mg/L	5	0.108	2.50	SM 3111 B	SAC	05/20/08
Molybdenum (Mo)	0.002	mg/L	10	0.000385	0.001	EPA 200.8	PAT	05/20/08
Potassium (K)	10.0	mg/L	5	0.890	2.50	SM 3111 B	SAC	05/20/08
Selenium (Se)	< 0.005	mg/L	10	0.001	0.005	EPA 200.8	PAT	05/20/08
Sodium (Na)	174	mg/L	10	1.48	5.00	SM 3111 B	SAC	05/20/08
Metals - Total								
Uranium	0.010	mg/L	10	0.000041	0.001	EPA 200.8	PAT	05/20/08



Report of Analysis for: **DENR - Minerals & Mining**Sample Site: **DB08-32-3C**

Parameter	Result	Units	DF	MDL	PQL	Method	Analyst/Date	
<b>Anion - Cation Balance</b>								
Anions	13.8	meq/L	1			Calculation	GAM	05/21/08
Anion - Cation Balance	-1.71	%	1			Calculation	GAM	05/21/08
Cations	13.3	meq/L	1			Calculation	GAM	05/21/08
<b>Radiological</b>								
Radium-226	430	pCi/L	1			E903.0	SYS	06/08/08
Radon-222	465000	pCi/L	1			ASTM D5072-92	SYS	05/23/08

**Notes:**

Dewey Pump Test- end sample

Approved By: *Eric Fischer*

Approved On: 6/19/2008 2:00:55 PM

RECEIVED  
JUN 20 2008  
MINERALS & MINING PROGRAM



## MINE CONTACT REPORT FORM

Date of Call: \_\_\_\_\_ Date of E-mail: 04/25/08  
Telephone call to: \_\_\_\_\_ DENR Employee Contacted: Mike Cepak  
Operator Contacted: \_\_\_\_\_  
Company: \_\_\_\_\_  
Telephone: \_\_\_\_\_  
Staff Signature: Michael S. Cepak

**From:** Greg McDougall [mailto:greg@thechemistrylab.com]

**Sent:** Friday, April 25, 2008 4:25 PM

**To:** Cepak, Mike

**Subject:** PRELIMARTY RESULTS

Mike:

These are the results that we do in our lab. Energy is performing the Radiological tests for us until we get our equipment in. It will probably be over a month until we get the results back from Energy. We will add Energy's results to our reports when we get them. Our data will help you get going on these samples in the meantime.

Thanks:

Greg McDougall

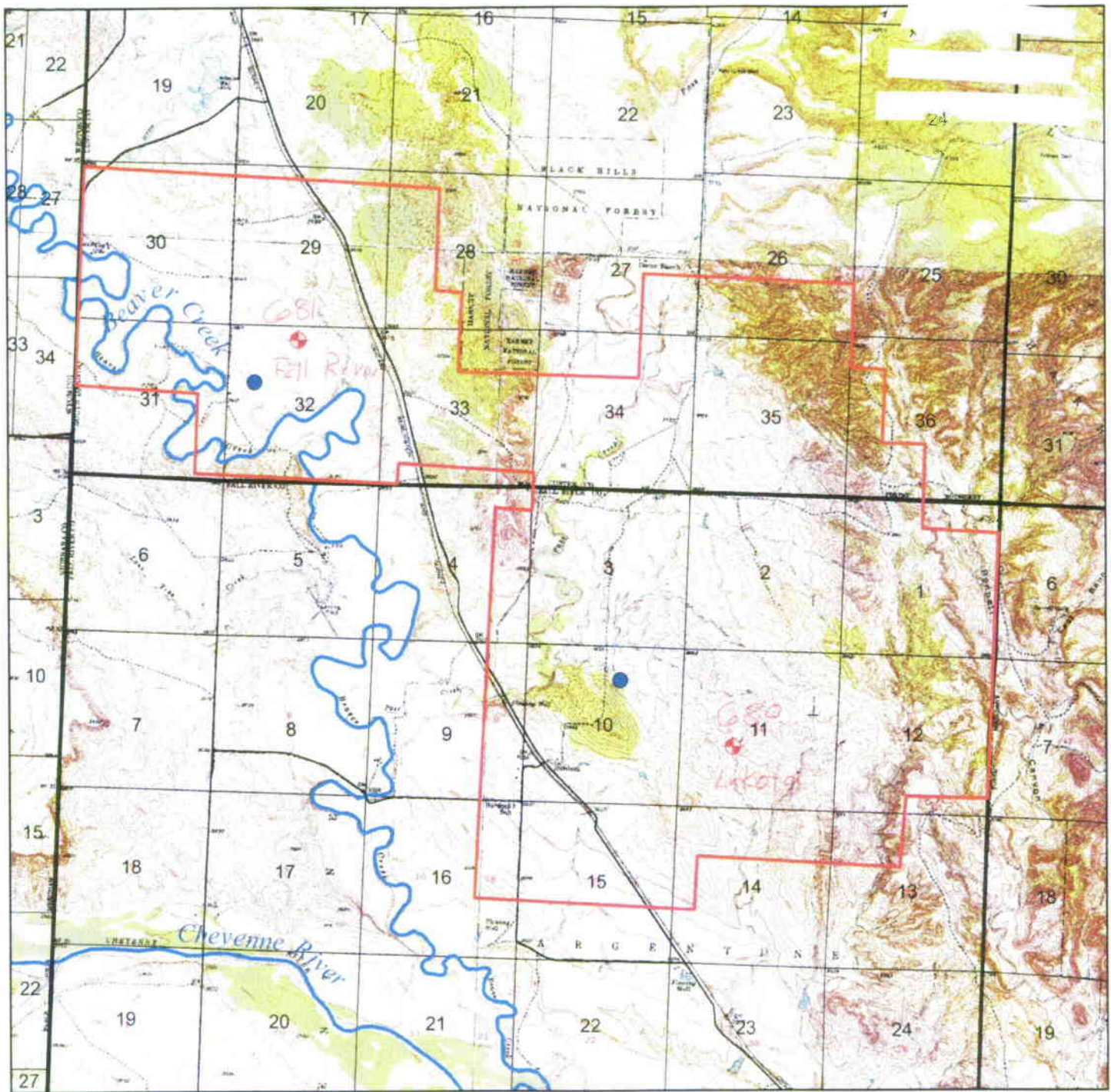
Mid Continent Testing Labs, Inc.

ph: 605-348-0111

fax 605-721-0265

Greg@TheChemistryLab.com





## Legend

- |  |                 |  |                |
|--|-----------------|--|----------------|
|  | Sections        |  | Pumped Wells   |
|  | Permit Boundary |  | Discharge Dams |
|  | Roads           |  |                |
|  | Streams         |  |                |

0 0.25 0.5 1 1.5 Miles



## Dewey-Burdock Withdrawal and Discharge Points

RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

Created By:	C.M. Hocking
Date:	10/25/07
Map File:	Impoundment Sampling

**RESPEC**  
WATER & NATURAL RESOURCES





## ANALYTICAL SUMMARY REPORT

RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

February 26, 2008

Cory Foreman

RESPEC Inc

3824 Jet Dr

Rapid City, SD 57701-

Workorder No.: R08010296

Quote ID: R286

Project Name: Edgemont

Energy Laboratories Inc. received the following 2 samples from RESPEC Inc on 1/31/2008 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
R08010296-001	DewBurd GW680	01/30/08 13:50	01/31/08	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Suspended Metals by ICP/ICPMS, Total Alkalinity Anion - Cation Balance Conductivity Selenium, Dissolved Selenium, Dissolved Selenium, Dissolved Anions by Ion Chromatography Nitrogen, Ammonia Oxidation Reduction Potential pH Digestion, Total Metals Digestion, Total Metals Dissolved Filtration Gross Alpha, Gross Beta Gross Gamma, Dissolved Lead 210, Dissolved Lead 210, Suspended Polonium 210, Dissolved Polonium 210, Suspended Radium 226, Dissolved Radium 226, Suspended Radon 222 Thorium, Isotopic Thorium, Suspended Isotopic Sodium Adsorption Ratio Solids, Total Dissolved
R08010296-002	DewBurd GW681	01/30/08 15:40	01/31/08	Aqueous	Same As Above

Thank you for submitting your samples to Energy Laboratories, Inc. - Rapid City. The following pages contain the results of the sample tests listed above and applicable analytical notes.

The samples were analyzed in accordance with the methods specified on the analytical reports. All analyses were accompanied by appropriate quality control samples throughout the test. Where applicable, the results of these quality control samples will be included, following your analytical data.

If you have any questions regarding the analyses performed or the results of these analyses, please contact Energy Laboratories Inc. - Rapid City at (605) 342-1225, (888) 672-1225 or Rapid\_City@energylab.com.

Report Approved By:

  
Linda Larson





RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

# LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc.  
Project: Edgemont  
Lab ID: R08010296-001  
Client Sample ID: DewBurd GW680

Report Date: 02/26/08  
Collection Date: 01/30/08 13:50  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
<b>MAJOR IONS</b>								
Alkalinity, Total as CaCO <sub>3</sub>	258	mg/L		5		1	A2320 B	02/06/08 12:04/sn
Carbonate as CO <sub>3</sub>	ND	mg/L		5		1	A2320 B	02/06/08 12:04/sn
Bicarbonate as HCO <sub>3</sub>	315	mg/L		5		1	A2320 B	02/06/08 12:04/sn
Calcium	343	mg/L		0.5		1	E200.7	02/14/08 19:21/eli-c
Chloride	15	mg/L		1		1	E300.0	01/31/08 20:32/sn
Fluoride	0.3	mg/L		0.1		1	E300.0	01/31/08 20:32/sn
Magnesium	113	mg/L		0.5		1	E200.7	02/14/08 19:21/eli-c
Nitrogen, Ammonia as N	0.2	mg/L		0.1		1	A4500-NH <sub>3</sub> G	02/04/08 16:33/sn
Nitrogen, Nitrate as N	ND	mg/L		0.1		1	E300.0	01/31/08 20:32/sn
Nitrogen, Nitrite as N	ND	mg/L		0.1		1	E300.0	01/31/08 20:32/sn
Potassium	20.7	mg/L		0.5		1	E200.7	02/14/08 19:21/eli-c
Silica	8.9	mg/L		0.5		1	E200.7	02/14/08 19:21/eli-c
Sodium	148	mg/L	D	0.8		1	E200.7	02/14/08 19:21/eli-c
Sulfate	1420	mg/L	D	3		50	E300.0	01/31/08 20:16/sn
<b>PHYSICAL PROPERTIES</b>								
Conductivity @ 25 C	2630	umhos/cm		5.0		1	A2510 B	02/01/08 14:21/jmh
Oxidation-Reduction Potential	0	mV				1	A2580 B	01/31/08 00:00/sn
pH	7.26	s.u.		0.01		1	A4500-H B	02/01/08 14:41/jmh
Sodium Adsorption Ratio (SAR)	1.8	unitless		0.10		1	Calculation	02/25/08 15:17/ADM
Solids, Total Dissolved TDS @ 180 C	2400	mg/L		5		1	A2540 C	01/31/08 14:50/jmh
<b>METALS - DISSOLVED</b>								
Aluminum	ND	mg/L		0.1		1	E200.8	02/12/08 23:57/eli-c
Arsenic	0.026	mg/L		0.001		1	E200.8	02/12/08 23:57/eli-c
Barium	ND	mg/L		0.1		1	E200.8	02/12/08 23:57/eli-c
Boron	0.1	mg/L		0.1		1	E200.7	02/14/08 19:21/eli-c
Cadmium	ND	mg/L		0.005		1	E200.8	02/12/08 23:57/eli-c
Chromium	ND	mg/L		0.05		1	E200.8	02/12/08 23:57/eli-c
Copper	ND	mg/L		0.01		1	E200.8	02/12/08 23:57/eli-c
Iron	0.43	mg/L		0.03		1	E200.7	02/14/08 19:21/eli-c
Lead	ND	mg/L		0.001		1	E200.8	02/12/08 23:57/eli-c
Manganese	0.43	mg/L		0.01		1	E200.8	02/12/08 23:57/eli-c
Mercury	ND	mg/L		0.001		1	E200.8	02/12/08 23:57/eli-c
Molybdenum	ND	mg/L		0.1		1	E200.8	02/12/08 23:57/eli-c
Nickel	ND	mg/L		0.05		1	E200.8	02/12/08 23:57/eli-c
Selenium	ND	mg/L		0.005		1	A3114 B	02/05/08 17:03/eli-c
Silver	ND	mg/L		0.005		1	E200.8	02/12/08 23:57/eli-c

Report: RL - Analyte reporting limit  
Definitions: QCL - Quality control limit  
D - RL increased due to sample matrix interference

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 1 of 6





RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

# LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc  
Project: Edgemont  
Lab ID: R08010296-001  
Client Sample ID: DewBurd GW680

Report Date: 02/26/08  
Collection Date: 01/30/08 13:50  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
<b>METALS - DISSOLVED</b>								
Thorium 232	ND	mg/L		0.005		1	E200.8	02/12/08 23:57/eli-c
Uranium	0.172	mg/L		0.0003		1	E200.8	02/12/08 23:57/eli-c
Vanadium	ND	mg/L		0.1		1	E200.8	02/12/08 23:57/eli-c
Zinc	ND	mg/L		0.01		1	E200.8	02/12/08 23:57/eli-c
<b>METALS - SUSPENDED</b>								
Uranium	0.0008	mg/L		0.0003		1	E200.8	02/14/08 03:34/eli-c
<b>METALS - TOTAL</b>								
Mercury	ND	mg/L		0.001		1	E200.8	02/12/08 14:13/eli-c
<b>METALS - SPECIATED</b>								
Selenium-IV	ND	mg/L		0.001		1	A3114 B	02/05/08 15:41/eli-cz
Selenium-VI	ND	mg/L		0.001		1	A3114 B	02/05/08 00:00/eli-cz
<b>RADIONUCLIDES - DISSOLVED</b>								
Gross Alpha	4090	pCi/L		1.0		1	E900.0	02/13/08 08:21/eli-c
Gross Alpha precision (±)	19.7	pCi/L				1	E900.0	02/13/08 08:21/eli-c
Gross Beta	1330	pCi/L		2.0		1	E900.0	02/13/08 08:21/eli-c
Gross Beta precision (±)	16.3	pCi/L				1	E900.0	02/13/08 08:21/eli-c
Lead 210	17	pCi/L		1.0		1	E909.0M	02/06/08 07:30/eli-c
Lead 210 precision (±)	2.5	pCi/L				1	E909.0M	02/06/08 07:30/eli-c
Polonium 210	1.7	pCi/L		1.0		1	RMO-3008	02/11/08 12:30/eli-c
Polonium 210 precision (±)	1.0	pCi/L				1	RMO-3008	02/11/08 12:30/eli-c
Radium 226	1180	pCi/L		0.2		1	E903.0	02/10/08 12:04/eli-c
Radium 226 precision (±)	10.6	pCi/L				1	E903.0	02/10/08 12:04/eli-c
Thorium 230	ND	pCi/L		0.2		1	E907.0	02/06/08 16:00/eli-c
Gross Gamma	4700	pCi/L		20		1	E901.1	02/06/08 15:40/eli-c
Gross Gamma precision (±)	110	pCi/L				1	E901.1	02/06/08 15:40/eli-c
<b>RADIONUCLIDES - SUSPENDED</b>								
Lead 210	ND	pCi/L		1.0		1	E909.0M	02/08/08 09:30/eli-c
Polonium 210	ND	pCi/L		1.0		1	RMO-3008	02/21/08 15:15/eli-c
Radium 226	12.7	pCi/L		0.2		1	E903.0	02/13/08 10:01/eli-c
Radium 226 precision (±)	2.7	pCi/L				1	E903.0	02/13/08 10:01/eli-c
Thorium 230	0.3	pCi/L		0.2		1	E907.0	02/13/08 12:00/eli-c
Thorium 230 precision (±)	0.2	pCi/L				1	E907.0	02/13/08 12:00/eli-c

Report: RL - Analyte reporting limit  
Definitions: QCL - Quality control limit

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 2 of 6





RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc  
Project: Edgemont  
Lab ID: R08010296-001  
Client Sample ID: DewBurd GW680

Report Date: 02/26/08  
Collection Date: 01/30/08 13:50  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>								
Radon 222	143000	pCi/L		100		1	D5072-92	02/01/08 16:58/eli-c
Radon 222 precision (±)	670	pCi/L				1	D5072-92	02/01/08 16:58/eli-c
<b>DATA QUALITY</b>								
A/C Balance (± 5)	ND					1	A1030 E	02/25/08 00:00/ikl
Anions	35.2	meq/L				1	A1030 E	02/25/08 00:00/ikl
Cations	33.5	meq/L				1	A1030 E	02/25/08 00:00/ikl
Solids, Total Dissolved Calculated	2210	mg/L				1	A1030 E	02/25/08 00:00/ikl
TDS Balance (0.80 - 1.20)	1.09					1	A1030 E	02/25/08 00:00/ikl

Report: RL - Analyte reporting limit  
Definitions: QCL - Quality control limit

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 3 of 6





RECEIVED  
MAR 12 2008  
MINERALS & MINING RESEARCH

# LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc  
Project: Edgemont  
Lab ID: R08010296-002  
Client Sample ID: DewBurd GW681

Report Date: 02/26/08  
Collection Date: 01/30/08 15:40  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
<b>MAJOR IONS</b>								
Alkalinity, Total as CaCO <sub>3</sub>	174	mg/L		5		1	A2320 B	02/06/08 12:06/sn
Carbonate as CO <sub>3</sub>	ND	mg/L		5		1	A2320 B	02/06/08 12:06/sn
Bicarbonate as HCO <sub>3</sub>	212	mg/L		5		1	A2320 B	02/06/08 12:06/sn
Calcium	60.3	mg/L		0.5		1	E200.7	02/14/08 19:25/eli-c
Chloride	13	mg/L		1		1	E300.0	01/31/08 21:02/sn
Fluoride	0.4	mg/L		0.1		1	E300.0	01/31/08 21:02/sn
Magnesium	22.3	mg/L		0.5		1	E200.7	02/14/08 19:25/eli-c
Nitrogen, Ammonia as N	ND	mg/L		0.1		1	A4500-NH <sub>3</sub> G	02/04/08 16:36/sn
Nitrogen, Nitrate as N	ND	mg/L		0.1		1	E300.0	01/31/08 21:02/sn
Nitrogen, Nitrite as N	ND	mg/L		0.1		1	E300.0	01/31/08 21:02/sn
Potassium	10.3	mg/L		0.5		1	E200.7	02/14/08 19:25/eli-c
Silica	8.1	mg/L		0.5		1	E200.7	02/14/08 19:25/eli-c
Sodium	192	mg/L	D	0.8		1	E200.7	02/14/08 19:25/eli-c
Sulfate	498	mg/L	D	3		50	E300.0	01/31/08 20:47/sn
<b>PHYSICAL PROPERTIES</b>								
Conductivity @ 25 C	1320	umhos/cm		5.0		1	A2510 B	02/01/08 14:22/jmh
Oxidation-Reduction Potential	0	mV				1	A2580 B	01/31/08 00:00/sn
pH	7.98	su		0.01		1	A4500-H B	02/01/08 14:43/jmh
Sodium Adsorption Ratio (SAR)	5.4	unitless		0.10		1	Calculation	02/25/08 15:17/ADM
Solids, Total Dissolved TDS @ 180 C	930	mg/L		5		1	A2540 C	01/31/08 14:50/jmh
<b>METALS - DISSOLVED</b>								
Aluminum	ND	mg/L		0.1		1	E200.8	02/13/08 00:04/eli-c
Arsenic	0.003	mg/L		0.001		1	E200.8	02/13/08 00:04/eli-c
Barium	ND	mg/L		0.1		1	E200.8	02/13/08 00:04/eli-c
Boron	ND	mg/L		0.1		1	E200.7	02/14/08 19:25/eli-c
Cadmium	ND	mg/L		0.005		1	E200.8	02/13/08 00:04/eli-c
Chromium	ND	mg/L		0.05		1	E200.8	02/13/08 00:04/eli-c
Copper	ND	mg/L		0.01		1	E200.8	02/13/08 00:04/eli-c
Iron	ND	mg/L		0.03		1	E200.7	02/14/08 19:25/eli-c
Lead	0.004	mg/L		0.001		1	E200.8	02/13/08 00:04/eli-c
Manganese	0.09	mg/L		0.01		1	E200.8	02/13/08 00:04/eli-c
Mercury	ND	mg/L		0.001		1	E200.8	02/13/08 00:04/eli-c
Molybdenum	ND	mg/L		0.1		1	E200.8	02/13/08 00:04/eli-c
Nickel	ND	mg/L		0.05		1	E200.8	02/13/08 00:04/eli-c
Selenium	ND	mg/L		0.005		1	A3114 B	02/05/08 17:05/eli-c
Silver	ND	mg/L		0.005		1	E200.8	02/13/08 00:04/eli-c

Report Definitions: RL - Analyte reporting limit  
QCL - Quality control limit  
D - RL increased due to sample matrix interference

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 4 of 6





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

# LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc  
Project: Edgemont  
Lab ID: R08010296-002  
Client Sample ID: DewBurd GW681

Report Date: 02/26/08  
Collection Date: 01/30/08 15:40  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	DF	Method	Analysis Date / By
<b>METALS - DISSOLVED</b>								
Thorium 232	ND	mg/L		0.005		1	E200.8	02/13/08 00:04/eli-c
Uranium	0.0117	mg/L		0.0003		1	E200.8	02/13/08 00:04/eli-c
Vanadium	ND	mg/L		0.1		1	E200.8	02/13/08 00:04/eli-c
Zinc	ND	mg/L		0.01		1	E200.8	02/13/08 00:04/eli-c
<b>METALS - SUSPENDED</b>								
Uranium	0.0010	mg/L		0.0003		1	E200.8	02/14/08 03:42/eli-c
<b>METALS - TOTAL</b>								
Mercury	ND	mg/L		0.001		1	E200.8	02/12/08 14:20/eli-c
<b>METALS - SPECIATED</b>								
Selenium-IV	ND	mg/L		0.001		1	A3114 B	02/05/08 15:43/eli-cz
Selenium-VI	ND	mg/L		0.001		1	A3114 B	02/05/08 00:00/eli-cz
<b>RADIONUCLIDES - DISSOLVED</b>								
Gross Alpha	656	pCi/L		1.0		1	E900.0	02/13/08 08:21/eli-c
Gross Alpha precision (±)	4.7	pCi/L				1	E900.0	02/13/08 08:21/eli-c
Gross Beta	226	pCi/L		2.0		1	E900.0	02/13/08 08:21/eli-c
Gross Beta precision (±)	4.3	pCi/L				1	E900.0	02/13/08 08:21/eli-c
Lead 210	46	pCi/L		1.0		1	E909.0M	02/06/08 07:30/eli-c
Lead 210 precision (±)	4.1	pCi/L				1	E909.0M	02/06/08 07:30/eli-c
Polonium 210	2.6	pCi/L		1.0		1	RMO-3008	02/11/08 12:30/eli-c
Polonium 210 precision (±)	1.5	pCi/L				1	RMO-3008	02/11/08 12:30/eli-c
Radium 226	421	pCi/L		0.2		1	E903.0	02/10/08 12:04/eli-c
Radium 226 precision (±)	6.8	pCi/L				1	E903.0	02/10/08 12:04/eli-c
Thorium 230	ND	pCi/L		0.2		1	E907.0	02/06/08 16:00/eli-c
Gross Gamma	13000	pCi/L		20		1	E901.1	02/06/08 15:40/eli-c
Gross Gamma precision (±)	190	pCi/L				1	E901.1	02/06/08 15:40/eli-c
<b>RADIONUCLIDES - SUSPENDED</b>								
Lead 210	1.7	pCi/L		1.0		1	E909.0M	02/08/08 09:30/eli-c
Lead 210 precision (±)	0.69	pCi/L				1	E909.0M	02/08/08 09:30/eli-c
Polonium 210	1.6	pCi/L		1.0		1	RMO-3008	02/21/08 15:15/eli-c
Polonium 210 precision (±)	0.86	pCi/L				1	RMO-3008	02/21/08 15:15/eli-c
Radium 226	9.9	pCi/L		0.2		1	E903.0	02/13/08 10:01/eli-c
Radium 226 precision (±)	2.4	pCi/L				1	E903.0	02/13/08 10:01/eli-c
Thorium 230	ND	pCi/L		0.2		1	E907.0	02/13/08 12:00/eli-c

Report: RL - Analyte reporting limit  
Definitions: QCL - Quality control limit

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 5 of 6





RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

# LABORATORY ANALYTICAL REPORT

Client: RESPEC Inc  
Project: Edgemont  
Lab ID: R08010296-002  
Client Sample ID: DewBurd GW681

Report Date: 02/26/08  
Collection Date: 01/30/08 15:40  
Date Received: 01/31/08  
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/		Method	Analysis Date / By
					QCL	DF		
RADIONUCLIDES - TOTAL								
Radon 222	462000	pCi/L		100		1	D5072-92	02/01/08 16:58/eli-c
Radon 222 precision (±)	1190	pCi/L				1	D5072-92	02/01/08 16:58/eli-c
DATA QUALITY								
A/C Balance (± 5)	ND					1	A1030 E	02/25/08 00:00/iki
Anions	14.2	meq/L				1	A1030 E	02/25/08 00:00/iki
Cations	13.5	meq/L				1	A1030 E	02/25/08 00:00/iki
Solids, Total Dissolved Calculated	901	mg/L				1	A1030 E	02/25/08 00:00/iki
TDS Balance (0.80 - 1.20)	1.03					1	A1030 E	02/25/08 00:00/iki

Report: RL - Analyte reporting limit  
Definitions: QCL - Quality control limit

MCL - Maximum contaminant level  
ND - Not detected at the reporting limit

Page 6 of 6





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B Batch: 080206A-ALK-SEL-W									
Sample ID: MBLK1_080206A	Method Blank						Run: PH_COND1-R_080206A		02/06/08 12:00
Alkalinity, Total as CaCO <sub>3</sub>	ND	mg/L	3						
Sample ID: LCS1_080206A	Laboratory Control Sample						Run: PH_COND1-R_080206A		02/06/08 12:01
Alkalinity, Total as CaCO <sub>3</sub>	1000	mg/L	5.0	100	90	110			
Method: A2510 B Batch: 080201_1_COND-PROBE-W									
Sample ID: LCS1-1_080201	Laboratory Control Sample						Run: PH_COND2-R_080201A		02/01/08 14:13
Conductivity @ 25 C	153	umhos/cm	5.0	102	90	110			
Sample ID: LCS2-1_080201	Laboratory Control Sample						Run: PH_COND2-R_080201A		02/01/08 14:14
Conductivity @ 25 C	4990	umhos/cm	5.0	100	90	110			
Sample ID: LCS_COND-1_080201	Laboratory Control Sample						Run: PH_COND2-R_080201A		02/01/08 14:15
Conductivity @ 25 C	1380	umhos/cm	5.0	98	90	110			
Sample ID: MBLK-1_080201	Method Blank						Run: PH_COND2-R_080201A		02/01/08 14:17
Conductivity @ 25 C	ND	umhos/cm	5						
Sample ID: R08010273-001BDUP	Sample Duplicate						Run: PH_COND2-R_080201A		02/01/08 14:18
Conductivity @ 25 C	652	umhos/cm	5.0				0.3	10	
Method: A2540 C Batch: 080131A-SLDS-TDS-W									
Sample ID: MBLK1_080131A	Method Blank						Run: BAL-4-R_080131B		01/31/08 14:46
Solids, Total Dissolved TDS @ 180 C	ND	mg/L	3						
Sample ID: LCS1_080131A	Laboratory Control Sample						Run: BAL-4-R_080131B		01/31/08 14:47
Solids, Total Dissolved TDS @ 180 C	210	mg/L	5.0	104	90	110			
Sample ID: R08010262-001AMS	Sample Matrix Spike						Run: BAL-4-R_080131B		01/31/08 14:48
Solids, Total Dissolved TDS @ 180 C	430	mg/L	5.0	100	80	120			
Sample ID: R08010262-001AMSD	Sample Matrix Spike Duplicate						Run: BAL-4-R_080131B		01/31/08 14:48
Solids, Total Dissolved TDS @ 180 C	440	mg/L	5.0	103	80	120	1.4	10	
Method: A2580 B Batch: R33347									
Sample ID: LCS_013108	Laboratory Control Sample						Run: PH_COND1-R_080131A		01/31/08 00:00
Oxidation-Reduction Potential	480	mV		102	95	105			

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit.





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A3114 B							Batch: C_R96577		
Sample ID: R08010296-001E	Sample Matrix Spike				Run: SUB-C96577			02/05/08 00:00	
Selenium-VI	0.0017	mg/L	0.0010	3	85	115			S
Sample ID: R08010296-001E	Sample Matrix Spike Duplicate				Run: SUB-C96577			02/05/08 00:00	
Selenium-VI	0.0025	mg/L	0.0010	4	85	115	39	10	SR
Method: A3114 B							Batch: C_SE3114-080205		
Sample ID: MBLK	Method Blank				Run: SUB-C96580			02/05/08 16:36	
Selenium	ND	mg/L	0.0004						
Sample ID: 288-20-3	Laboratory Control Sample				Run: SUB-C96580			02/05/08 16:44	
Selenium	0.055	mg/L	0.0010	110	90	110			
Sample ID: R08010296-001E	Sample Matrix Spike				Run: SUB-C96580			02/05/08 17:11	
Selenium	0.050	mg/L	0.0010	99	85	115			
Sample ID: R08010296-001E	Sample Matrix Spike Duplicate				Run: SUB-C96580			02/05/08 17:13	
Selenium	0.051	mg/L	0.0010	102	85	115	3.0	10	
Method: A3114 B							Batch: C_SEIV3114-080205		
Sample ID: MBLK	Method Blank				Run: SUB-C96573			02/05/08 15:36	
Selenium-IV	ND	mg/L	0.0002						
Sample ID: 288-20-3	Laboratory Control Sample				Run: SUB-C96573			02/05/08 15:38	
Selenium-IV	0.050	mg/L	0.0010	99	90	110			
Sample ID: R08010296-001E	Sample Matrix Spike				Run: SUB-C96573			02/05/08 15:45	
Selenium-IV	0.051	mg/L	0.0010	102	85	115			
Sample ID: R08010296-001E	Sample Matrix Spike Duplicate				Run: SUB-C96573			02/05/08 15:47	
Selenium-IV	0.054	mg/L	0.0010	105	85	115	4.4	10	
Method: A4500-H B							Batch: 080201_1_PH-W		
Sample ID: LCS_pH-1_080201	Laboratory Control Sample				Run: PH_COND2-R_080201A			02/01/08 14:37	
pH	6.94	s.u.	0.010	101	98.55	101.45			
Sample ID: R08010280-001ADUP	Sample Duplicate				Run: PH_COND2-R_080201A			02/01/08 14:39	
pH	8.06	s.u.	0.010				0.1	1.25	

### Qualifiers:

RL - Analyte reporting limit  
R - RPD exceeds advisory limit

ND - Not detected at the reporting limit  
S - Spike recovery outside of advisory limits





RECEIVED  
MAR 12 2008  
MINERALS & MINING PRODUCTS

## QA/QC Summary Report

Client: RESPEC Inc.  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-NH3 G							Batch: A2008-02-04_2_NH3_01		
Sample ID: LFB-3	Laboratory Fortified Blank					Run: TECHAA2-R_080204A			02/04/08 16:20
Nitrogen, Ammonia as N	0.27	mg/L	0.10	106	90	110			
Sample ID: LFB-4	Laboratory Fortified Blank					Run: TECHAA2-R_080204A			02/04/08 16:22
Nitrogen, Ammonia as N	0.28	mg/L	0.10	111	90	110			S
Sample ID: MBLK-5	Method Blank					Run: TECHAA2-R_080204A			02/04/08 16:23
Nitrogen, Ammonia as N	ND	mg/L	0.01						
Sample ID: R08010296-001BDUP	Sample Duplicate					Run: TECHAA2-R_080204A			02/04/08 16:34
Nitrogen, Ammonia as N	0.24	mg/L	0.10				2.9	10	
Sample ID: R08010296-002BMS	Sample Matrix Spike					Run: TECHAA2-R_080204A			02/04/08 16:37
Nitrogen, Ammonia as N	0.30	mg/L	0.10	106	80	120			
Method: D5072-92							Batch: C_R96506		
Sample ID: C08020027-012CDUP	Sample Duplicate					Run: SUB-C96506			02/01/08 16:58
Radon 222	365	pCi/L	100				47	30	R
- The RPD for the Dup is outside of the acceptable range.									
Sample ID: MB-R96506	Method Blank					Run: SUB-C96506			02/01/08 16:58
Radon 222	ND	pCi/L	100						
Sample ID: LCS-R96506	Laboratory Control Sample					Run: SUB-C96506			02/01/08 16:58
Radon 222	317	pCi/L	100	104	70	130			

### Qualifiers:

RL - Analyte reporting limit  
R - RPD exceeds advisory limit

ND - Not detected at the reporting limit  
S - Spike recovery outside of advisory limits





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method:</b> E200.7							Batch: C_R96996		
<b>Sample ID:</b> LFB-TM	Laboratory Fortified Blank			Run: SUB-C96996			02/14/08 12:48		
Silica	2.0	mg/L	0.10	100	85	125			
Boron	1.9	mg/L	0.10	97	85	125			
Iron	2.0	mg/L	0.030	100	85	125			
<b>Sample ID:</b> LFB-MAJORS	Laboratory Fortified Blank			Run: SUB-C96996			02/14/08 12:52		
Calcium	25	mg/L	0.50	102	85	125			
Magnesium	24	mg/L	0.50	97	85	125			
Potassium	24	mg/L	0.50	95	85	125			
Sodium	24	mg/L	0.76	95	85	125			
<b>Sample ID:</b> C08020352-001CMS	Sample Matrix Spike			Run: SUB-C96996			02/14/08 13:40		
Boron	10.2	mg/L	0.13	99	70	130			
Iron	9.56	mg/L	0.087	96	70	130			
Calcium	462	mg/L	0.79	92	70	130			
Magnesium	438	mg/L	0.80	88	70	130			
Potassium	1100	mg/L	0.50	92	70	130			
Silica	33.8	mg/L	0.11	85	70	130			
Sodium	693	mg/L	5.3	91	70	130			
<b>Sample ID:</b> C08020352-001CMSD	Sample Matrix Spike Duplicate			Run: SUB-C96996			02/14/08 13:43		
Boron	10.6	mg/L	0.13	104	70	130	4.3	20	
Iron	9.89	mg/L	0.087	99	70	130	3.4	20	
Calcium	475	mg/L	0.79	95	70	130	2.8	20	
Magnesium	460	mg/L	0.80	92	70	130	5.0	20	
Potassium	1110	mg/L	0.50	92	70	130	0.3	20	
Silica	34.6	mg/L	0.11	93	70	130	2.4	20	
Sodium	697	mg/L	5.3	92	70	130	0.6	20	
<b>Sample ID:</b> LFB-TM	Laboratory Fortified Blank			Run: SUB-C96996			02/15/08 02:45		
Silica	1.9	mg/L	0.10	97	85	125			
Boron	1.8	mg/L	0.10	91	85	125			
Iron	1.9	mg/L	0.030	95	85	125			
<b>Sample ID:</b> LFB-MAJORS	Laboratory Fortified Blank			Run: SUB-C96996			02/15/08 02:48		
Calcium	24	mg/L	0.50	94	85	125			
Magnesium	24	mg/L	0.50	95	85	125			
Potassium	24	mg/L	0.50	97	85	125			
Sodium	23	mg/L	0.76	93	85	125			

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7_8									Batch: C_R96996
Sample ID: C08011081-001CMS	Sample Matrix Spike		Run: SUB-C96996		02/14/08 15:59				
Boron	103	mg/L	1.3	101	70	130			
Iron	98.9	mg/L	0.87	98	70	130			
Calcium	5700	mg/L	7.9	95	70	130			
Magnesium	4710	mg/L	8.0	93	70	130			
Potassium	11200	mg/L	4.4	93	70	130			
Silica	210	mg/L	1.1	99	70	130			
Sodium	5460	mg/L	53	93	70	130			
Sample ID: C08011081-001CMSD	Sample Matrix Spike Duplicate		Run: SUB-C96996		02/14/08 16:02				
Boron	107	mg/L	1.3	105	70	130	3.7	20	
Iron	101	mg/L	0.87	100	70	130	2.0	20	
Calcium	5810	mg/L	7.9	97	70	130	1.9	20	
Magnesium	4810	mg/L	8.0	95	70	130	2.1	20	
Potassium	11300	mg/L	4.4	94	70	130	0.7	20	
Silica	215	mg/L	1.1	105	70	130	2.7	20	
Sodium	5420	mg/L	53	92	70	130	0.7	20	
Method: E200.8									Batch: C_17699
Sample ID: MB-17699	Method Blank		Run: SUB-C96857		02/12/08 13:32				
Mercury	ND	mg/L	6E-06						
Sample ID: C08020069-001AMS4	Post Digestion Spike		Run: SUB-C96857		02/12/08 16:21				
Mercury	0.00620	mg/L	0.0010	89	70	130			
Sample ID: C08020069-001AMSD4	Post Digestion Spike Duplicate		Run: SUB-C96857		02/12/08 16:28				
Mercury	0.00622	mg/L	0.0010	89	70	130	0.4	20	
Sample ID: MB-17699	Method Blank		Run: SUB-C96944		02/13/08 17:26				
Mercury	3E-05	mg/L	3E-05						
Sample ID: C08020038-001DMS	Sample Matrix Spike		Run: SUB-C96944		02/13/08 18:12				
Mercury	0.0056	mg/L	0.0010	111	70	130			
Sample ID: C08020038-001DMSD	Sample Matrix Spike Duplicate		Run: SUB-C96944		02/13/08 18:19				
Mercury	0.0055	mg/L	0.0010	110	70	130	1.0	20	

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: E200.8</b>									Batch: C_R96857
<b>Sample ID: LRB</b>	Method Blank		Run: SUB-C96857			02/12/08 12:31			
Aluminum	ND	mg/L	0.0001						
Arsenic	ND	mg/L	6E-05						
Barium	ND	mg/L	3E-05						
Cadmium	ND	mg/L	1E-05						
Chromium	ND	mg/L	4E-05						
Copper	ND	mg/L	7E-05						
Lead	ND	mg/L	3E-05						
Manganese	ND	mg/L	5E-05						
Mercury	ND	mg/L	8E-05						
Molybdenum	ND	mg/L	5E-05						
Nickel	ND	mg/L	0.0007						
Silver	0.001	mg/L	3E-05						
Thorium 232	5E-05	mg/L	4E-05						
Uranium	ND	mg/L	1E-05						
Vanadium	ND	mg/L	3E-05						
Zinc	ND	mg/L	0.0003						
<b>Sample ID: LFB</b>	Laboratory Fortified Blank		Run: SUB-C96857			02/12/08 12:38			
Aluminum	0.0514	mg/L	0.0010	103	85	115			
Arsenic	0.0510	mg/L	0.0010	102	85	115			
Barium	0.0511	mg/L	0.0010	102	85	115			
Cadmium	0.0505	mg/L	0.0010	101	85	115			
Chromium	0.0507	mg/L	0.0010	101	85	115			
Copper	0.0502	mg/L	0.0010	100	85	115			
Lead	0.0505	mg/L	0.0010	101	85	115			
Manganese	0.0505	mg/L	0.0010	101	85	115			
Mercury	0.00512	mg/L	0.0010	102	85	115			
Molybdenum	0.0512	mg/L	0.0010	102	85	115			
Nickel	0.0511	mg/L	0.0010	102	85	115			
Silver	0.0203	mg/L	0.0010	96	85	115			
Thorium 232	0.0503	mg/L	0.0010	101	85	115			
Uranium	0.0504	mg/L	0.00030	101	85	115			
Vanadium	0.0507	mg/L	0.0010	101	85	115			
Zinc	0.0520	mg/L	0.0010	104	85	115			
<b>Sample ID: C08020018-001DMS4</b>	Post Digestion Spike		Run: SUB-C96857			02/12/08 13:12			
Aluminum	0.109	mg/L	0.10	95	70	130			
Arsenic	0.0544	mg/L	0.0010	108	70	130			
Barium	0.178	mg/L	0.10	93	70	130			
Cadmium	0.0523	mg/L	0.010	105	70	130			
Chromium	0.0531	mg/L	0.050	102	70	130			

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: E200.8</b>							Batch: C_R96857		
<b>Sample ID: C08020018-001DMS4</b>							Run: SUB-C96857		
Post Digestion Spike							02/12/08 13:12		
Copper	0.0577	mg/L	0.010	102	70	130			
Lead	0.0541	mg/L	0.050	106	70	130			
Manganese	0.0551	mg/L	0.010	102	70	130			
Mercury	0.00527	mg/L	0.0010	105	70	130			
Molybdenum	0.0561	mg/L	0.10	109	70	130			
Nickel	0.0525	mg/L	0.050	103	70	130			
Silver	0.0181	mg/L	0.010	91	70	130			
Thorium 232	0.0522	mg/L	0.0010	104	70	130			
Uranium	0.0538	mg/L	0.00030	105	70	130			
Vanadium	0.0522	mg/L	0.10	103	70	130			
Zinc	0.103	mg/L	0.010	107	70	130			
<b>Sample ID: C08020018-001DMSD4</b>							Run: SUB-C96857		
Post Digestion Spike Duplicate							02/12/08 13:19		
Aluminum	0.114	mg/L	0.10	107	70	130	5.3	20	
Arsenic	0.0534	mg/L	0.0010	105	70	130	2.0	20	
Barium	0.178	mg/L	0.10	94	70	130	0.2	20	
Cadmium	0.0523	mg/L	0.010	105	70	130	0.1	20	
Chromium	0.0524	mg/L	0.050	101	70	130	1.3	20	
Copper	0.0572	mg/L	0.010	101	70	130	0.8	20	
Lead	0.0535	mg/L	0.050	105	70	130	1.2	20	
Manganese	0.0545	mg/L	0.010	101	70	130	1.0	20	
Mercury	0.00528	mg/L	0.0010	106	70	130	0.2	20	
Molybdenum	0.0557	mg/L	0.10	106	70	130	0.0	20	
Nickel	0.0519	mg/L	0.050	101	70	130	1.2	20	
Silver	0.0203	mg/L	0.010	102	70	130	11	20	
Thorium 232	0.0519	mg/L	0.0010	104	70	130	0.5	20	
Uranium	0.0531	mg/L	0.00030	103	70	130	1.3	20	
Vanadium	0.0517	mg/L	0.10	102	70	130	0.0	20	
Zinc	0.106	mg/L	0.010	102	70	130	2.3	20	
<b>Sample ID: C08020114-003BMS4</b>							Run: SUB-C96857		
Post Digestion Spike							02/13/08 00:31		
Aluminum	0.0512	mg/L	0.10	100	70	130			
Arsenic	0.0540	mg/L	0.0010	107	70	130			
Barium	0.0822	mg/L	0.10	105	70	130			
Cadmium	0.0531	mg/L	0.010	106	70	130			
Chromium	0.0512	mg/L	0.050	101	70	130			
Copper	0.0515	mg/L	0.010	102	70	130			
Lead	0.0543	mg/L	0.050	106	70	130			
Manganese	0.0546	mg/L	0.010	102	70	130			
Mercury	0.00516	mg/L	0.0010	103	70	130			
Molybdenum	0.0557	mg/L	0.10	103	70	130			

### Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc

Project: Edgemont

Report Date: 02/26/08

Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8							Batch: C_R96857		
Sample ID: C08020114-003BMS4 Post Digestion Spike							Run: SUB-C96857		02/13/08 00:31
Nickel	0.0504	mg/L	0.050	101	70	130			
Silver	0.0172	mg/L	0.010	86	70	130			
Thorium 232	0.0562	mg/L	0.0010	112	70	130			
Uranium	0.160	mg/L	0.00030	104	70	130			
Vanadium	0.0518	mg/L	0.10	103	70	130			
Zinc	0.0882	mg/L	0.010	106	70	130			
Sample ID: C08020114-003BMSD4 Post Digestion Spike Duplicate							Run: SUB-C96857		02/13/08 00:37
Aluminum	0.0503	mg/L	0.10	98	70	130	0.0	20	
Arsenic	0.0534	mg/L	0.0010	106	70	130	1.2	20	
Barium	0.0820	mg/L	0.10	105	70	130	0.0	20	
Cadmium	0.0527	mg/L	0.010	105	70	130	0.8	20	
Chromium	0.0501	mg/L	0.050	99	70	130	2.3	20	
Copper	0.0513	mg/L	0.010	101	70	130	0.4	20	
Lead	0.0540	mg/L	0.050	105	70	130	0.5	20	
Manganese	0.0539	mg/L	0.010	100	70	130	1.4	20	
Mercury	0.00518	mg/L	0.0010	104	70	130	0.3	20	
Molybdenum	0.0565	mg/L	0.10	103	70	130	0.0	20	
Nickel	0.0502	mg/L	0.050	100	70	130	0.3	20	
Silver	0.0184	mg/L	0.010	92	70	130	6.8	20	
Thorium 232	0.0558	mg/L	0.0010	112	70	130	0.9	20	
Uranium	0.157	mg/L	0.00030	97	70	130	2.2	20	
Vanadium	0.0510	mg/L	0.10	101	70	130	0.0	20	
Zinc	0.0886	mg/L	0.010	107	70	130	0.5	20	
Method: E200.8							Batch: C_R96944		
Sample ID: LRB Method Blank							Run: SUB-C96944		02/13/08 15:42
Uranium	ND	mg/L	4E-05						
Sample ID: LFB Laboratory Fortified Blank							Run: SUB-C96944		02/13/08 15:49
Uranium	0.0475	mg/L	0.00030	95	85	115			
Sample ID: LCS1-17696 Laboratory Control Sample							Run: SUB-C96944		02/14/08 03:19
Uranium	0.0511	mg/L	0.00030	102	80	120			
Sample ID: R08010296-0021 Post Digestion Spike							Run: SUB-C96944		02/14/08 03:49
Uranium	0.0539	mg/L	0.00030	106	70	130			
Sample ID: R08010296-0021 Post Digestion Spike Duplicate							Run: SUB-C96944		02/14/08 03:57
Uranium	0.0539	mg/L	0.00030	106	70	130	0.1	20	

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc

Report Date: 02/26/08

Project: Edgemont

Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0							Batch: R33354		
Sample ID: LFB0801311244-1	Laboratory Fortified Blank		Run: DIONEX_080131A				01/31/08 18:13		
Chloride	4.84	mg/L	0.50	97	90	110			
Fluoride	2.10	mg/L	0.10	105	90	110			
Nitrogen, Nitrate as N	2.49	mg/L	0.10	100	90	110			
Nitrogen, Nitrite as N	2.48	mg/L	0.10	99	90	110			
Sulfate	14.4	mg/L	1.0	96	90	110			
Sample ID: LFB0801311244-1	Laboratory Fortified Blank		Run: DIONEX_080131A				01/31/08 18:28		
Chloride	4.74	mg/L	0.50	95	90	110			
Fluoride	1.98	mg/L	0.10	99	90	110			
Nitrogen, Nitrate as N	2.44	mg/L	0.10	98	90	110			
Nitrogen, Nitrite as N	2.40	mg/L	0.10	96	90	110			
Sulfate	14.1	mg/L	1.0	94	90	110			
Sample ID: R08010278-001I MS	Sample Matrix Spike		Run: DIONEX_080131A				01/31/08 18:59		
Chloride	7.66	mg/L	0.50	85	80	120			
Fluoride	2.11	mg/L	0.10	93	80	120			
Nitrogen, Nitrate as N	2.71	mg/L	0.10	95	80	120			
Nitrogen, Nitrite as N	2.56	mg/L	0.10	102	80	120			
Sulfate	60.5	mg/L	1.0	75	80	120			S
Sample ID: R08010278-001I MSD	Sample Matrix Spike Duplicate		Run: DIONEX_080131A				01/31/08 19:15		
Chloride	7.42	mg/L	0.50	80	80	120	3.2	10	
Fluoride	2.08	mg/L	0.10	91	80	120	1.4	10	
Nitrogen, Nitrate as N	2.71	mg/L	0.10	95	80	120	0.0	10	
Nitrogen, Nitrite as N	2.53	mg/L	0.10	101	80	120	1.2	10	
Sulfate	60.5	mg/L	1.0	75	80	120	0.0	10	S

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit

S - Spike recovery outside of advisory limits





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0									Batch: C_GrAB-0394
Sample ID: MB-GrAB-0394	Method Blank					Run: SUB-C97004			02/12/08 04:24
Gross Alpha	ND	pCi/L	1						
Gross Beta	ND	pCi/L	2						
Sample ID: UNAT-GrAB-0394	Laboratory Control Sample					Run: SUB-C97004			02/12/08 04:24
Gross Alpha	200	pCi/L	1.0	99	70	130			
Sample ID: Cs137-GrAB-0394	Laboratory Control Sample					Run: SUB-C97004			02/12/08 04:24
Gross Beta	90	pCi/L	2.0	99	70	130			
Sample ID: C08020114-001AMS	Sample Matrix Spike					Run: SUB-C97004			02/12/08 04:24
Gross Alpha	300	pCi/L	1.0	101	70	130			
Sample ID: C08020114-001AMSD	Sample Matrix Spike Duplicate					Run: SUB-C97004			02/12/08 04:24
Gross Alpha	290	pCi/L	1.0	95	70	130	5.1	12.5	
Sample ID: C08020114-001AMS	Sample Matrix Spike					Run: SUB-C97004			02/12/08 04:24
Gross Beta	110	pCi/L	2.0	96	70	130			
Sample ID: C08020114-001AMSD	Sample Matrix Spike Duplicate					Run: SUB-C97004			02/12/08 04:24
Gross Beta	110	pCi/L	2.0	97	70	130	1.3	15.3	
Sample ID: R08010296-002H	Sample Duplicate					Run: SUB-C97004			02/13/08 08:21
Gross Alpha	650	pCi/L	1.0				0.7	11.4	
Gross Beta	220	pCi/L	2.0				2.2	13.9	

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED

MAR 12 2008

MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method:</b> E901.1									Batch: C_17896
<b>Sample ID:</b> R08010296-002H	<b>Sample Duplicate</b>		<b>Run:</b> SUB-C96781		02/06/08 15:40				
Americium 241	ND	pCi/L	20				0.0	30	
Barium 133	ND	pCi/L	20				0.0	30	
Bismuth 212	ND	pCi/L	20				0.0	30	
Bismuth 214	5600	pCi/L	20				20	30	
Cesium 134	ND	pCi/L	20				0.0	30	
Cesium 137	ND	pCi/L	20				0.0	30	
Cobalt 60	ND	pCi/L	20				0.0	30	
Iodine 125	ND	pCi/L	20				0.0	30	
Iodine 131	ND	pCi/L	20				0.0	30	
Lead 212	ND	pCi/L	20				0.0	30	
Lead 214	5200	pCi/L	20				15	30	
Manganese 54	ND	pCi/L	20				0.0	30	
Potassium 40	ND	pCi/L	20				0.0	30	
Radium 223	ND	pCi/L	20				0.0	30	
Radium 224	ND	pCi/L	20				0.0	30	
Thallium 208	ND	pCi/L	20				0.0	30	
Thorium 228	ND	pCi/L	20				0.0	30	
Thorium 234	ND	pCi/L	20				0.0	30	
Zinc 65	ND	pCi/L	20				0.0	30	
Radium 228	ND	pCi/L	20				0.0	30	
Gross Gamma	11000	pCi/L	20				18	30	
<b>Sample ID:</b> MB-R96781	<b>Method Blank</b>		<b>Run:</b> SUB-C96781		02/06/08 15:40				
Bismuth 212		pCi/Filter	20						
Bismuth 214		pCi/Filter	20						
Cesium 134		pCi/Filter	20						
Cesium 137		pCi/Filter	20						
Cobalt 60		pCi/Filter	20						
Iodine 125		pCi/Filter	20						
Iodine 131		pCi/Filter	20						
Lead 212		pCi/Filter	20						
Lead 214		pCi/Filter	20						
Manganese 54		pCi/Filter	20						
Potassium 40		pCi/Filter	20						
Radium 223		pCi/Filter	20						
Radium 224		pCi/Filter	20						
Thallium 208		pCi/Filter	20						
Thorium 228		pCi/Filter	20						
Thorium 234		pCi/Filter	20						
Zinc 65		pCi/Filter	20						
Radium 228		pCi/Filter	20						

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING DIV.

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E901.1									
Batch: C_17696									
Sample ID: MB-R96781	Method Blank						Run: SUB-C96781		02/06/08 15:40
Gross Gamma		pCi/Filter	20						
Sample ID: LCS-R96781									
Batch: C_17696									
Cesium 137	Laboratory Control Sample						Run: SUB-C96781		02/06/08 15:40
Potassium 40	1200	pCi/Filter	20	85	70	130			
	7320	pCi/Filter	20	110	70	130			
Method: E903.0									
Batch: C_R96882									
Sample ID: C08020054-003CMS	Sample Matrix Spike						Run: SUB-C96882		02/13/08 11:10
Radium 226	2.5	pCi/L	0.20	70	70	130			
Sample ID: C08020054-003CMSD									
Batch: C_R96882									
Radium 226	Sample Matrix Spike Duplicate						Run: SUB-C96882		02/13/08 11:10
	2.7	pCi/L	0.20	81	70	130	7.2		28.8
Sample ID: LCS-17696									
Batch: C_R96882									
Radium 226	Laboratory Control Sample						Run: SUB-C96882		02/13/08 11:10
	52	pCi/L	0.20	83	70	130			
Sample ID: MB-17696									
Batch: C_R96882									
Radium 226	Method Blank						Run: SUB-C96882		02/13/08 11:10
	ND	pCi/L	4E-06						
Method: E903.0									
Batch: C_RA226-2608									
Sample ID: C08020055-004AMS	Sample Matrix Spike						Run: SUB-C96760		02/10/08 13:30
Radium 226	10	pCi/L	0.20	80	70	130			
Sample ID: C08020055-004AMSD									
Batch: C_RA226-2608									
Radium 226	Sample Matrix Spike Duplicate						Run: SUB-C96760		02/10/08 13:30
	11	pCi/L	0.20	89	70	130	11		31.3
Sample ID: LCS-RA226-2608									
Batch: C_RA226-2608									
Radium 226	Laboratory Control Sample						Run: SUB-C96760		02/10/08 15:03
	12	pCi/L	0.20	91	70	130			
Sample ID: MB-RA226-2608									
Batch: C_RA226-2608									
Radium 226	Method Blank						Run: SUB-C96760		02/10/08 15:03
	ND	pCi/L	0.2						

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E907.0									Batch: C_17696
Sample ID: C08020054-003CMS Thorium 230	Sample Matrix Spike 3.10	pCi/g-dry	0.10	111	70	130			02/13/08 12:00
Sample ID: C08020054-003CMSD Thorium 230	Sample Matrix Spike Duplicate 3.39	pCi/g-dry	0.10	130	70	130	8.9		02/13/08 12:00
Sample ID: LCS-17696 Thorium 230	Laboratory Control Sample 60.6	pCi/g-dry	0.10	124	70	130			02/13/08 12:00
Sample ID: MB-17696 Thorium 230	Method Blank ND	pCi/g-dry	0.01						02/13/08 12:00
Method: E907.0									Batch: C_R96860
Sample ID: LCS-R96860 Thorium 230	Laboratory Control Sample 4.50	pCi/L	0.20	92	70	130			02/06/08 16:00
Sample ID: C08020065-004AMS Thorium 230	Sample Matrix Spike 16.4	pCi/L	0.20	101	70	130			02/06/08 16:00
Sample ID: C08020065-004AMSD Thorium 230	Sample Matrix Spike Duplicate 15.5	pCi/L	0.20	95	70	130	5.6		02/06/08 16:00
Sample ID: MB-R96860 Thorium 230	Method Blank ND	pCi/L	0.2						02/06/08 16:00
Method: E909.0M									Batch: C_17696
Sample ID: C08020054-003CMS Lead 210	Sample Matrix Spike 451	pCi/g-dry	0.10	76	70	130			02/08/08 09:30
Sample ID: C08020054-003CMSD Lead 210	Sample Matrix Spike Duplicate 450	pCi/g-dry	0.10	76	70	130	0.2		02/08/08 09:30
Sample ID: MB-R97077 Lead 210	Method Blank ND	pCi/L							02/08/08 09:30
Sample ID: LCS-R97077 Lead 210	Laboratory Control Sample 98	pCi/L	1.0	82	70	130			02/08/08 09:30

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit





RECEIVED  
MAR 12 2008  
MINERALS & MINING PROGRAM

## QA/QC Summary Report

Client: RESPEC Inc  
Project: Edgemont

Report Date: 02/26/08  
Work Order: R08010296

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E909.0M							Batch: C_R96775		
Sample ID: C08020055-002AMS	Sample Matrix Spike				Run: SUB-C96775		02/06/08 07:30		
Lead 210	160	pCi/L	1.0	80	70	130			
Sample ID: C08020055-002AMSD	Sample Matrix Spike Duplicate				Run: SUB-C96775		02/06/08 07:30		
Lead 210	240	pCi/L	1.0	122	70	130	42	30	R
The RPD for the spike is high. The individual Spike recoveries are within range, the MB is acceptable, and the LCS is within range, therefore the batch is approved.									
Sample ID: MB-R96775	Method Blank				Run: SUB-C96775		02/06/08 07:30		
Lead 210	ND	pCi/L	1						
Sample ID: LCS-R96775	Laboratory Control Sample				Run: SUB-C96775		02/06/08 07:30		
Lead 210	110	pCi/L	1.0	96	70	130			
Method: RMO-3008							Batch: C_R97013		
Sample ID: C08020129-001HMS	Sample Matrix Spike				Run: SUB-C97013		02/11/08 12:30		
Polonium 210	89	pCi/L	1.0	79	70	130			
Sample ID: C08020129-001HMSD	Sample Matrix Spike Duplicate				Run: SUB-C97013		02/11/08 12:30		
Polonium 210	90	pCi/L	1.0	81	70	130	1.8	30	
Sample ID: LCS-R97013	Laboratory Control Sample				Run: SUB-C97013		02/11/08 12:30		
Polonium 210	19	pCi/L	1.0	85	70	130			
Method: RMO-3008							Batch: C_R97290		
Sample ID: C08020336-008IMS	Sample Matrix Spike				Run: SUB-C97290		02/21/08 15:15		
Polonium 210	86	pCi/L	1.0	79	70	130			
Sample ID: C08020336-008IMSD	Sample Matrix Spike Duplicate				Run: SUB-C97290		02/21/08 15:15		
Polonium 210	81	pCi/L	1.0	74	70	130	6.0	30	
Sample ID: C08020548-004IDUP	Sample Duplicate				Run: SUB-C97290		02/21/08 15:15		
Polonium 210	ND	pCi/L	1.0				0.0	30	
Sample ID: LCS-17696	Laboratory Control Sample				Run: SUB-C97290		02/21/08 15:15		
Polonium 210	18	pCi/L	1.0	80	70	130			
Sample ID: MB-17696	Method Blank				Run: SUB-C97290		02/21/08 15:15		
Polonium 210	ND	pCi/L	0.02						

### Qualifiers:

RL - Analyte reporting limit

ND - Not detected at the reporting limit

R - RPD exceeds advisory limit



RECEIVED

## Chain of Custody and Analytical Request Record MAR 12 2008

Page 1 of 1

PLEASE PRINT- Provide as much information as possible.

Company Name: <b>RESPEC</b>	Project Name, PWS, Permit, Etc. <b>PowerTech Overy Burdack</b>	State: <b>SD</b>	EPA/State Compliance: Yes <input type="checkbox"/> No <input type="checkbox"/>
Report Mail Address: <b>RESPEC</b>	Contact Name: <b>cori.foreman@respec.com</b>	Phone/Fax: <b>605.394.6507</b>	Sampler: (Please Print)
Invoice Address: <b>RESPEC</b>	Invoice Contact & Phone:	Purchase Order:	Quote/Bottle Order:

Special Report/Formats - ELI must be notified prior to sample submittal for the following:

- ☐ DW  
☐ GSA  
☐ POTW/WWTP  
☐ State:  
☐ Other:  
☐ A2LA  
☐ EDD/EDT (Electronic Data)  
 Format:  
☐ LEVEL IV  
☐ NELAC

## ANALYSIS REQUESTED

Number of Containers  
Sample Type: A W S V B O  
Vegetation Bioassay Other

SEE ATTACHED  
Normal Turnaround (TAT)

Contact ELI prior to  
RUSH sample submittal  
for charging and  
scheduling - See  
Instruction Page

Comments:  
**As per Quick  
Groundwater**

Shipped by:

Cooler (Dry):

Receipt Temp:

On Ice: **Yes**

Custody Seal: Y N

Intact: Y N

Signature Match: Y N

Signature: **RESPEC**Match: **002**

## MATRIX

Collection Date

Collection Time

01/30/08

13:50

01/30/08

15:40

W

W

Custody  
Record  
MUST be  
Signed

Requested by (print):

Requested by (print):

Date/Time:

Date/Time:

Signature:

Signature:

Received by (print):

Received by (print):

Date/Time:

Date/Time:

Signature:

Signature:

Received by Laboratory:

Received by Laboratory:

Date/Time:

Date/Time:

Signature:

Signature:

Sample Disposal: Return to Client: Lab Disposal:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.

This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at [www.energylab.com](http://www.energylab.com) for additional information, downloadable fee schedule, forms, and links



*Powertech (USA), Inc.*  
*Pre-Permit Baseline*

Dewey-Burdock In Situ  
Uranium Project  
Baseline Sampling Plan





## POWERTECH (USA) INC.

October 21, 2011

RECEIVED  
OCT 24 2011  
MINERALS & MINING PROGRAM

Mr. Mike Cepak  
Natural Resources Engineering Director  
Office of Minerals and Mining  
South Dakota Department of Environment  
and Natural Resources and Natural Resources  
PMB 2020, 523 East Capitol  
Joe Foss Building  
Pierre, SD 57501-3181

### Dewey-Burdock Alluvium Test Holes

Dear Mr. Cepak:

Powertech in May of 2011 bored 19 shallow alluvium test holes. Of the 19 holes, 3 were made into wells by casing with 2-inch PVC.

The lower 10 feet was screened. Sand was then placed in the open hole around the screen. A 4- to 5-foot bentonite plug was set above the sand and the remainder of the hole was filled with cement. The 2-inch casing extends approximately 2 feet above the ground surface.

Boreholes that did not encounter water were plugged with drill cuttings. Boreholes that encountered water, but that were not screened, were plugged with plugging gel.

Enclosed is a spreadsheet with borehole locations, total depths and plugging information.

Sincerely,

Frank Lichnovsky  
Chief Geologist  
605-981-3761 cell  
[fllichnovsky@powertechuranium.com](mailto:fllichnovsky@powertechuranium.com)

Enc.

cc: Richard Blubaugh, Powertech (USA) Inc.



Dewey-Burdock Operations Office  
310 2nd Avenue - PO Box 812 - Edgemont, SD 57735  
(605) 662-8308 [www.powertechuranium.com](http://www.powertechuranium.com)



RECEIVED

OCT 24 2011

MINERALS & MINING PROGRAM

**Powertech (USA) Inc**  
Dewey Burdock Project  
Alluvium Borings

HOLE NAME	LAT/LONG WGS 84	COMPLETION NOTES	NAD 27 SP - EASTING	SP - NORTHING	Plugging
DB11-15-ALLUV-1	N43 26.789 W103 59.717	PLUGGED AND ABANDONED	1027973.47	427143.92	hole plug
DB11-15-ALLUV-2	N43 26.833 W103 59.364	PLUGGED AND ABANDONED	1029545.76	427341.49	cuttings
DB11-15-ALLUV-3	N43 26.874 W103 59.088	PLUGGED AND ABANDONED	1030776.20	427538.55	cuttings
DB11-15-ALLUV-4	N43 26.711 W103 59.386	CONVERTED TO WELL	1029415.68	426606.00	
DB11-2-ALLUV-1	N43 28.228 W103 58.525	PLUGGED AND ABANDONED	1033624.54	435644.47	cuttings
DB11-2-ALLUV-2	N43 28.254 W103 58.364	PLUGGED AND ABANDONED	1034344.89	435771.60	cuttings
DB11-3-ALLUV-1	N43 28.116 W103 59.701	PLUGGED AND ABANDONED	1028399.74	435195.40	cuttings
DB11-3-ALLUV-2	N43 28.221 W103 59.067	PLUGGED AND ABANDONED	1031228.76	435706.85	hole plug
DB11-3-ALLUV-3	N43 27.950 W103 59.242	CONVERTED TO WELL	1030382.38	434097.93	
DB11-30-ALLUV-1	N43 29.802 W104 02.783	PLUGGED AND ABANDONED	1015234.38	446032.28	cuttings
DB11-30-ALLUV-2	N43 29.645 W104 02.785	PLUGGED AND ABANDONED	1015184.06	445078.67	cuttings
DB11-32-ALLUV-1	N43 29.250 W104 01.299	PLUGGED AND ABANDONED	1021642.39	442388.61	cuttings
DB11-32-ALLUV-2	N43 29.388 W104 01.314	PLUGGED AND ABANDONED	1021610.73	443228.50	cuttings
DB11-32-ALLUV-3	N43 28.762 W104 01.120	PLUGGED AND ABANDONED	1022298.99	439393.65	hole plug
DB11-34-ALLUV-1	N43 29.036 W103 59.703	PLUGGED AND ABANDONED	1028634.75	440779.44	cuttings
DB11-34-ALLUV-2	N43 29.029 W103 59.406	PLUGGED AND ABANDONED	1029946.91	440676.09	hole plug
DB11-34-ALLUV-3	N43 29.035 W103 58.823	PLUGGED AND ABANDONED	1032522.70	440600.30	cuttings
DB11-34-ALLUV-4	N43 29.231 W103 58.939	CONVERTED TO WELL	1032064.98	441812.53	
DB11-35-ALLUV-1	N43 29.074 W103 58.348	PLUGGED AND ABANDONED	1034634.29	440744.52	cuttings



RECEIVED

JAN 29 2008

MINERALS &amp; MINING PROGRAM

January 28, 2008

Mr. Mike Cepak  
Department of Water and Natural Resources  
523 East Capitol Avenue  
Pierre, SD 57501-3182

Dear Mr. Cepak:

**Re: Revision 1 to the Baseline Sampling Plan for Dewey-Burdock In Situ Uranium Project**

Attached is a revision to the baseline sampling plan previously submitted by Powertech Uranium, Inc. The DENR's comments to the original sampling plan were noted and corrected. The most significant change to the sampling plan includes monthly water-quality sampling and water level measurements of 12 additional Inyan Kara wells. Of the 12 wells, only 2 wells are preexisting while the other 10 wells are in the process of being completed (see Figure 2-2 of the plan).

Should you have any questions, please feel free to give me a call at 605.394.6400.

Sincerely,



Dan Hoyer, Ph.D.  
Vice President, Water & Natural Resources

DPH:krl

Enclosure

cc: Project Central File 1764 — Category K



# **BASELINE SAMPLING PLAN FOR DEWEY-BURDOCK IN SITU URANIUM PROJECT**

Topical Report RSI-1956  
*Revision 1*

*prepared for*

Powertech (USA) Inc.  
145 N. Chicago Avenue, Suite C  
Hot Springs, South Dakota 57747

January 2008





RECEIVED

JAN 29 2008

MINERALS & MINING PROGRAM

# **BASELINE SAMPLING PLAN FOR DEWEY-BURDOCK IN SITU URANIUM PROJECT**

Topical Report RSI-1956

*prepared for*

Powertech (USA) Inc.  
145 N. Chicago Avenue, Suite C  
Hot Springs, South Dakota 57747

January 2008

— REVISION 1 —



## CONTRIBUTORS TO THE REPORT

**Paul Bergstrom**

Knight Piésold and Co.  
1050 17th Street  
Suite 450  
Denver, CO 80265

**Crystal Hocking**

**Dan Hoyer**

RESPEC  
P.O. Box 725  
Rapid City, SD 57709

**Ken Baker**

Environmental Restoration Group, Inc.  
8809 Washington St., NE  
Suite 150  
Albuquerque, NM 87113

**Gwyn McKee**

Jones & Stokes  
1901 Energy Court, Suite 115  
Gillette, WY 82718

**Brenda Schladweiler**

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, WY 82717

**Tim Gillen**

Archeology Laboratory  
Augustana College  
2032 South Grange Avenue  
Sioux Falls, SD 57105

— REVISION 1 —



## TABLE OF CONTENTS

<b>1.0 BASELINE SAMPLING PLAN.....</b>	<b>1</b>
<b>2.0 GROUNDWATER SAMPLING PLAN.....</b>	<b>3</b>
2.1 INTRODUCTION .....	3
2.2 PERMIT REQUIREMENTS .....	3
2.3 DATA COLLECTION .....	3
2.4 GEOCHEMICAL ANALYSIS .....	4
2.5 GROUNDWATER SAMPLING SUBSET .....	4
2.6 CHEMICAL ANALYSIS.....	4
2.7 POTENTIOMETRIC SURFACE .....	8
<b>3.0 SURFACE WATER SAMPLING PLAN .....</b>	<b>11</b>
3.1 INTRODUCTION .....	11
3.2 WATER IMPOUNDMENTS .....	11
3.3 STREAMS.....	11
3.4 CHEMICAL ANALYSIS.....	12
<b>4.0 RADIOLOGICAL SAMPLING PLAN .....</b>	<b>16</b>
4.1 INTRODUCTION .....	16
4.2 AIR MONITORING .....	17
4.3 VEGETATION, FOOD, AND FISH.....	17
4.4 SOILS.....	19
4.4.1 Global Positioning System-Based Gamma Survey.....	19
4.4.2 Surface Soils .....	19
4.4.3 Subsurface Soils .....	21
4.5 DIRECT RADIATION .....	22
4.6 RADON FLUX.....	22
<b>5.0 WILDLIFE BASELINE STUDIES .....</b>	<b>23</b>
5.1 PROJECT TASKS.....	23
5.1.1 Species List.....	23
5.1.2 Habitat Description.....	23
5.1.3 Big Game.....	23
5.1.4 Upland Game Birds .....	24
5.1.5 Raptors.....	24
5.1.6 Breeding Birds.....	25
5.1.7 Other Avian Species.....	25
5.1.8 Small Mammals.....	26
5.1.9 Other Mammals.....	27



## TABLE OF CONTENTS

### (Continued)

5.1.10 Reptiles and Amphibians .....	27
5.1.11 Species of Concern .....	28
5.1.12 Aquatic Species .....	28
5.1.12.1 Stream Condition .....	28
5.1.12.2 Fish .....	28
5.1.12.3 Macroinvertebrates .....	29
5.1.12.4 Periphyton .....	29
5.1.13 Radiological Testing .....	29
5.1.14 Other Species .....	29
<b>6.0 VEGETATION BASELINE STUDIES .....</b>	<b>30</b>
6.1 INTRODUCTION .....	30
6.2 VEGETATION COMMUNITY CLASSIFICATION AND MAPPING .....	31
6.3 TRANSECT ORIGIN SELECTION .....	31
6.4 LINE TRANSECT LAYOUT .....	31
6.5 GROUND COVER .....	32
6.6 TOTAL VEGETATION COVER .....	32
6.7 TOTAL GROUND COVER .....	32
6.8 SPECIES DIVERSITY .....	32
6.9 PRODUCTION .....	33
6.10 SHRUB DENSITY .....	33
6.11 TREE DENSITY .....	33
6.12 SAMPLE ADEQUACY .....	33
6.13 PLANT SPECIES LIST .....	35
6.14 OTHER DATA COLLECTED .....	35
6.15 EXTENDED REFERENCE AREA MAPPING AND JUSTIFICATION .....	35
<b>7.0 CULTURAL RESOURCES .....</b>	<b>38</b>
7.1 PRELIMINARY RECORD SEARCH .....	38
7.2 LEVEL III ARCHEOLOGICAL SURVEY .....	39
<b>8.0 REFERENCES .....</b>	<b>41</b>
<b>APPENDIX A. WELL COMPLETION REPORTS FOR SAMPLED WELLS .....</b>	<b>A-1</b>
<b>APPENDIX B. RADIOLOGICAL QA/QC PLAN .....</b>	<b>B-1</b>



## LIST OF TABLES

TABLE	PAGE
2-1 Constituents to Be Analyzed in Groundwater Samples .....	7
3-1 Surface Water Impoundment Sample Sites.....	12
6-1 Vegetation Map Units and Associated Acreages.....	30
6-2 Vegetation Baseline Sampling—Measured Parameters.....	30
6-3 Vegetation Monitoring Minimum/Maximum Sample Population Requirements for Upland Grassland, Ponderosa Pine Woodland, and Riparian Communities .....	34
6-4 Threatened and Candidate Species to Be Sampled .....	36
6-5 Species of Special Concern to Be Sampled.....	37



## LIST OF FIGURES

FIGURE	PAGE
1-1 Dewey-Burdock General Site Map.....	2
2-1 Location of Quarterly Sampled Water Wells Near the Dewey-Burdock Site.....	5
2-2 Location of Monthly Sampled Water Wells Near the Dewey-Burdock Site.....	6
2-3 Potentiometric Map of the Fall River Aquifer Near the Dewey-Burdock Site.....	9
2-4 Location of Water Level Measurements Near the Dewey-Burdock Site .....	10
3-1 Impoundment Sampling Locations Near the Dewey-Burdock Site .....	13
3-2 Stream Sampling Locations Near the Dewey-Burdock Site.....	14
4-1 High-Volume Air Monitoring Sites Near Dewey-Burdock .....	18
4-2 High-Volume Air Monitoring Station.....	19
4-3 Gamma Survey Transects Near Dewey-Burdock Site .....	20



## 1.0 BASELINE SAMPLING PLAN

Powertech Uranium Corporation has proposed to conduct in situ mining within a uranium-enriched ore deposit on the proposed permit area known as the Dewey-Burdock project. This area is located approximately 12 to 15 miles north-northwest of Edgemont, South Dakota, and spans northern Fall River and southern Custer Counties. The proposed permit area consists of approximately 11,000 acres of private land on either side of County Road 6463 and encompasses portions of Sections 1-4 and 9-15, T7S, R1E and Sections 26-35, T6S, R1E. Figure 1-1 shows the site boundary.

A baseline environmental study in the Dewey-Burdock area is being completed per the requirements of the South Dakota Department of Environment and Natural Resources (SD DENR), U.S. Nuclear Regulatory Commission (US NRC), and U.S. Environmental Protection Agency (US EPA). The purpose of this report is to summarize the baseline sampling plan for groundwater and surface water, radiological monitoring, wildlife, plants, and archaeology.



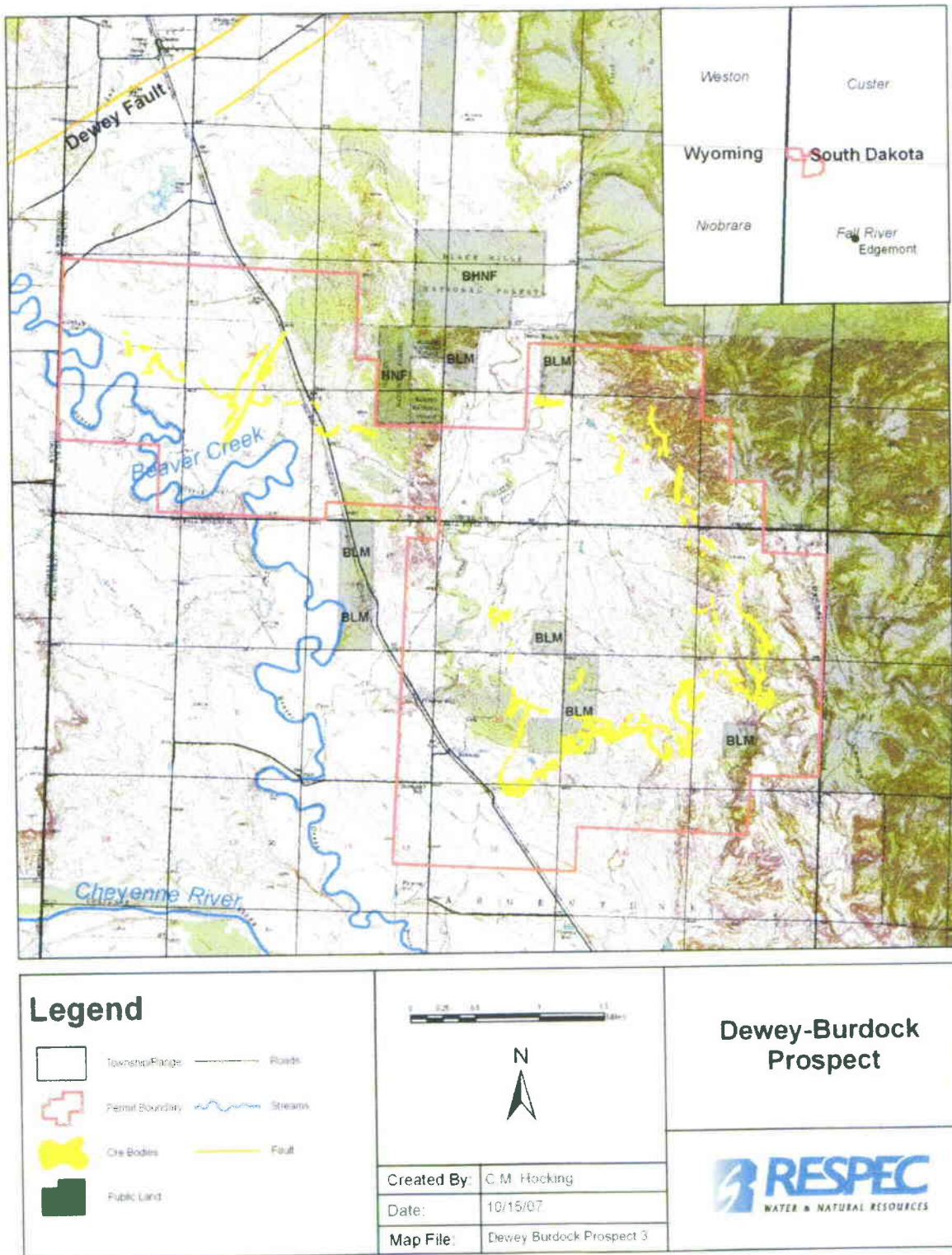


Figure 1-1. Dewey-Burdock General Site Map.



## 2.0 GROUNDWATER SAMPLING PLAN

### 2.1 INTRODUCTION

In situ leach mining occurs directly in the subsurface; therefore, it is vital to characterize the baseline water quality. The permit requirements, overview of data and results, and proposed sampling plans are described below.

### 2.2 PERMIT REQUIREMENTS

The SD DENR mining rules ARSD 74:29 or SD statutes SDCL 45-6B require a baseline sampling plan to include "an adequate number of wells and samples to adequately characterize baseline water quality in production and nonproduction zones." Rule ARSD 74:29:2:07 requires these samples be collected monthly for at least one year. The SD rule (ARSD 74:29:11:07) also states that samples shall be taken once a month for a minimum of 6 months for new mining units as they are being developed. US NRC Guide 4.14 (RG 4.14) *Radiological Effluent and Environmental Monitoring at Uranium Mills* states that every well within 2 kilometers of the mining area used for domestic, livestock, or irrigation purposes must be sampled quarterly for 1 year's time. Of those wells included in sampling, there must be one well that is hydrologically upgradient from the site as well as three wells downgradient.

### 2.3 DATA COLLECTION

Data from the United States Geological Survey (USGS), well completion reports, and various Tennessee Valley Authority (TVA) data reports were used to generate Geographic Information System (GIS) files of wells. Because of the quality of data, the location of nearly all the wells was not precisely known. In an effort to increase the accuracy and understanding of the data, field efforts focused on locating water wells, primarily those within 2 kilometers of the permit boundary. To date, 77 wells of approximately 250 total wells have been field verified, photographed, and described. Of the 84 wells within 2 kilometers of the permit boundary, over 60 wells were located. Most wells serve as water supply for livestock, although some wells are used for domestic or other purposes or are abandoned. Available well completion reports for existing wells are found in Appendix A. Quarterly sampled wells without well completion reports will be logged in the near future to determine depth and completion. Newly installed wells (including all 12 of the monthly sampled wells) will have geophysical logs and well completion reports as they are drilled.



## 2.4 GEOCHEMICAL ANALYSIS

In an effort to understand the current groundwater geochemistry, the historical TVA data were analyzed. Twenty-four geochemical maps were created that displayed the median value for water-quality samples taken from wells between 1979 and 1984. Descriptive statistics, box plots, and Kruskal-Wallis analysis were performed for wells which were considered to be statistically viable (i.e., having ten samples or more over the 5-year time period). Trilinear diagrams were also created for water-quality samples collected June 8, 1979, and September 12, 1979. Based on these geochemistry results, it was determined that the water chemistry does not vary much by date or member of the Inyan Kara Aquifer.

## 2.5 GROUNDWATER SAMPLING SUBSET

Because of the significant number of groundwater wells and their noted geochemical similarities, sampling a representative subset of the wells was proposed to NRC. The wells were selected based on type of use, aquifer, and location. For the baseline study for the NRC permit, 19 groundwater wells (14 existing and 5 newly drilled) were selected as making up a representative sampling group for the area (Figure 2-1). The wells selected for sampling include all eight domestic wells within 2 kilometers of the permit boundary and six stock watering wells, with three wells being hydrologically upgradient of the mining area. The subset includes wells within the Fall River Formation (4), Lakota Formation (7), Inyan Kara Group (Fall River or Lakota) (2), Sundance Formation (1), and alluvium (5). Initial baseline sampling of these wells will be conducted quarterly.

In accordance with South Dakota mining rules (ARSD 74:29:2:07), 12 wells will be sampled monthly for the baseline investigation (Figure 2-2). Of these 12 wells, 6 wells are in the Dewey area and 6 wells are at Burdock. At Dewey, there will be a set of Fall River and Lakota wells sampled at three places, upgradient, within, and downgradient of proposed mining activities. Near the Burdock area, the same well arrangement applies with two wells upgradient, within, and downgradient of proposed mining. Groundwater sampling protocol will follow that of the USGS National Field Manual for the Collection of Water-Quality Data (Book 9, variously dated).

## 2.6 CHEMICAL ANALYSIS

In the field, in situ measurements will be made for specific conductance, temperature, turbidity, and pH. Groundwater samples will also be analyzed in the laboratory for a variety of constituents listed in Table 2-1. Ra-228 will be added to the laboratory analysis if initial sampling indicates the presence of Th-232. QA/QC samples, including field replicates and field blanks, will also be analyzed.



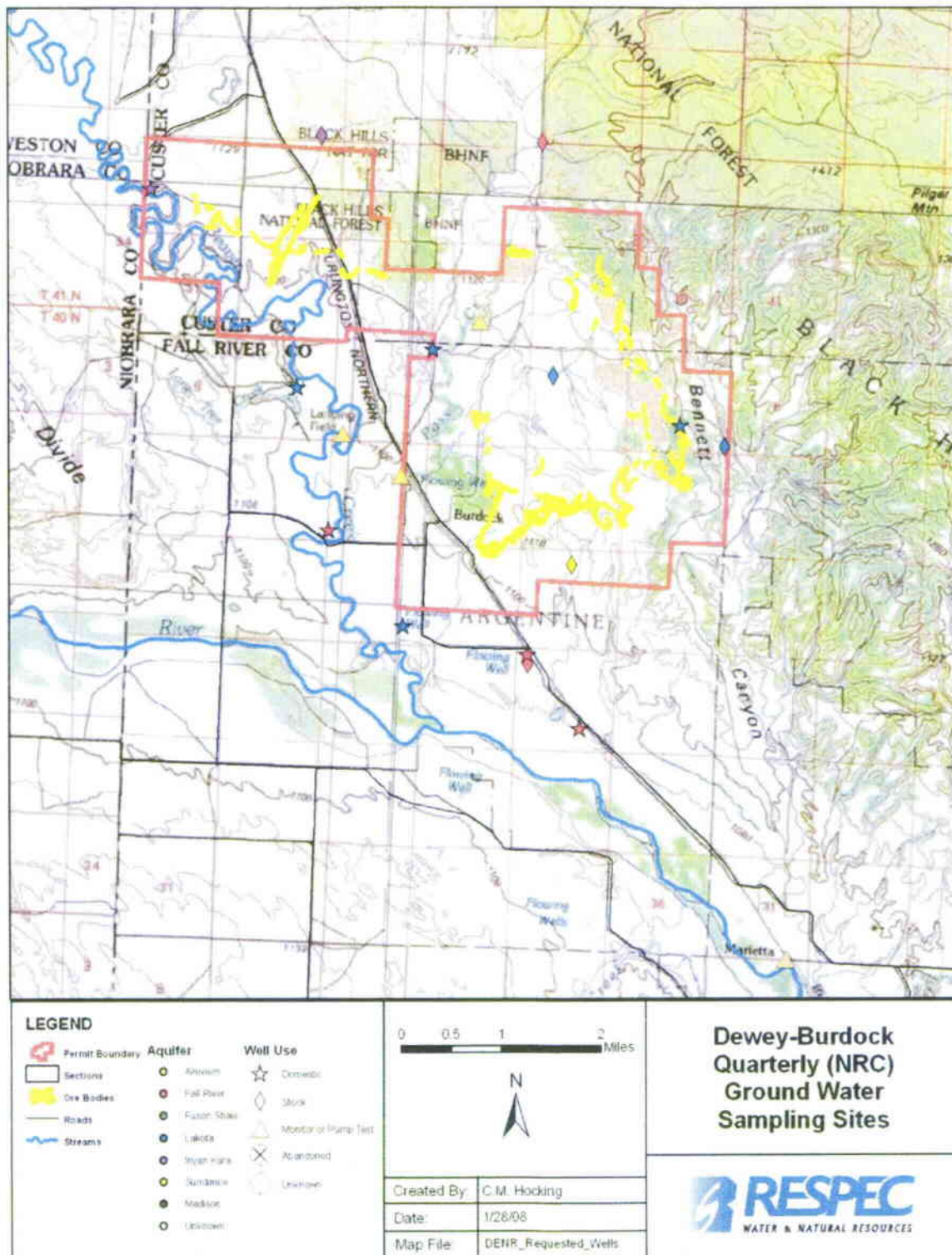
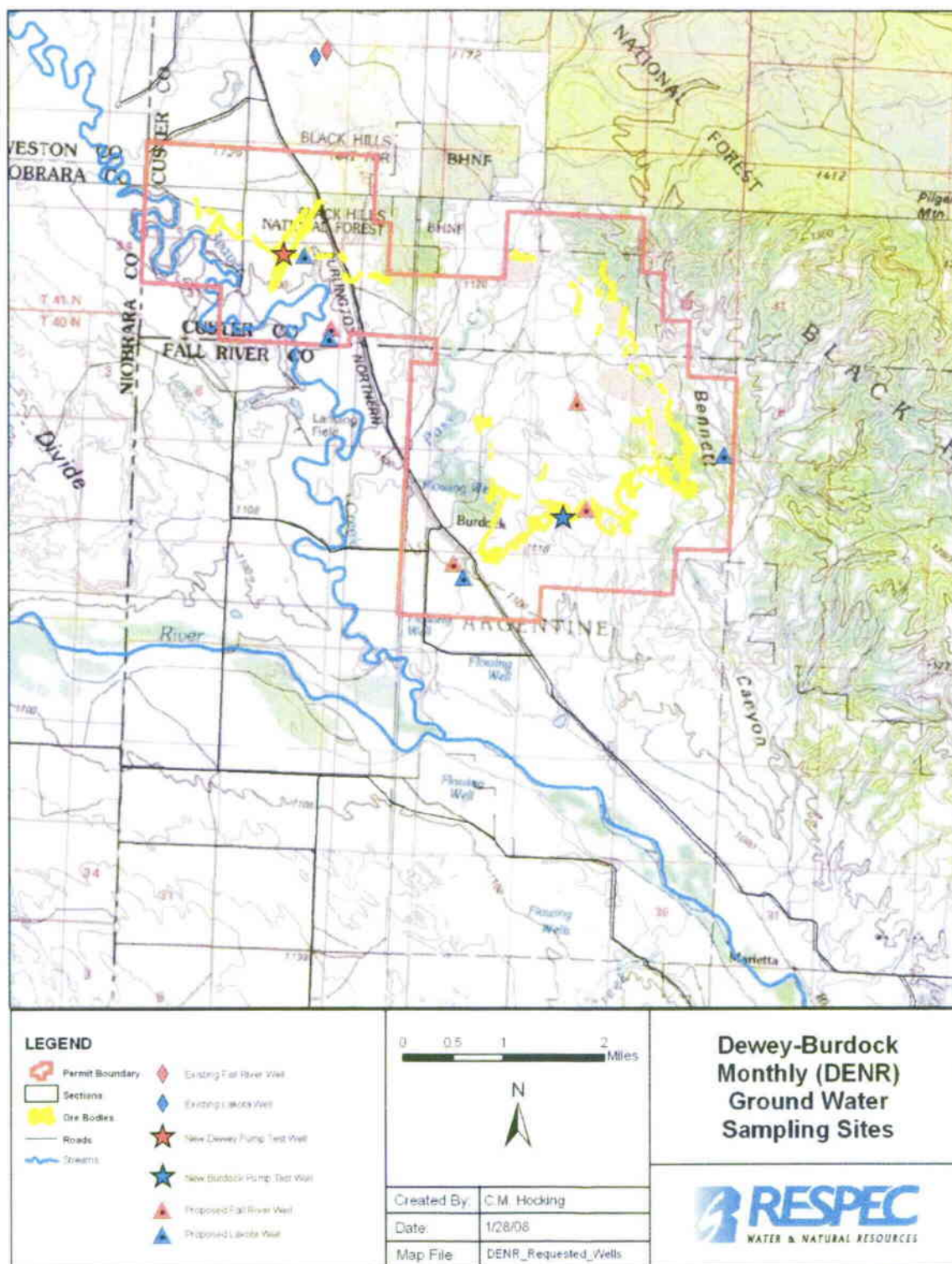


Figure 2-1. Location of Quarterly Sampled Water Wells Near the Dewey-Burdock Site.





**Figure 2-2.** Location of Monthly Sampled Water Wells Near the Dewey-Burdock Site.



**Table 2-1. Constituents to Be Analyzed in Groundwater Samples**

Aluminum <sup>(d)</sup>	Selenate <sup>(d)</sup>
Ammonia	Silica <sup>(d)</sup>
Arsenic <sup>(d)</sup>	Silver <sup>(d)</sup>
Barium <sup>(d)</sup>	Sodium <sup>(d)</sup>
Boron <sup>(d)</sup>	Sulfate
Cadmium <sup>(d)</sup>	Uranium <sup>(d,s)</sup>
Calcium <sup>(d)</sup>	Vanadium <sup>(d)</sup>
Chloride	Zinc <sup>(d)</sup>
Chromium <sup>(d)</sup>	Gross Alpha <sup>(d)</sup>
Copper <sup>(d)</sup>	Gross Beta <sup>(d)</sup>
Fluoride	Gross Gamma <sup>(d)</sup>
Iron <sup>(d)</sup>	Radon 222
Lead <sup>(d)</sup>	Radium 226 <sup>(d)</sup>
Lead 210 <sup>(d,s)</sup>	Thorium 230 <sup>(d,s)</sup>
Magnesium <sup>(d)</sup>	Thorium 232 Dissolved <sup>(d)</sup>
Manganese <sup>(d)</sup>	Anion-Cation Balance
Mercury <sup>(d,t)</sup>	Alkalinity
Molybdenum <sup>(d)</sup>	Bicarbonate
Nickel <sup>(d)</sup>	Carbonate
Nitrate	Conductivity
Nitrite	Total Dissolved Solids (TDS)
Potassium <sup>(d)</sup>	pH
Polonium 210 <sup>(d,s)</sup>	Oxygen Reduction Potential
Selenium <sup>(d)</sup>	Sodium Adsorption Ratio
Selenite <sup>(d)</sup>	

d Dissolved Concentration

s Suspended Concentration

t Total Concentration



## 2.7 POTENTIOMETRIC SURFACE

At present time, maps of the potentiometric surface for the Fall River (Figure 2-3) and Lakota aquifers have been generated using historical data collected primarily by Silver King Mines and Tennessee Valley Authority (TVA) in the early to mid 1970s as well as values from the USGS map "*Potentiometric Surface of the Inyan Kara Aquifer in the Black Hills Area, South Dakota*" [Strobel et al., 2000]. The map in this baseline sampling plan is meant only as a temporary draft. Water level data that has been collected by RESPEC personnel will be used to create an up to date potentiometric map of the Inyan Kara aquifer. Water level will continue to be monitored to improve upon the potentiometric map and establish any possibly natural diurnal and/or seasonal water level fluctuations. Water levels will be measured at approximately 30 groundwater wells, including five shallow alluvial wells (Figure 2-4). For wells sampled monthly, water level measurements will be made immediately prior to sampling. Wells that are sampled quarterly will be periodically measured to establish natural fluctuations in the water table.



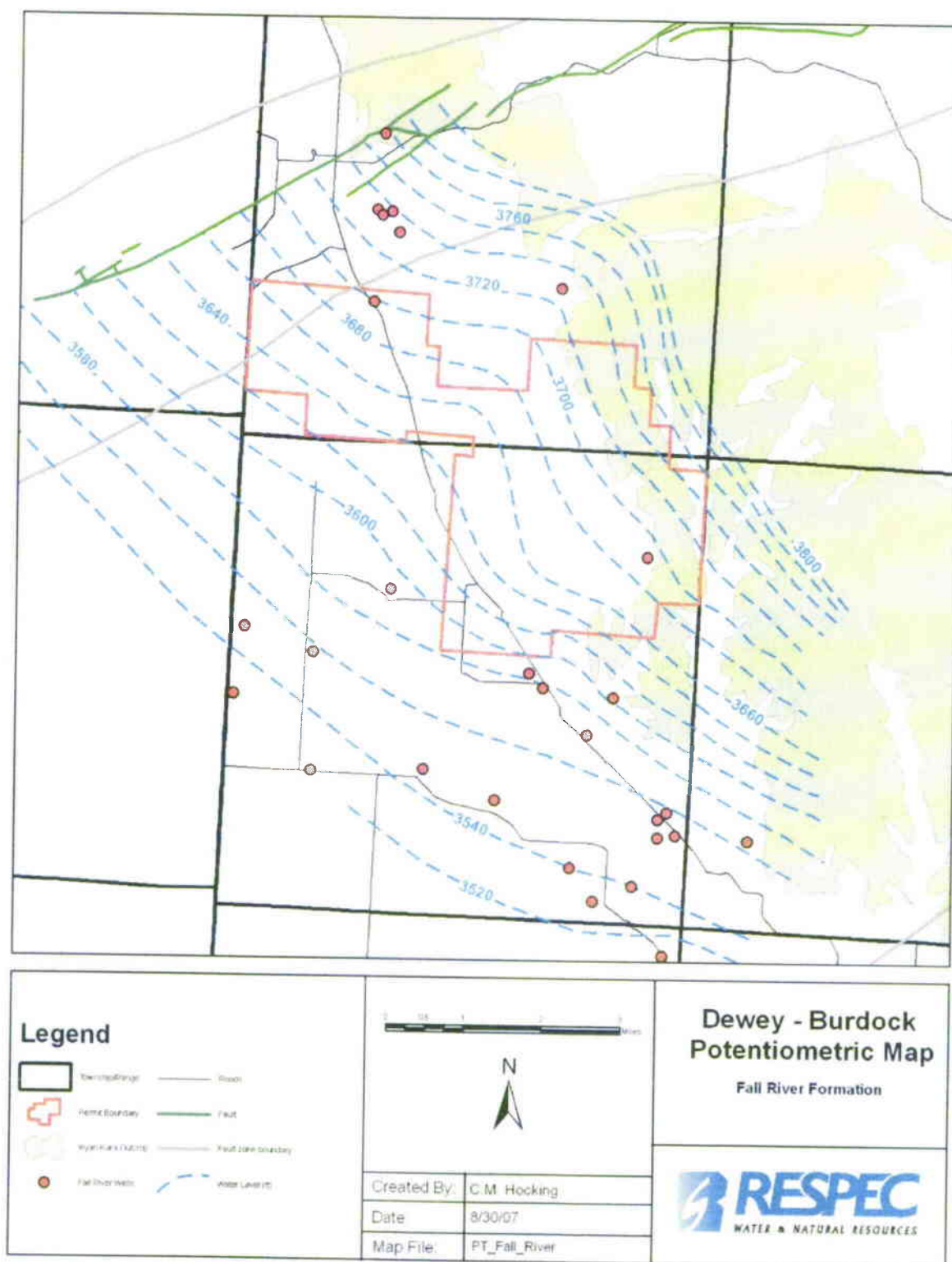


Figure 2-3. Potentiometric Map of the Fall River Aquifer Near the Dewey-Burdock Site.



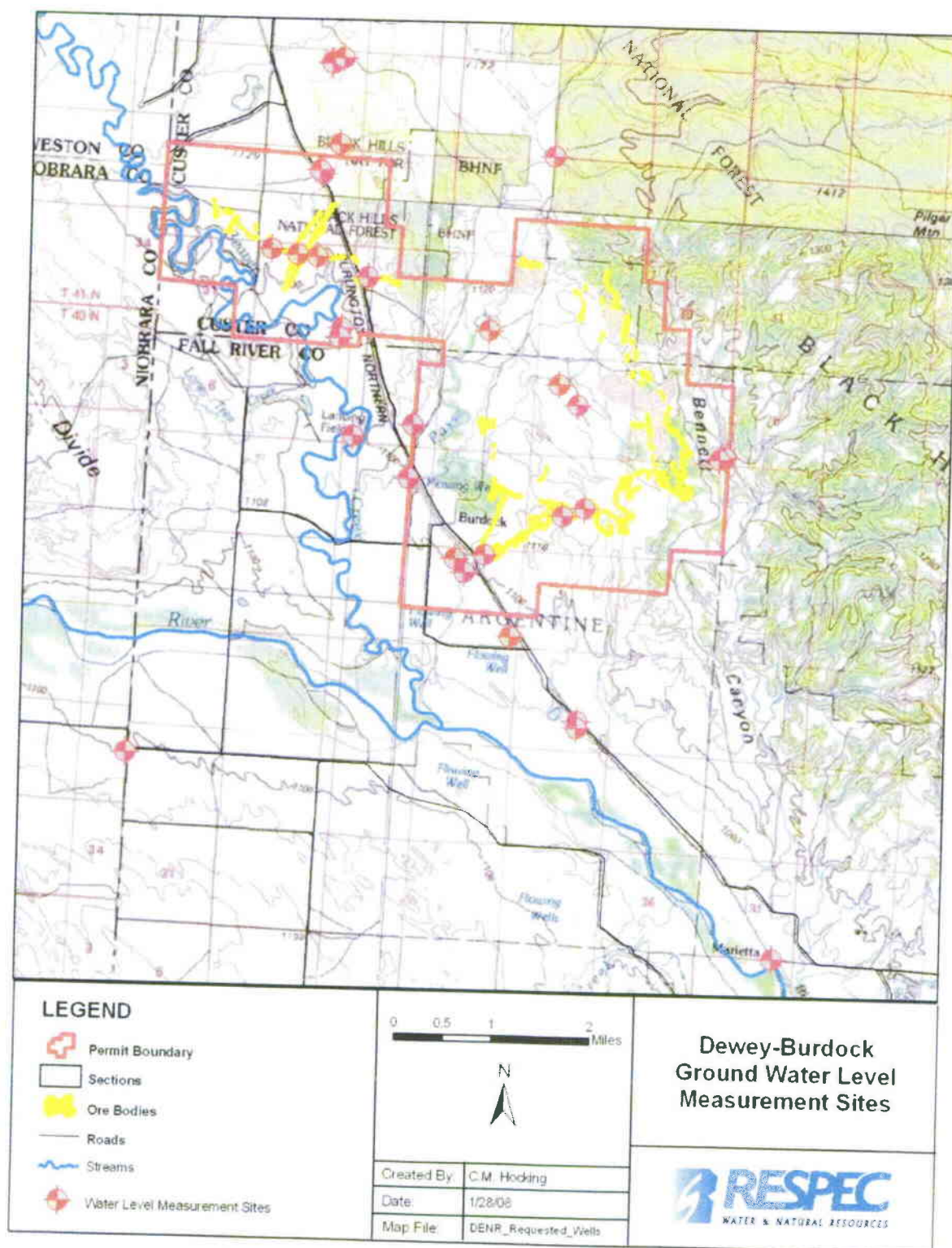


Figure 2-4. Location of Water Level Measurements Near the Dewey-Burdock Site.



## 3.0 SURFACE WATER SAMPLING PLAN

### 3.1 INTRODUCTION

In situ leach mines generally have minimal surface impact and do not have associated tailings impoundments; however, it is still vital to characterize the baseline water quality. The permit requirements and proposed sampling plans for water impoundments and streams are described below. All surface water sampling activities follow the SD DENR's SOP (2005).

### 3.2 WATER IMPOUNDMENTS

US NRC Guide 4.14 (RG 4.14) requires that one grab sample be taken quarterly from all "large permanent on-site water impoundments or off-site impoundments that may be subject to direct surface drainage from potentially contaminated areas or that could be affected by a tailings impoundment failure." The SD mining rules ARSD 74:29 require that background radiological data for surface waters "that could be affected by the proposed operations" need to be sampled.

In an effort to develop a sampling plan, surface water impoundments, including stock dams and mine pits, were originally identified on topographic maps and aerial photographs. Several days in early July were spent in the field gathering data. All together, 38 impoundments were verified, photographed, and described (see Table 3-1 and Figure 3-1). Although the study area received approximately 1 inch of rain just 2 days before field work, 14 impoundments were dry. Three wet stock dams were observed to be under the direct influence of water from free-flowing artesian wells. Field observations and watershed analysis of digital elevation models (DEMs) revealed that the drainage basins of many of the impoundments are extremely small.

Because of the number of impoundments and their characteristics, sampling a representative subset of the water impoundments was proposed. Impoundments were selected based on the presence of water, drainage area, and location. Eleven surface water impoundments were selected as making up a representative sampling group for the area (see Table 3-1 and Figure 3-1).

### 3.3 STREAMS

In compliance with US NRC Guide 4.14 (RG 4.14) and other permits, each of the streams (perennial or ephemeral) will be sampled upstream and downstream of the permit boundary. One monthly sample will be collected on Beaver Creek both at the USGS gage station (BVC04) and near Burdock (BVC01) (see Figure 3-2). Although it does not pass through the permit boundary, the Cheyenne River will also be sampled monthly upstream of the confluence with



Beaver Creek (CHR01) and south of the confluence at Marietta (CHR05). When flowing, samples will be taken using passive samplers on intermittent streams, including Pass Creek (PSC01 and PSC02), Bennett Canyon (BEN01), and one unnamed tributary west of Bennett Canyon (UNT01) (see Figure 3-2). OTT Thalimedes stage recorders have been installed at the six tributary sites. Discharge will be computed from Thalimedes stage data using rating curves developed from discharge measurements.

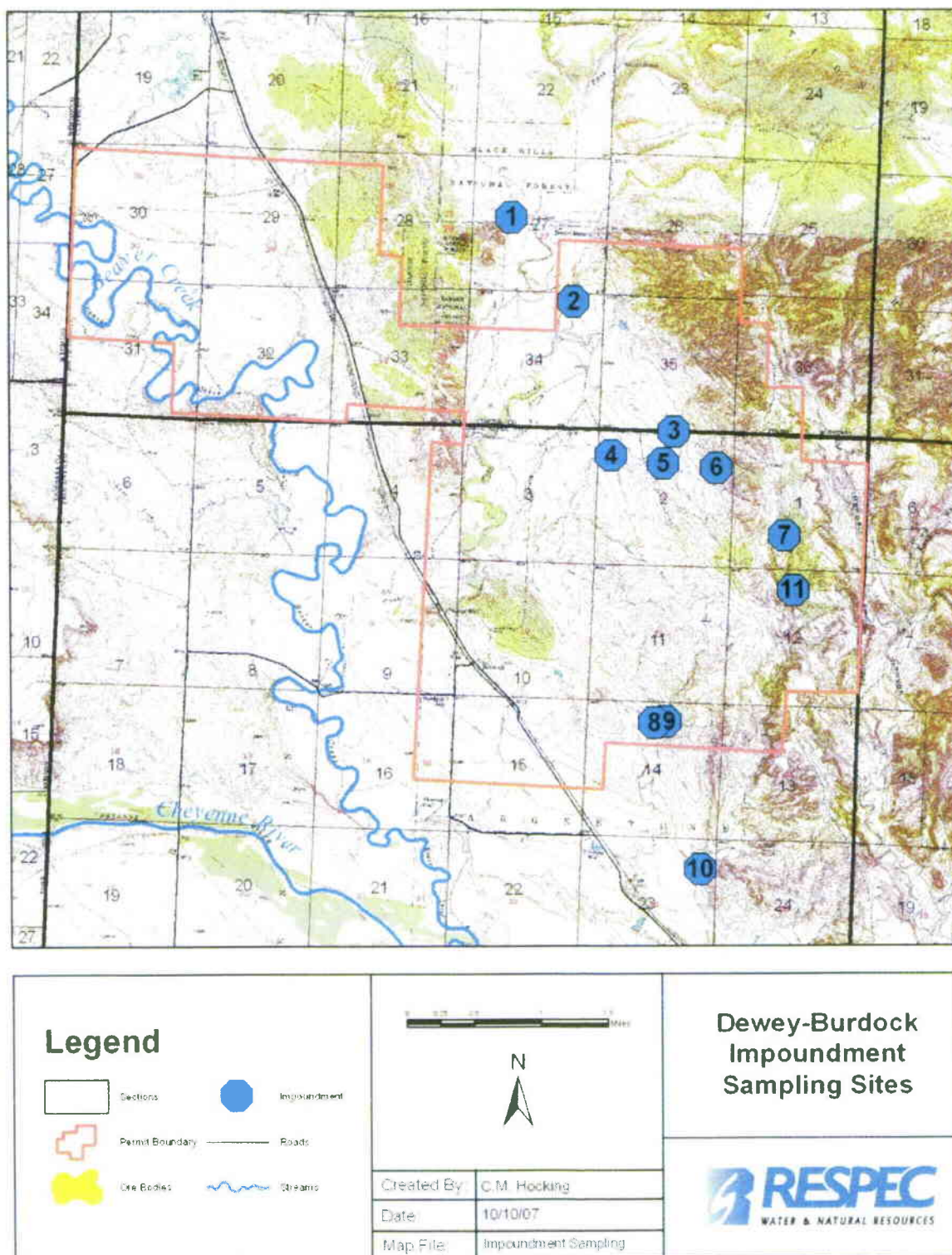
**Table 3-1. Surface Water Impoundment Sample Sites**

ID Number	Location	Name/Comment	Water	Groundwater Influence
1	Sec. 27, T6S, R1E	Stock Dam west of Doran Ranch	×	
2	Sec. 34, T6S, R1E	Triangle Mine Pit	×	×
3	Sec. 2, T7S, R1E	Stock Dam—drainage from Spencer-Richardson Mine	×	
4	Sec. 2, T7S, R1E	Stock Dam west of Darrow Mine	×	
5	Sec. 2, T7S, R1E	Darrow Mine Drainage Dam	×	
6	Sec. 2, T7S, R1E	N Darrow Mine Pit	×	
7	Sec. 1, T7S, R1E	Stock Dam east of Darrow Mine	×	
8	Sec. 14, T7S, R1E	Stock Dam fed from flowing well	×	×
9	Sec. 14, T7S, R1E	Stock Dam East of #8	×	
10	Sec. 23, T7S, R1E	Large Stock Dam	×	
11	Sec. 12, T7S, R1E	Stock Dam SE of Darrow Mine	×	

### 3.4 CHEMICAL ANALYSIS

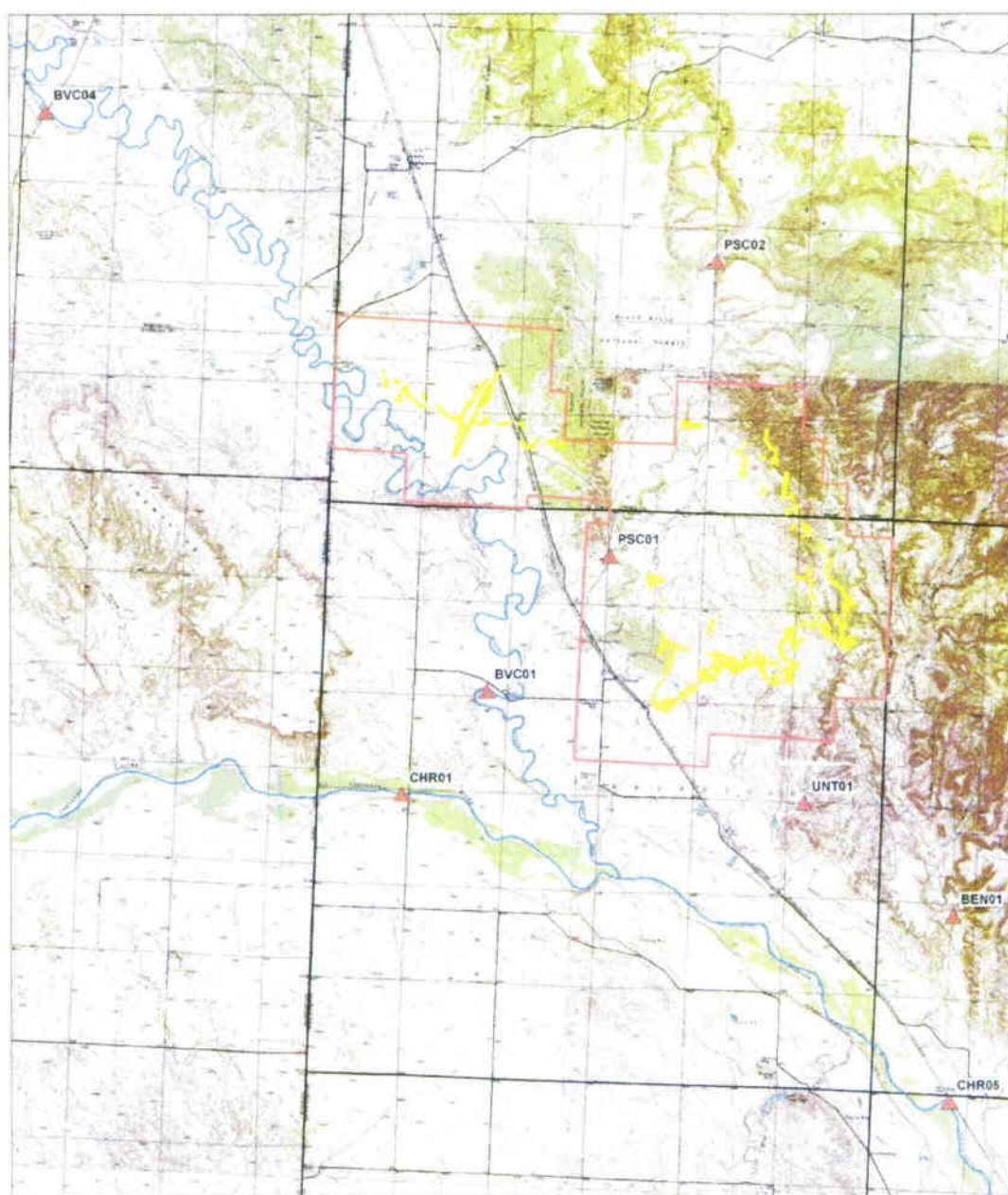
In the field, in situ measurements will be made for specific conductance, temperature, turbidity, dissolved oxygen, and pH. Surface water samples will also be analyzed in the laboratory for a variety of constituents listed in Table 3-2. Ra-228 will be added to the laboratory analysis if initial sampling indicates the presence of Th-232. For those samples taken by passive samplers where holding times exceed the recommended time from collection to analysis, certain constituents will not be reported (fecal coliforms, for example). In addition to the water sample taken from each of the ten impoundments, a sediment sample will be taken once from each site and analyzed for uranium, radium-226, thorium-230, and lead-210 (per the requirements of US NRC Guide 4.14 (RG 4.14)). Sediment samples will also be taken twice at the upstream (BVC04) and downstream (BVC01) sites on Beaver Creek, “once following spring runoff and late summer following extended low flow” (US NRC Guide 4.14 (RG 4.14)). All baseline surface water sampling activities are being conducted following the SD DENR’s SOP (2005).





**Figure 3-1.** Impoundment Sampling Locations Near the Dewey-Burdock Site.





**Figure 3-2.** Stream Sampling Locations Near the Dewey-Burdock Site.



**Table 3-2. Constituents to Be Analyzed in Surface Water Samples**

Aluminum <sup>(d,t)</sup>	Selenate <sup>(d,s)</sup>
Ammonia	Silica <sup>(d,t)</sup>
Arsenic <sup>(d,t)</sup>	Silver <sup>(d,t)</sup>
Barium <sup>(d,t)</sup>	Sodium <sup>(d,t)</sup>
Boron <sup>(d,s)</sup>	Sulfate
Cadmium <sup>(d,t)</sup>	Uranium <sup>(d,s,t)</sup>
Calcium <sup>(d,t)</sup>	Vanadium <sup>(d,t)</sup>
Chloride	Zinc <sup>(d,s)</sup>
Chromium <sup>(d,t)</sup>	Gross Alpha
Hexavalent Chromium <sup>(t)</sup>	Gross Beta
Trivalent Chromium <sup>(t)</sup>	Gross Gamma <sup>(t)</sup>
Copper <sup>(d,t)</sup>	Radium 226 <sup>(d,s,t)</sup>
Fluoride	Thorium 230 <sup>(d,s,t)</sup>
Iron <sup>(d,t)</sup>	Thorium 232 <sup>(d,s,t)</sup>
Lead <sup>(d,t)</sup>	Anion-Cation Balance
Lead 210 <sup>*,(d,s,t)</sup>	Alkalinity
Magnesium <sup>(d,s)</sup>	Bicarbonate
Manganese <sup>(d,t)</sup>	Carbonate
Mercury <sup>(d,t)</sup>	Conductivity
Molybdenum <sup>(d,t)</sup>	Total Dissolved Solids (TDS)
Nickel <sup>(d,t)</sup>	Total Suspended Solids (TSS)
Nitrate	pH
Potassium <sup>(d,t)</sup>	Fecal Coliform Bacteria
Polonium 210 <sup>*,(d,s,t)</sup>	Sodium Adsorption Ratio
Selenium <sup>(d,t)</sup>	Suspended Sediment Concentration
Selenite <sup>(d,t)</sup>	

d Dissolved Concentration

s Suspended Concentration

t Total Concentration

\* Semiannual Analysis



## 4.0 RADIOLOGICAL SAMPLING PLAN

### 4.1 INTRODUCTION

Recommendations in US NRC Regulatory Guide 4.14 (RG 4.14), Revision 1 originally were used to establish baseline (preoperational) radiological monitoring requirements for Powertech Uranium's proposed Dewey-Burdock uranium in situ recovery (ISR) facility located near Edgemont, South Dakota. The RG 4.14 was used because it is specifically mentioned in Nuclear Regulatory Guide (NUREG) 1569 *Standard Review Plan for In Situ Leach Uranium Extraction License Application*, and the data are typical of what licensing organizations expect to see in an application. Current licensing activities in the uranium ISR industry are revealing that recommendations in RG 4.14 may not provide the most appropriate methods to establish baseline radiological conditions of an ISR facility in general. Some of the general characteristics of ISR facility which may make application of RG 4.14 recommendations inappropriate are as follows:

- Uranium ISR facilities have no tailings impoundments, and in the case of satellite facilities, may not have a centralized processing location or yellowcake dryer. In these cases, establishing the polar coordinate sampling system originating at the central processing facility, as recommended by RG 4.14, is ambiguous.
- Typically, radon-222 is the only routine or planned emission from uranium ISR facilities, so airborne emission and off-site deposition of long-lived radionuclides in the uranium-238 decay series, such as radium-226, thorium-230, and natural uranium, is not as significant when compared to a conventional uranium mill.
- Unplanned releases of radioactive materials most likely will involve spills of production or restoration fluids. Surface environmental impacts from these types of releases would be localized and likely contained within the permit boundary of the facility.

The proposed Dewey-Burdock facility has site-specific characteristics which also make strict application of RG 4.14 less appropriate. These site-specific characteristics include the following:

- The current plan is to operate as a satellite facility with a mobile ion exchange system. The ion exchange system will be moved near active well fields. Once a well field is mined, the ion exchange system will be moved to the next active well field. Given this scenario, there is no centralized processing facility.
- The proposed permit boundary contains inactive open pit uranium mines, historic uranium exploration holes, and rail track with high coal train traffic. These surface features act as potential radionuclide sources which are unrelated to the proposed activities at the site. The methods recommended in RG 4.14 are not adequate to properly characterize these potential sources.



An alternative baseline sampling program is proposed to provide a better estimate of background radiological conditions at the Dewey-Burdock site. The following sections describe the proposed alternative program and how it differs from RG 4.14 and the basis for the approach.

## **4.2 AIR MONITORING**

No alternatives to the approach in RG 4.14 are suggested. Eight high-volume air monitoring stations were established within and surrounding the proposed permit area (Figure 4-1). The samplers are HVP-4200AFC/230-S, 230 VAC, High Volume TSP Air Samplers that are 2-Stage, PLC based, automatic mass flow controlled, with a brushless motor blower (Figure 4-2). The filter media being used is an 8.5×11-inch borosilicate glass fiber filter with an acrylic resin binder. The samplers will be operated continuously for one year with filters collected weekly and composited quarterly. Once at the laboratory, the entire filter composite will be digested for analysis of natural uranium, radium-226, thorium-230, and lead-210. Passive radon-222 detectors (track etch detectors) will be placed near each high-volume air sampler as well as seven other locations within the permit boundary.

The Quality Assurance measures to be used are described in U.S. Nuclear Regulatory Agency Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment" (1979). This includes written sampling procedures, trained personnel, adequate Quality Control requirement such as chain of custody and secure sample storage, and a qualified analytical laboratory. Also, a blind blank filter composite will be submitted quarterly along with the actual sample composites to check for any background radionuclides present in the clean filter media. A site-specific Quality Assurance Project Plan outlining the Quality Assurance program for radiological sampling has also been developed to provide QA guidance for the Dewey-Burdock Project. The site-specific QAAP is attached in Appendix B.

## **4.3 VEGETATION, FOOD, AND FISH**

No alternatives to the approach in RG 4.14 are suggested. Vegetation samples will be collected from each high-volume air monitoring location and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210. Sampling will occur three times during the grazing season.

Meat samples from locally grazing livestock will be collected once and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210. No crops are currently being grown near the site. Four fish samples will be collected and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210.



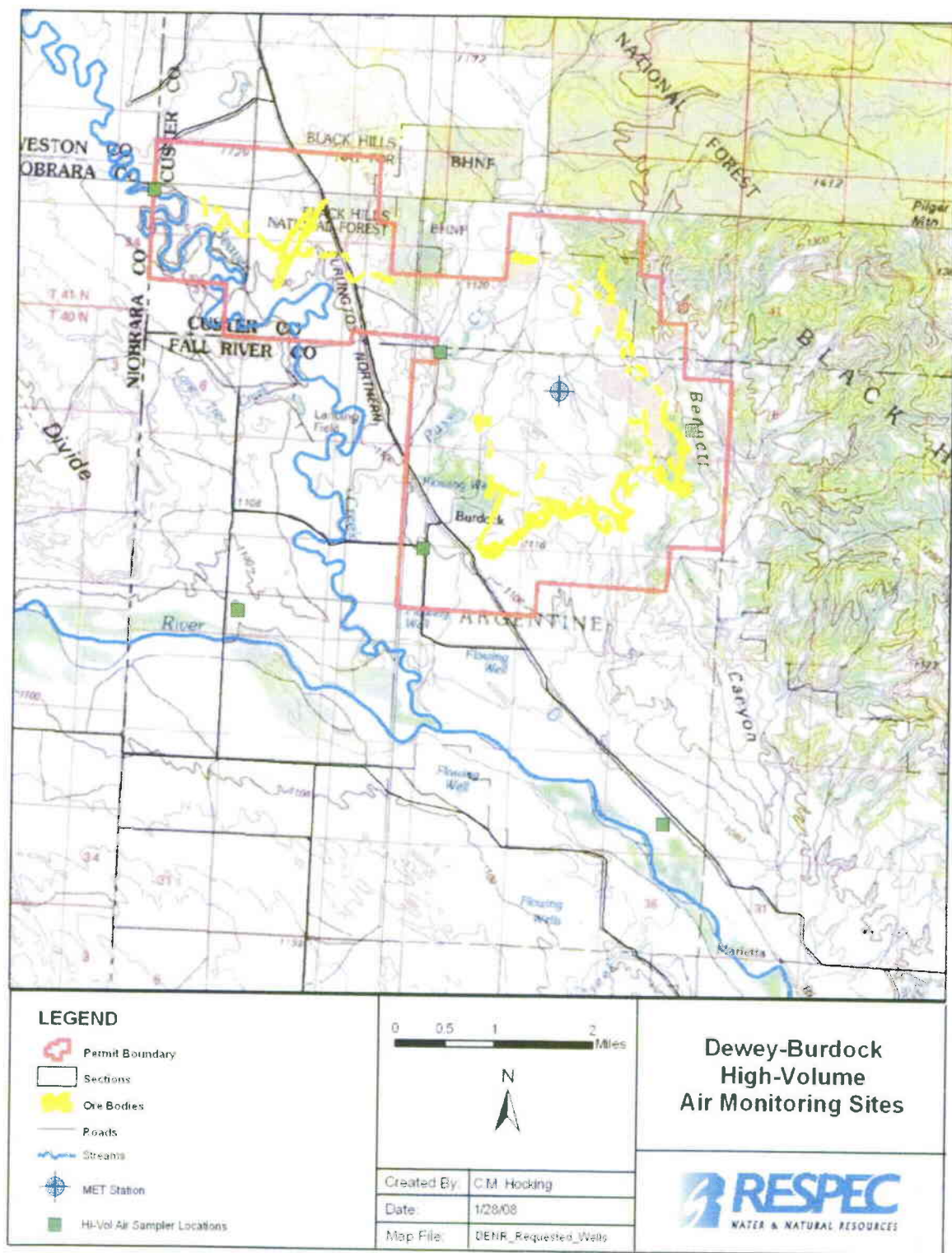


Figure 4-1. High-Volume Air Monitoring Sites Near Dewey-Burdock.





**Figure 4-2.** High-Volume Air Monitoring Station.

#### **4.4 SOILS**

##### **4.4.1 Global Positioning System-Based Gamma Survey**

A Global Positioning System- (GPS-) based gamma survey will be conducted across the site. Currently, the site was divided into two areas: the mined area and the remaining site area. For the mined area, gamma survey transects spacing of 100 meters will be conducted. For the remaining site area, the transect spacing will be 500 meters (see Figure 4-3). In addition, gamma surveys of service roads along the rail tracks will be performed to evaluate radiological impacts from coal trains. If tighter transects are needed as evidenced by field data, spacing adjustments will be made in the field following input and approval from team members.

##### **4.4.2 Surface Soils**

Surface soils at a depth interval of 0–5 centimeters will be collected once at the air monitoring locations and analyzed for natural uranium, radium-226, thorium-230, and lead-210. This is consistent with the recommendations of RG 4.14. This sampling recommendation was retained because the 0–5-centimeter-depth interval is the most sensitive to aerial deposition of radionuclides.



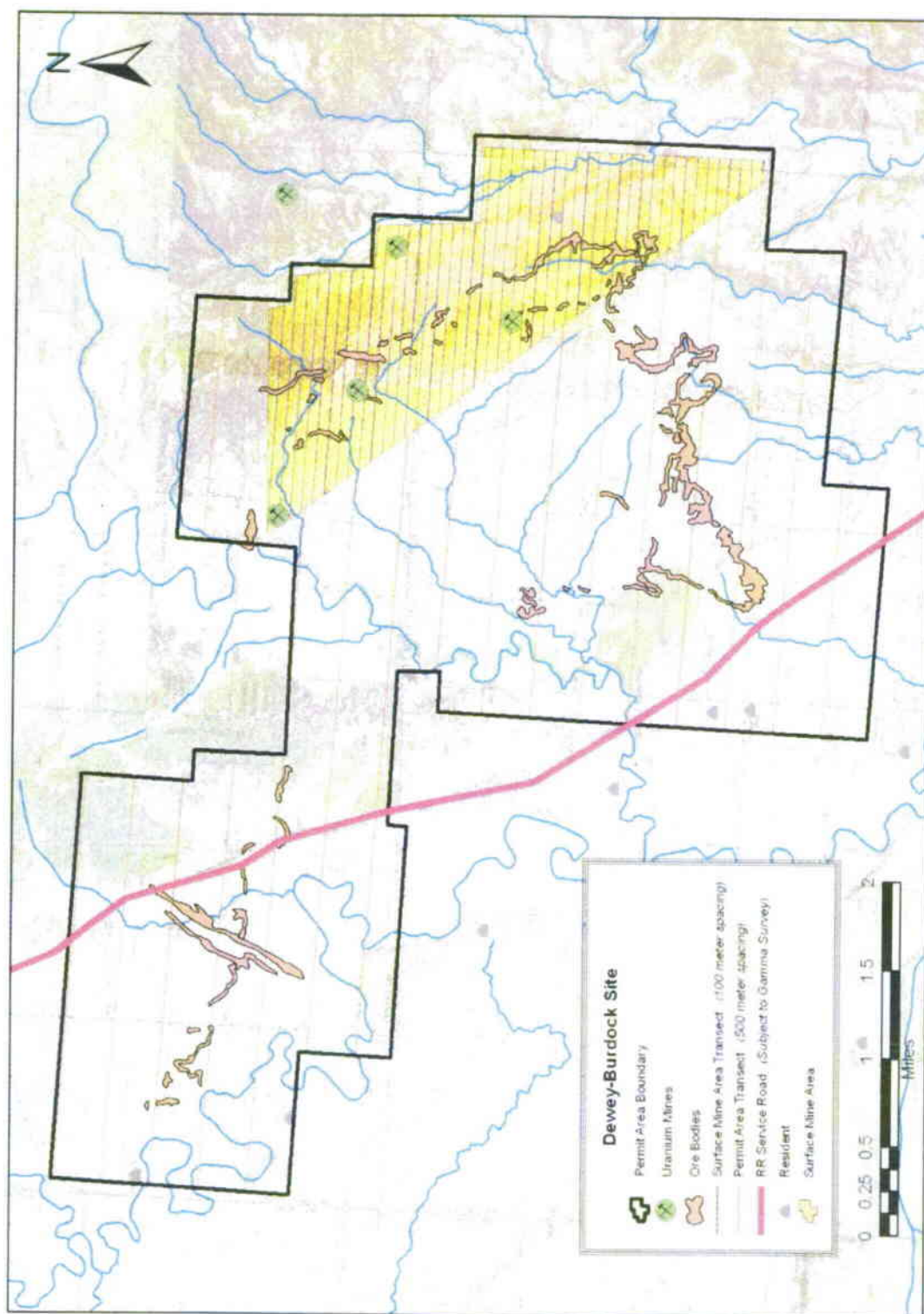


Figure 4-3. Gamma Survey Transects Near Dewey-Burdock Site.



The remaining surface soil sampling is an alternative to the methods described in RG 4.14. The polar coordinate sampling grid was abandoned and a stratified random sampling design coupled with GPS-based gamma surveys developed. In addition, the 0–5-centimeter sample depth for the polar coordinate sampling grid was changed to a 0–15-centimeter sample depth. This change reflects the sample depth established for radium-226 soil cleanup standards in 10 CFR 40. The samples will be analyzed for the radionuclides described in RG 4.14.

The soil sampling strategy will be developed using information obtained from the GPS-based gamma survey. The soil sampling plan (i.e., number and location of samples) will be based on the following criteria:

- The number and location of radiological anomalies attributable to naturally occurring or anthropogenic land surface features (i.e., open pit mining, historic exploration activities, rail tracks) as determined by the gamma survey.
- Mean and variability of the gamma survey data.
- Stratified random sampling design in order to estimate the central tendency of radionuclide distributions.
- Biased soil sampling, if needed, to encompass the range of radionuclide concentrations.

Once the gamma survey is complete, Environmental Restoration Group, Inc. (ERG) will develop a draft soil sampling plan based on data obtained from the gamma survey. This strategy will then be submitted to the Powertech team for review. Once the team has reviewed the soil sampling plan, ERG will incorporate comments and recommendations to form a consensus soil sampling plan.

For each soil sampling location identified, the following data will be collected:

- Direct gamma radiation measurements using the same geometry as measurements taken in the GPS-based survey. This data will be correlated to radium-226 concentrations. The correlation will be applied to data collected in the gamma survey to provide estimated radium-226 soil concentrations.
- Laboratory data for radium-226 with 10 percent of the samples analyzed for natural uranium, thorium-230, and lead-210.

#### **4.4.3 Subsurface Soils**

Consistent with RG 4.14, nine subsurface soil samples will be collected, but not along the polar coordinate sampling grid which, as mentioned above, was abandoned. The locations of the subsurface samples will be determined in the same manner as the 0–15-centimeter surface soils stated previously. Samples will consist of soil composites of 15–30-centimeter and



30–100-centimeter depth intervals. All samples will be analyzed for radium-226 and at least one set analyzed for natural uranium, thorium-230, and lead-210.

#### **4.5 DIRECT RADIATION**

Gamma exposure rate measurements will be collected using thermoluminescent dosimeters (TLDs) at each air monitoring location. The TLDs will be exchanged quarterly for 1 year.

Exposure rate measurements using a High Pressurized Ion Chamber (HPIC) will be made in areas encompassing the expected range of exposure rates at the site. These HPIC data will be correlated to count rate data from NaI detectors using the same geometry used in the gamma survey. Using this correlation, the count rate data from the gamma survey will be used to estimate exposure rates along transects shown in Figure 4-3.

#### **4.6 RADON FLUX**

Consistent with RG 4.14, nine radon flux measurements using EPA Method 115 will be collected in each of 3 months, but not along the polar coordinate sampling grid which, as mentioned above, was abandoned. The locations of the flux measurements will be determined in the field and will be concentrated in the area of the surface uranium mines. These open pit mines are expected to be a significant source of ambient radon-222 in the mine permit area.



## 5.0 WILDLIFE BASELINE STUDIES

### 5.1 PROJECT TASKS

The purpose of the surveys will be to determine the baseline aquatic and wildlife characteristics of the Dewey-Burdock property and the potential impacts of uranium extraction.

#### 5.1.1 Species List

Before initiating field studies, a potential vertebrate species list for the study area will be developed. Information on species' range and occurrence will be obtained from available literature. This will include standard field guides, regional faunal texts and checklists, previous wildlife studies in the vicinity, and any available state and federal agency data. During all field investigations, lists of species actually observed on and near the proposed permit area will be maintained.

#### 5.1.2 Habitat Description

Wildlife habitats within the proposed permit area will be described in terms of general physical and vegetative characteristics, using terminology that corresponds with vegetative maps of the study area generated from field surveys conducted by BKS Environmental Associates, Inc. (BKS). Special emphasis will be placed on documenting and describing any high value, unusual, or critical wildlife habitats. Specific vegetation sampling itself will be coordinated between BKS and South Dakota Game, Fish & Parks (SD GFP) staff following standard and accepted methodology and designations. Results and maps from that vegetation sampling will be provided in a separate document, as for previous permit applications. General discussion of wildlife habitats will be included in the wildlife baseline report.

#### 5.1.3 Big Game

During a site visit with Mr. Mark Hollenbeck (Powertech Uranium Corporation), Mr. Stan Michals (SD GFP), Ms. Gwyn McKee (Jones & Stokes (J&S)), and Mr. Brian Grasman (J&S) in July 2007, it was agreed that big game pellet counts would not be required for baseline studies associated with the Dewey-Burdock project. No such counts were required for other baseline studies at other South Dakota properties in the recent past. In keeping with methods used for those projects, J&S biologists will document all big game observations on and within 1 mile of the proposed permit area during each site visit throughout the baseline study period. Data collected will include the date, location, species and number of animals, habitat type, and activity. Each sighting will be provided in a table appended to the wildlife baseline report. Those data, plus a review of existing information, will be used to describe big game use of the area in the report text.



#### 5.1.4 Upland Game Birds

The Dewey-Burdock project is within the known range of a variety of upland game bird species, including the sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus*), wild turkey (*Meleagris gallopavo*), and mourning dove (*Zenaida macroura*). Other introduced species could also be present in the region. Seasonal observations of game birds and their sign, as well as habitat assessments, will be used to determine the current and potential use of the proposed permit area by these species throughout the year, with special attention during the breeding, brood-rearing, and winter months.

No grouse leks are known to exist near the proposed Dewey-Burdock permit area, with the nearest known lek located approximately 6 to 8 miles northwest of the project site. Lek searches will be conducted from late March through April and will include the proposed permit area and 1-mile perimeter. Searches will be conducted between dawn and 1 hour after sunrise. Biologists will drive existing roads and two-tracks through suitable habitat in the survey area, stopping at intervals of 1 mile or less to scan and listen for displaying grouse. All newly discovered leks will be noted. Any new areas where displaying activity is observed will be checked two more times during the breeding season at 7- to 10-day intervals, when weather permits. Lek attendance counts at those locations will be conducted from ½ hour before to ½ hour after sunrise. Peak male numbers will be determined using repeated counts until the observer is confident in the tally. The number of females observed will also be recorded. Survey results will be incorporated into the wildlife baseline report.

If grouse leks are discovered, J&S biologists will search the permit area to determine whether birds are using the area for brood production. If warranted, brood surveys will occur in June 2008 and will be conducted using pedestrian surveys in or along creeks or other mesic drainages. Surveys will begin no sooner than 9 a.m. to allow time for hens to take their broods to water or other moist areas. Winter use will be assessed from December 2007 to mid-February 2008. In addition to data from systematic surveys, all incidental observations (including nests) of game birds made during other surveys will be recorded throughout the year. Data presentation and analysis for upland game birds will include a map of any historic and current lek locations, peak attendance numbers at active leks, and a summary of incidental game bird observations. A table listing all upland game bird occurrences will be appended to the baseline wildlife report.

#### 5.1.5 Raptors

J&S biologists will document all raptor sightings on and within 1 mile of the proposed Dewey-Burdock permit area throughout the baseline study period. Seasonal raptor use of the area will be determined by reviewing existing data and compiling results from specific surveys and incidental observations. The baseline wildlife report will include a discussion of raptor use of the area, including a topographic map depicting all nests within the study area and the



nesting history of each site, when available. Nests will be mapped in the field using hand-held GPS receivers; those efforts will be timed to prevent disruption of active nest sites. A table listing all raptor sightings made within the survey area during baseline studies will be appended to the report.

Searches for nesting raptors will be conducted within the proposed permit area and 1-mile perimeter. Efforts will consist of pedestrian searches in potential nesting areas during the nonbreeding season and remote observations from vantage points using binoculars and a spotting scope during the nesting season. Initial surveys for early-nesting species, such as golden eagles (*Aquila chrysaetos*) and great horned owls (*Bubo virginianus*), will be conducted in February 2008. Surveys for other raptor species will be conducted periodically from late March through early May that year. All known nests will be monitored to determine their nesting status (active/inactive) for the year. Active nests will be visited in May and June to obtain production information. Nest checks during all periods will be brief and conducted from a distance to avoid flushing raptors from their nests [Grier and Fyfe, 1987].

Winter use of the study area by raptors will be determined through specific surveys and incidental observations. Searches for bald eagle (*Haliaeetus leucocephalus*) winter roost sites will be conducted once per month from December 2007 through February 2008, per current survey guidelines. Roost searches will be conducted during one of two survey windows during each visit: from ½ hour before to 1 hour after sunrise, or from 1 hour before to ½ hour after sunset. Surveys will likely consist of two evening searches and one morning search to maximize observations. All raptor species observed during those surveys and other winter site visits will also be recorded, including date, species and number of birds, location, habitat, and activity.

#### **5.1.6 Breeding Birds**

Per the July 2007 site visit with Powertech, SD GFP, and J&S, surveys for breeding birds, primarily passerines, will be conducted within the proposed permit area once during the baseline study period. Additional surveys may be requested as part of the permitting process. At least one belt transect measuring 100×1,000 meters will be established in each habitat type of sufficient acreage on the Dewey-Burdock property, with additional transects in dominant habitats. Surveys will be conducted on three consecutive mornings between late May and mid-June 2008. Results will describe avian species richness and relative abundance within the proposed permit area. This methodology will provide the desired presence/absence information.

#### **5.1.7 Other Avian Species**

Occurrence of other avian species, such as waterfowl and shorebirds, will be documented through review of literature and existing data (from agency files and previous baseline studies in the area) and incidental observations within the permit area during each site visit.



throughout the baseline study period. All sightings will be recorded on a species list that will be appended in table format to the baseline wildlife report.

#### **5.1.8 Small Mammals**

Small mammal presence/absence within the Dewey-Burdock permit area will be determined using a combination of live, snap, and pitfall traps (1-gallon food cans buried with open top even with ground surface). Per the July 2007 project meeting with Powertech, SD GFP, and J&S, trapping will occur once (September 2007) during the baseline study period. Additional trapping may be requested as part of the permitting process. A SD GFP Scientific Collector will be obtained for both small mammal and aquatic sampling before any collection.

Per the July 2007 site visit meeting, one or two trap lines will be established in dominant habitats: four in grassland (two east and two west), one in ponderosa pine, one along the pine/sagebrush edge, one in greasewood, one in cottonwood-riparian, and one in the bentonite breaks west of Pass Creek. Each trap line will consist of 35 traps placed at 20 stations spaced at 15-meter intervals: 20 Sherman live traps (roughly 8x9x23 centimeters, 1 per station), 10 Museum Special snap traps (1 at each even-numbered station), and 5 pitfall traps (1 each at Stations 1, 5, 10, 15, and 20). Where possible, pitfall traps will be placed in existing rodent runways to increase the possibility of capturing any shrew (*Sorex* spp.) species that may inhabit the area.

Sherman live traps will be baited with a mixture of birdseed, rolled oats, peanut butter, and bacon grease. Snap traps will be baited with a blend of peanut butter and birdseed. Pitfall traps will be lined with a thin layer of dirt on the floor and baited with mealworms, earthworms, crickets, or other similar invertebrates, depending on their availability. All bait will be replenished as needed, and bedding material (cotton balls) will be placed in live and pitfall traps. Each trap line will be checked for three consecutive evenings and mornings (i.e., traps monitored twice daily), beginning with the evening of the set day. All animals captured will be identified to species, aged, and sexed, and their condition will be noted. Live captures other than shrews will be marked by clipping the front, outside right toenail and/or using permanent marker under the chin, and released. All shrews will be sent to the SD GFP for identification, with skulls intact.

The proposed trapping protocol (trap types, trap number, trap nights, and distribution) for the Dewey-Burdock project is the same as that used for the recent similar baseline studies in South Dakota. Additionally, J&S has used live traps and three trap nights as the standard approach during regular sampling at two surface coal mines in northeast Wyoming from the mid-1980s through 2002. These efforts and published literature demonstrate that a variety of trapping methods (both transects and grids), trap days, bait mixes, and prebaiting efforts have successfully been used to obtain small mammal data. Review of results from similar trapping efforts for recent bentonite projects (Dobesh, Kudlock, Shear-Clarkson) near Belle Fourche,



South Dakota, indicated that the rate of new captures typically drops below 50 percent by the second or third morning. Similar results were revealed from the Wyoming data. No new species were captured after the second morning during the recent South Dakota projects; no shrews were captured there at all. Shrews have rarely been collected during trapping efforts in northeast Wyoming, as well, and those that were captured were found in live traps (versus pitfalls). Review of literature (available on the Internet under any search engine) for Merriam's shrews, a species of interest for previous trapping efforts in the region, indicates that it is commonly, but not exclusively, associated with sagebrush habitats, which are quite limited in the Dewey-Burdock area. As noted above, pitfall traps will be placed in or near existing rodent runways to increase trapping opportunity for shrews.

As the purpose of these baseline studies is primarily to determine presence/absence rather than population indices, a sampling schedule of three consecutive afternoons and mornings should be sufficient, especially given the variety of trap types used in each line.

#### **5.1.9 Other Mammals**

As agreed during the July 2007 site visit, occurrence of predators, furbearers, and other mammals will be documented through review of existing data and literature, as well as incidental sightings of individuals or sign throughout the baseline study period. No specific surveys will be conducted for these species. Biologists will watch for bats hunting over tree stands or waterbodies within the permit area during site visits occurring from spring through fall and will record the presence/absence of these animals. If equipment and expertise are readily available, bat calls and flight patterns will be recorded to aid in species identification. Lagomorph abundance will be documented through driving spotlight surveys conducted on two consecutive nights during summer or early fall 2007. All targeted and incidental observations for these species will be provided in a table appended to the report, including dates, species and number of individuals, locations, habitats, and activities. Should individuals or sign (i.e., tracks, scat) of mammalian species of interest (e.g., black-footed ferrets (*Mustela nigripes*)) be observed, the appropriate agency personnel will be notified and follow-up surveys will be conducted. The lone, occupied black-tailed prairie dog (*Cynomys ludovicianus*) colony will be delineated using hand-held GPS receivers and included on the baseline wildlife report map.

#### **5.1.10 Reptiles and Amphibians**

Existing data and pertinent literature will be reviewed to identify herptile species likely to occur within the permit area. Actual occurrence will be documented through targeted searches and incidental observations of likely habitats during appropriate months between July 2007 and June 2008. Specific surveys will consist of nocturnal visits to ponds and creek channels on and within ¼ mile of the proposed permit area to listen for calls and diurnal observations of egg masses, adults, and/or young. All observations of these species will be recorded and listed in



table format appended to the baseline wildlife report, with text discussion summarizing their occurrence.

#### **5.1.11 Species of Concern**

Species of concern include those on federal and state threatened and endangered lists, as well as others monitored by the South Dakota Natural Heritage Program. Current lists for those species will be obtained before the baseline studies. Personnel will watch for species of concern and habitats that could support them during all site visits. Any sightings will be recorded and passed on to the appropriate agencies. One prairie dog colony is present within the western portion of the proposed permit area. However, during a previous telephone conversation with J&S on August 25, 2004, Mr. Scott Larson, U.S. Fish and Wildlife Service, Pierre, South Dakota, stated that specific surveys for black-footed ferrets were not required, as that agency issued a block clearance for this species throughout the entire state a few years ago.

#### **5.1.12 Aquatic Species**

The purpose of the aquatic surveys will be to determine the baseline aquatic and stream characteristics of the Dewey-Burdock property and the potential impacts of uranium extraction.

##### **5.1.12.1 Stream Condition**

Stream and riparian area conditions will be documented through the use of South Dakota Department of Environment and Natural Resources' *Standard Operating Procedures for Field Samplers* [2005]. Baseline conditions for Beaver Creek, the only perennial stream in the project area, will be documented in the same locations as other water sampling stations to maximize data collection and comparisons.

##### **5.1.12.2 Fish**

Electrofishing will be conducted on two 100-meter sections of Beaver Creek: one upstream and one downstream of the Dewey-Burdock project area. The upstream and downstream extents of each sample section will be blocked using seines, and sampling will continue until the capture for a given pass is less than 25 percent of the capture for the previous pass or until three passes have been made. Immediately upon capture, the fish will be weighed in grams and the length measured in millimeters. Once these measurements are taken, the fish will be returned live to the area below the downstream net. Condition class will be determined using the formula  $C = W5/L3$ , where  $C$  is the condition factor,  $W$  is the weight in grams, and  $L$  is the length in millimeters [Everhart et al., 1975]. Assuming water conditions are adequate, fish sampling will be performed seasonally (once per quarter) for the baseline conditions, beginning with the third quarter of 2007 and ending with the second quarter of 2008. Any deviations from this sampling regime will be coordinated with SD GFP personnel.



#### **5.1.12.3 Macroinvertebrates**

Macroinvertebrates will be sampled reachwide twice a year (fall 2007 and spring 2008) using a modified D-frame kick net, as described in Peck et al. [2001]. Species richness (identification to family level) and general abundance will be discussed within the text and listed in table format appended to the baseline wildlife report.

#### **5.1.12.4 Periphyton**

No periphyton sampling will be performed.

#### **5.1.13 Radiological Testing**

As discussed during the July 2007 site visit, radiological testing of tissue samples will be restricted to fish and will occur once during the baseline study period. Collection of fish for this analysis will include up to five top-level predator species (expected to be catfish species (*Ictalurus* spp.)) from each of the two sampling locations (i.e., one upstream and one downstream). The whole body specimens will be preserved and analyzed in accordance with the NRC Guide 4.14 (RG 4.14). Testing will be performed by Energy Laboratories in Gillette, Wyoming, and will include natural uranium, thorium-230, radium-226, lead-210, and polonium-210.

#### **5.1.14 Other Species**

No specific surveys for invertebrates are required for the Dewey-Burdock project. Invertebrates observed within the permit area are typically recorded in field notes when identified but are not usually included in specific field studies or discussed in the baseline report. Any species of federal or state concern documented during baseline studies will be reported to the appropriate agency personnel.



## 6.0 VEGETATION BASELINE STUDIES

### 6.1 INTRODUCTION

The baseline vegetation study will cover the Dewey-Burdock permit area. The project area may contain all or some of the following four native vegetation community types: upland grassland, ponderosa pine woodland, riparian, and wetland. Field work was conducted in the summer of 2007. Table 6-1 shows the mapping acreages.

**Table 6-1. Vegetation Map Units and Associated Acreages**

Vegetation Map Units	Proposed Permit Area Acreage
Upland Grassland	To be determined
Ponderosa Pine Woodland	
Riparian	
Wetland	
<b>Total</b>	<b>9,400</b>

Vegetation baseline study monitoring will be conducted using the procedures described in this document. Vegetation parameter sampling will be conducted by vegetation community type as specified in Table 6-2. For purposes of this methodology, "project area" will be the same as "study or permit area."

**Table 6-2. Vegetation Baseline Sampling—Measured Parameters**

Parameter	Upland Grassland	Ponderosa Pine Woodland	Riparian	Wetland <sup>(a)</sup>
% Absolute Total Ground Cover	Yes	Yes	Yes	No
First Hit % Absolute Total Vegetation Cover	Yes	Yes	Yes	No
Multiple Hit Vegetation	Yes	Yes	Yes	No
Shrub/Subshrub Density	Yes	Yes	Yes	No
Production	No	No	No	No
Tree Count and Distribution	No	Yes	No	No

(a) Wetlands will not be sampled as part of the baseline study but will be included under U.S. Army Corps of Engineers (US ACE) delineation requirements.



## 6.2 VEGETATION COMMUNITY CLASSIFICATION AND MAPPING

The baseline project area will be classified and mapped before commencing vegetation sampling. Preliminary mapping and classification, based on aerial photography, has identified the four following plant communities:

1. Upland grassland
2. Ponderosa pine woodland
3. Riparian
4. Wetland.

Plant communities will be further mapped using color infra-red (CIR) aerial photography and verified through field survey. Disturbed areas within the project will also be identified and mapped, if possible, based on the scale of available mapping. Disturbed areas will be excluded, however, from all vegetation parameter sampling. All areas within  $\frac{1}{2}$  mile of the project area will be mapped, based on a review of CIR aerial photography and known expression of photography within the project area. It will not be necessary to field verify this mapping within a  $\frac{1}{2}$  mile nor will vegetation sampling be conducted.

## 6.3 TRANSECT ORIGIN SELECTION

A computerized systematic grid (through AutoCAD or ArcGIS) will be used to randomly locate sample points within each vegetation community. These computer-generated random numbers will be uploaded to a hand-held GPS unit for actual location in the field. Sample points will be sampled in numerical order until the minimum sample size is attained and then until either sample adequacy is met or the required maximum number of samples is collected.

## 6.4 LINE TRANSECT LAYOUT

A 50-meter line transect will be used in the three vegetation communities to be sampled; i.e., upland grassland, ponderosa pine woodland, and riparian. Each 50-meter line transect will begin at its specified random origin point and extend in a randomly generated compass direction.

Transects that exceed the boundaries of the vegetation community being sampled will be redirected back into its vegetation community at a 90-degree angle from the original transect direction at the point of intercept. In instances where a 90-degree angle of reflection does not place the transect within the sampled community, a 45-degree angle of reflection will be used.



## **6.5 GROUND COVER**

Line-transect point-intercept methods will be used to collect percent absolute cover data from the three vegetation communities. In the upland grassland, ponderosa pine woodland, and riparian communities, each 50-meter transect will represent a single sample point. Percent cover measurements will be taken from point-intercepts at 1-meter intervals along a 50-meter transect using a laser pointer. Should a transect run out of the vegetation community boundary or a nonvegetated feature, it will be redirected as described above. Each point-intercept will represent 2 percent toward cover measurements.

Percent cover measurements will record "first-hit" point-intercepts by live foliar vegetation species, litter, rock, or bare ground. Litter will include all organic material that is dead, including manure. Rock fragments will be recorded when they are equal to or greater than 2 centimeters in size (i.e., sheet flow, minimum nonerodible particle size). First-hit data will be recorded and tabulated to evaluate total ground cover and total vegetation cover. Multiple hits on vegetation will be recorded but used only for the purpose of constructing a plant species list for each plant community. Total ground cover is the sum of cover values for percent vegetation, percent litter, and percent rock.

## **6.6 TOTAL VEGETATION COVER**

Vegetation cover data will be recorded by species using first-hit data. All point intercepts of living vegetation and growth produced during the current growing season will be counted toward total vegetation cover. Total vegetation cover measurements will be expressed in absolute percentages for each sample point. Relative cover values for percent species cover will be provided. Percent vegetation cover is the vertical projection of the general outline of plants to the ground surface. Total vegetation cover will include moss.

## **6.7 TOTAL GROUND COVER**

Total ground cover data will be recorded by live vegetation, litter, rock, or bare ground. Litter will include all dead organic matter and manure that is recognizable as well as lichen and moss. Total ground cover measurements will be expressed in absolute percentages for each sample point.

## **6.8 SPECIES DIVERSITY**

The total number of plant species within a 1×50-meter belt transect will be summarized for each vegetation type.



## 6.9 PRODUCTION

No production sampling will be necessary for the 2007 baseline vegetation assessment.

## 6.10 SHRUB DENSITY

Shrub density data will be collected in conjunction with randomly selected cover transects, wherever possible. All shrubs, full, half, or sub, will be counted within 50 centimeters on either side of the 50-meter cover transect (1-meter×50-meter belt transect). Sample adequacy will not be calculated on shrub density transects; however, shrub density data will be qualitatively evaluated. The number of belt transects will equal the number of cover transects for a given vegetation type. No shrub height measurements will be collected.

## 6.11 TREE DENSITY

Within the ponderosa pine woodland vegetation community, tree density will be estimated by gridding the aerial photograph for the project area and counting the number of ponderosa pine per unit area, based on a small number of randomly selected grid intervals. In addition, a range of age distribution will be determined using nondestructive techniques, such as correlating known measures of age and height, or age and diameter at breast height (DBH), or ring counts from recent timber harvest stumps and logs.

Within other vegetation communities, individual ponderosa pine or other tree species found will be directly counted for numbers. Height and DBH may be more appropriate in these vegetation types based on lack of downed timber, such as is present in the ponderosa pine woodland.

## 6.12 SAMPLE ADEQUACY

A minimum of 20 cover transects per vegetation type will be sampled in upland grassland, ponderosa pine woodland, and riparian communities. Sample adequacy will be calculated and an incremental number of cover transects will be sampled up to the maximum of 50.

Minimum and maximum sample sizes are listed in Table 6-3. The following sample adequacy formula will be utilized to determine the minimum required size of the sample population:

$$n_{\min} \geq \frac{2(sz)^2}{(dx)^2} \quad (6-1)$$



where:

$n_{min}$  = minimum number of sampled line transects needed to adequately represent native vegetation types

$s$  = sample standard deviation

$z$  = the  $z$  statistic

$d$  = the amount of reduction desired

$\bar{x}$  = sample mean for cover.

**Table 6-3. Vegetation Monitoring Minimum/Maximum Sample Population Requirements for Upland Grassland, Ponderosa Pine Woodland, and Riparian Communities**

Vegetation Community	Parameter	Sample Size	
		Minimum	Maximum
Upland Grassland	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
Ponderosa Pine Woodland	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
Riparian	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
	Vegetation Cover		
	Shrub Density		
<b>Total</b>		<b>60</b>	<b>150</b>

The three vegetation communities have been identified as "grassland" or "shrubland." Upland grassland is identified as grassland while the ponderosa pine woodland and riparian communities are identified as shrublands. The constant values to be used in statistical test are:  $z=1.28$  and  $d=0.1$  for grasslands. The shrubland values are  $z=0.84$  and  $d=0.2$ . All sampled vegetation will be included in the sample adequacy test (i.e., "undesirable" species will not be eliminated from the equation).



### 6.13 PLANT SPECIES LIST

A vegetation species list by scientific name, common name, and lifeform will be developed individually for each of the three vegetation communities. This list will be compiled from species noted during all vegetation monitoring activities, including point-intercept line transect cover measurements and other opportunistic observations of the sampling area.

### 6.14 OTHER DATA COLLECTED

Any United States Fish and Wildlife Service (US FWS) threatened or candidate species or any state species of special concern listed in the South Dakota Natural Heritage database will be surveyed and any known location identified on the map. Table 6-4 lists the threatened and candidate species along with their habitat and flowering dates. Table 6-5 lists the species of special concern along with their habitats and flowering dates. All state-listed noxious weed will be noted and significant concentrations identified on the vegetation baseline report map.

Photographs will be taken of the vegetation communities. Photographic locations will be documented and illustrated on a map.

### 6.15 EXTENDED REFERENCE AREA MAPPING AND JUSTIFICATION

As noted in the Vegetation Community Classification and Mapping section (Section 6.2), all lands within the project area are to be mapped as one of three plant community types. Upland grassland, ponderosa pine woodland, and riparian areas unaffected by the mining operation will serve as an Extended Reference Area (EXREFA). Wetlands will not be sampled under baseline evaluation but included in US ACE delineation. For the purposes of this study, EXREFA means a native land unit which will be used to evaluate revegetation success for each of the same native plant communities which was affected by the mining operation. The EXREFA will be a subset of the mapped native communities and will be included as potential sample points for the cover sampling program. The EXREFA will remain unaffected over the course of the mining operation and will be as large as practical, at least 2 acres, considering land ownership patterns and land management history. The permit application will show the EXREFA on the vegetation map and will include text justifying the choice of the EXREFA.



Table 6-4. Threatened and Candidate Species to Be Sampled

Scientific Name	Common Name	Flowering Date	Habitat	Classification
<i>Botrychium campestre</i>	Prairie Moonwort	May–Early June	Dry prairies and sand dunes, as well as sandy, dry disturbed sites, such as roadsides and old fields	Not ranked (under review)
<i>Botrychium lineare</i>	Moonwort Grape-Fern	May–Early June	Meadows with tall grasses and forbs, beneath trees in wooded areas, on north-facing limestone cliff shelves, and in streamside edges	Not ranked
<i>Botrychium multisided</i>	Leathery Grape-fern	May–Early June	Savannah, prairie, meadow, field	Not ranked (under review)
<i>Carex alopecoidea</i>	Tawny Sedge	July	Seasonally saturated soils in wet meadows, openings in alluvial woods, stream banks, particularly on calcareous substrates	S2
<i>Cypripedium parviflorum</i>	Lesser Yellow Lady's Slipper	May–June	Bogs, shady swamps, wet woods	Not ranked (under review)
<i>Eleocharis elliptica</i>	Elliptic Spikerush	June–August	Very wet, calcareous (or brackish) shores, pool margins, fens, meadows, prairies	Not ranked
<i>Epipactis gigantea</i>	Stream Orchid	April–July	Ledges, stream, river banks	S1
<i>Lycopodium complanatum</i>	Ground Cedar	Unknown	Dry open coniferous or mixed forest alpine slopes	S1
<i>Platanthera orbiculata</i>	Round-Leaved Orchid	July	Moderate moisture; woods, forests; in rich soil	S2
<i>Salix candida</i>	Sage Willow	April–May	Cold, open fens, swamps and bogs	S1
<i>Salix serissima</i>	Autumn Willow	Unknown	Swamp, marsh, bog, fen, lakeshores	S1
<i>Sanguinaria canadensis</i>	Bloodroot	March–April	Rich, deciduous, upland and floodplain woods	S4
<i>Viburnum opulus var. americana</i>	American Cranberrybush	May–July	Cool woods, thickets, rocky shores, slopes	Not ranked (under review)
<i>Viola selkirkii</i>	Great-Spurred Violet	April–June	Cold areas	S1



**Table 6-5. Species of Special Concern to Be Sampled**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Flowering Date</b>	<b>Habitat</b>	<b>Classification</b>
<i>Adiantum capillus-veneris</i>	Southern Maidenhair-Fern	June–August	Moist, well-drained sand, loam or limestone	S1
<i>Carex bella</i>	Elegant Sedge	June–August	Moist subalpine meadows	S1
<i>Eleocharis rostellata</i>	Beaked Spikerush	July–September	Saline or alkaline wetlands	S1
<i>Gentiana affinis</i>	Northern Gentian	Unknown	Moist	S2
<i>Listera convallarioides</i>	Broad-Lipped Twayblade	June–August	Moist woods	S1
<i>Lycopodium annotinum</i>	Bristly Clubmoss	Unknown	Swampy or moist coniferous forests, mountain forests, and exposed grassy or rocky sites	S1
<i>Oxyria digyna</i>	Mountain Sorrel	June–September	Gravel bars, mudflats, tundra, scree slopes, crevices in rock outcrops, talus slopes	S1
<i>Petasites sagittatus</i>	Sweet-Coltsfoot	May–June	Wet, forests, meadows	S1
<i>Polystichum lonchitis</i>	Northern Holly-Fern	Unknown	Woodland, rocky bluff	S1
<i>Salix lucida</i>	Shining Willow	April–May	Stream and swamp banks, fens, beaches, wet meadows, mud flats	S1



## 7.0 CULTURAL RESOURCES

The objective of the cultural resources investigation of the Dewey-Burdock permit area is the completion of a preliminary record search and Level III archeological survey of the entire project area; a final report documenting all work will be produced. To this end, an established research orientation was adhered to, and field methodology was implemented pursuant to governing state [South Dakota State Historic Preservation Office, 2005] and federal [Advisory Council on Historic Preservation, 2006] standards for the management and protection of cultural resources.

### 7.1 PRELIMINARY RECORD SEARCH

Mr. Michael Fosha, Assistant State Archeologist, provided maps depicting the locations of previously recorded sites and surveys within the project area before field work. Pertinent site forms were accessed and printed through the state database for review before field work.

The Dewey-Burdock project area is contained within the Black Hills Region as defined by the South Dakota State Plan for Archaeological Resources [Winham and Hannus, 1990]. Occasional archeological investigations within the Black Hills Region began during the early 1920s and continued through the early 1970s [Winham and Hannus, 1990].

By the mid-1970s, systematic, intensive archeological surveys were adopted into the Black Hills National Forest cultural resources management program. Also occurring during this period was an increase in mineral exploration and highway construction throughout much of the southern Black Hills. Between 1985 and 1989, the United States Forest Service (USFS) reported the submission of over 800 cultural resource reports, the majority of which detailed small-scale surveys and the documentation of few or no archeological sites [Winham and Hannus, 1990]. Two separate culture history overviews were compiled for the Black Hills Region during this time [Cassells, 1986; Sundstrom, 1989]. From the 1990s forward, numerous additional investigations have taken place throughout the Black Hills Region for federal and state road projects, utility work, and mineral exploration.

Although data for most temporal/cultural periods are generally better documented within the Black Hills than within other archeological regions throughout the state, a large majority of this has been generated by means of surface collections [Winham and Hannus, 1990]. As a result, the continuance of basic inventory and systematic data collection procedures remains a primary research objective within the Black Hills Region.



## 7.2 LEVEL III ARCHEOLOGICAL SURVEY

The pedestrian survey conducted began on April 18, 2007, and concluded on August 4, 2007. Slightly less than 10,000 acres were surveyed, resulting in the identification of 262 archeological sites. The final number of sites will change if two or more smaller sites are combined into a single entity or one or more larger sites are split into smaller localities. Adherence to requisite specifications for a Level III cultural resources survey was maintained for the duration of the investigations. The South Dakota State Historic Preservation Office (SHPO) defines a Level III cultural resources survey as follows:

Level III: 100 Percent Survey. Level III surveys require a visual inspection of the project APE. Survey transects must be no more than 30 meters (100 feet) apart. The report must explain survey methods and the rationale for their use, for instance, why the archaeologist did or did not conduct subsurface testing [South Dakota State Historic Preservation Office, 2005].

Archeology Laboratory, Augustana College (ALAC) field crews were comprised of between four and seven individuals throughout the duration of the project. ALAC was provided with GIS data and USGS 7.5-minute series 1:24,000 scale topographic quadrangle maps highlighting the proposed project area.

Pedestrian reconnaissance of the Dewey-Burdock project area was conducted with parallel linear transects, maintaining distances of 30 meters (98.43 feet) between field personnel. The crew utilized a Trimble Pro XT model GPS unit, fence lines, compass bearings, well-defined landforms, and visual line-of-site to maintain transects.

In certain instances, an adjustment to the survey strategy was necessary to allow for a more detailed examination of areas possessing higher site location potential. Such locales included surfaces or landforms in an advanced erosional state (e.g., cutbanks, blowouts, ditches, slopes, animal/vehicle trails, rodent burrows), as well as those situated upon high terraces/terrace remnants above major established waterways. Survey strategy in these locales typically adopted the form of shorter-spaced transects (15-meter intervals) and a focus of attention directed toward the inspection of erosional or burrow features where present.

Field data for all archeological sites documented during the current survey were recorded by means of standardized methodological practices. Archeological sites were defined as being any extant manifestations of human cultural activity having occurred before the calendar year A.D. 1958.

Transect widths were reduced to between 1- and 5-meter intervals within identified sites, depending on ground surface visibility. All observed artifacts were marked with pin flags and piece-plotted individually with the use of the Trimble Pro XT model GPS unit.



Specific field data collected from each site included the following: field number, any previously assigned Smithsonian number, component type, cultural affiliation, dimensions and physiographic position, general site description and condition, presence/description of relevant features and cultural materials present, soil and nearest water source information, and tentative National Register of Historic Places (NRHP) evaluation status. Also documented for each site were legal locations and Universal Transverse Mercator (UTM) coordinates. Sites were documented with both film and digital photographs.

Descriptions of documented sites were also recorded in field notes. All relevant site information was recorded in these notes, including artifact inventories identifying respective type, modification, raw material utilized, and count, and additional site feature descriptions and measurements (including features such as hearths, structures, cairns, wells). General environmental descriptions of each respective site area were also made; these descriptions included land use, vegetation, visibility, and evidence of past disturbances (cultivation, erosion, deflation, removal of features). Certain culturally diagnostic artifacts (projectile points) and formal tools (scrapers, knives, bifaces) were collected for illustration, photographs, metric, and other analyses. All artifacts remain the property of the landowners and will be returned to the landowner; artifacts may be donated to the state of South Dakota if desired.

South Dakota state site forms will be completed for each new archeological site documented in accordance with established guidelines [State Archeological Research Center, 2003]. Additionally, existing site forms will be updated in those instances where boundaries of previously recorded sites were redefined.

Subsurface testing was not necessary during the course of the pedestrian survey. A combination of conditions in the project area at the time of the survey, such as sparse vegetation, heavily grazed pastureland, and numerous extant animal burrows (prairie dog, badger), resulted in extremely sparse ground cover within the majority of the project area. These factors produced nearly ideal visibility conditions in most instances, thereby precluding the necessity of substantial subsurface testing to satisfy requisite specifications for reconnaissance cultural resource surveys [South Dakota State Historic Preservation Office, 2005]. Recommendations concerning the testing of geomorphic landforms considered to possess significant potential for containing deeply buried, intact cultural deposits may be discussed in the final report.

The final report will provide all background information, methodology, and site descriptions for each site identified. Specific clearance recommendations for each site will also be addressed.



## 8.0 REFERENCES

- Advisory Council on Historic Preservation, 2006.** *Section 106 Regulations: Text of ACHP's Regulations, "Protection of Historic Properties" (36 CFR Part 800) (incorporates amendments effective Aug. 5, 2004)*, Advisory Council on Historic Preservation, Washington, DC, accessed January 15, 2007, from <http://www.achp.gov/work106.html>
- Cassells, E. S., 1986.** *Prehistoric Hunters of the Black Hills*, Johnson Publishing Company, Boulder, CO.
- Everhart, W. H., A. W. Eipper, and W. D. Youngs, 1975.** *Principles of Fishery Science*, Cornell University Press, Ithaca, NY, pp 288.
- Grier, J. W. and R. W. Fyfe, 1987.** *Preventing Research and Management Disturbance, Raptor Management Techniques Manual*, B. A. Giron Pendleton, B. A. Milsap, K. W. Cline, and D. M. Bird (eds.), National Wildlife Federation, Washington, DC, pp. 173–182.
- Peck, D. V., J. M. Lazorchak, and D. J. Klemm (eds.), 2001.** *Environmental Monitoring and Assessment Program-Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams*, (unpublished draft), Environmental Protection Agency, Washington, DC.
- South Dakota Department of Environment and Natural Resources Water Resources Monitoring Team, 2005.** *Standard Operating Procedures for Field Samplers Vol I: Tributary and In-Lake Sampling Techniques*, Revision 5.2.2, Water Resources Assistance Program, Pierre, SD.
- South Dakota Department of Environment and Natural Resources Water Resources Monitoring Team, 2005.** *Standard Operating Procedures for Field Samplers Vol II: Biological and Habitat Sampling*, Water Resources Assistance Program, Pierre, SD, pp. 123.
- South Dakota State Historic Preservation Office, 2005.** *Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance)*, South Dakota State Historical Society, Office of History, Pierre, SD.
- State Archeological Research Center, 2003.** *The Archaeological Research Center Field Site Form*, retrieved August 16, 2007, from the World Wide Web: <http://www.sdsmt.edu/wwwsarc/downloads/site-manual.pdf>
- Strobel, M. L., J. M. Galloway, G. R. Hamade, and G. J. Jarrell, 2000.** *Potentiometric Surface of the Inyan Kara Aquifer in the Black Hills Area, South Dakota*, U.S. Geological Survey Hydrologic Investigations Atlas HA-745-A, 2 sheets, scale 1:100,000.
- Sundstrom, L. 1989.** *Culture History of the Black Hills With Reference to Adjacent Areas of the Northern Great Plains*, Reprints in Anthropology, Vol. 40, J&L Reprint Company, Lincoln, NE.



**APPENDIX A**

**WELL COMPLETION REPORTS FOR  
SAMPLED WELLS**



# NOTICE OF WELL CONSTRUCTION

## (1) WELL CONSTRUCTION

Location of well: NW 1/4 NW 1/4 Section 3 Township 7S Range 1E

Well owner Kathryn Spencer (Name) Dewey Route Edgemont, SD 57735 (Address)

Date well drilling completed 10-22-80 Purpose of well Domestic  
(domestic, irrigation, municipal, industrial, other)

## WELL LOG

(Litho Log Footages) Layers, top to top in feet	Description of layer	Depth to top of water producing equifer	
Ksc → 0-320	Dark gray shale	580	ft.
Kfu → 320-395	Gray mudstone with 10% gray siltstone	Depth to static water level	flows
395-445	Gray mudstone with 5% 20% gray vfss	Name of producing equifer (if known)	Lakota
Klf → 445-490	Green mudstone	Total depth of drill hole	625
490-520	AA w/10-30% G & GR wt silt	Depth to bottom of casing	580
520-545	Gray fgss	Casing information: In the space below show kind, size, weight, length per diameter, etc., for production casing and surface casing, if used.	
545-560	well cemented vt - fgss	5 1/2" 14 lbs/ft.	
560-575	Gray mudstone with 10% dark brown mudstone	Random	twenties
575-590	AA with 10-20% gray vfss	Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.	
590-615	Gray fine grain sandstone	45 ft. open hole	
615-620	Green mudstone with <5% gray vfss		
620-625	Green mudstone with 50% Brown-red mudstone		

Attach sheet if more space is needed

If a flowing well, flow of completed well 1.00 G.P.M.

Silver King Mines, Inc.  
Name of Drilling Contractor

## (2) PUMP INSTALLATION

Company name and size of pump \_\_\_\_\_ HP \_\_\_\_\_

Type of pump \_\_\_\_\_ Capacity of installed pump \_\_\_\_\_ G.P.M.

Depth of pump placement \_\_\_\_\_ ft., Date of pump installation \_\_\_\_\_

## (3) WATER SURFACE MEASURING TUBE

On some wells an air-tight water surface measuring tube is required: See Section 46.408 of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.

Show exact vertical length of water surface measuring tube, when installed \_\_\_\_\_ ft., tube diameter \_\_\_\_\_, tube material \_\_\_\_\_

\_\_\_\_\_  
Name of Pump Installation Contractor



TVA well pump tank 76.77 2 miles  
May 20

NOTICE OF WELL LOCATION

751E3BB

Fall River

WELL CONSTRUCTION

Driller: WALTER D. SPENDER (Name)  
Drilling House: Edgemoor, Edgemoor, SD 57735 (Address)  
Date well drilling completed: 10-22-80  
Purpose of well: Domestic  
(Domestic, irrigation, municipal, industrial, other)

WELL LOG

(Litho. Log Footages) Log No. Top to Top in feet	Description of layer	Depth to top of water producing aquifer	Depth to static water level	Name of producing member (if known)	Total depth of drill hole	Depth to bottom of casing
Ksc - 0-320	Dark gray shale	580	flows	Lakota	625	580
Kfu - 320-395	Gray mudstone with 10% gray siltstone					
395-445	Gray mudstone with 5% 20% gray vfoss					
Klf - 445-490	Green mudstone					
490-520	AA w/10-30% G & GR Mt silt					
520-545	Gray fgss					
545-560	well cemented vt - fgss					
560-575	Gray mudstone with 10% dark brown mudstone					
575-590	AA with 10-20% gray vfoss					
590-615	Gray fine grain sandstone					
615-620	Green mudstone with <5% gray vfoss					
620-625	Green mudstone with 50% Brown-red mudstone					

Casing information: In the space below show kind, size, weight, length per diameter, etc. for production casing and surface casing, if used.  
5 1/2" 14 lbs/ft.  
Random twenties

Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.  
45 ft. open hole

Attach sheet if more space is needed

If a flowing well, flow of completed well 1.00 G.P.M.

Silver King Mines, Inc.

Name of Drilling Contractor

(2) PUMP INSTALLATION

Company name and size of pump \_\_\_\_\_  
Type of pump \_\_\_\_\_ Capacity of installed pump \_\_\_\_\_  
Depth of pump placement \_\_\_\_\_ ft. Date of pump installation \_\_\_\_\_ G.P.M.

(3) WATER SURFACE MEASURING TUBE

On some wells an air-tight water surface measuring tube is required. See Section 46.408 of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.

Show exact vertical length of water surface measuring tube, when installed \_\_\_\_\_ ft. tube diameter \_\_\_\_\_  
tube material \_\_\_\_\_

Name of Pump Installation Contractor



# NOTICE OF WELL CONSTRUCTION

7-1-16

*Felt River*

## (1) WELL CONSTRUCTION

Location of well SE 1/4 SE 1/4 Section 16 Township 7S Range 1E

Well owner Peterson & Son, Inc. Edgemont, SD  
(Name) (Address)

Date well drilling completed 11-17-81 Purpose of well Domestic  
(domestic, irrigation, municipal, industrial, other)

### WELL LOG

Layers, top to top in feet	Description of layer	Depth to top of water producing aquifer	
0-380	Blk Sh	555	ft
380-470	1B gy clst & ss	Depth to static water level	flowing
470-495	Gy ss & clst	Name of producing aquifer (if known)	Lakota
495-565	Gy, rd-brn & gn clst	Total depth of drill hole	650
565-580	Gy ss	Depth to bottom of casing	650
580-650	Gy clst	Casing information: In the space below show kind, size, weight, length per diameter, etc., for production casing and surface casing, if used.	
		4" blk iron 10#/ft	
		Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.	
		slotted 566-608	
		629-650	
		If a flowing well, flow of completed well	
		30	

Attach sheet if more space is needed

Silver King Mines, Inc.

Name of Drilling Contractor

## (2) PUMP INSTALLATION

Company name and size of pump

Type of pump Capacity of installed pump

Depth of pump placement ft., Date of pump installation

## (3) WATER SURFACE MEASURING TUBE

On some wells an air-tight water surface measuring tube is required: See Section 46.40B of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.

Show exact vertical length of water surface measuring tube, when installed ft., tube diameter tube material

Name of Pump Installation Contractor





## 07-92

Date 06.22.99





ARTESIAN WELL REPAIR

OFFICE OF STATE ENGINEER  
 Pierre, S. DAK.

OFFICE OF STATE ENGINEER  
 Pierre, South Dakota

Well No. 24-6R  
 (do not fill in)

Fall River COUNTY

Location SE 1/4 Section 23 Twp. 7S Range 1E

Owner L. E. Stewart Address Litchman, N. Dak

Depth 240 Drawdown \_\_\_\_\_ Type Rig Used Repair

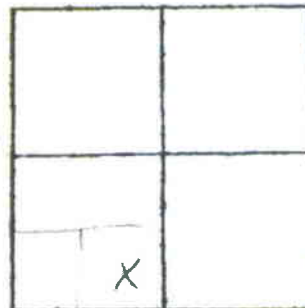
Flow (gpm) 2 1/2 Pressure Strong Date Measured June 10, 1951

Grd. Elev. \_\_\_\_\_ Water Level Below Ground Surface \_\_\_\_\_

Temperature \_\_\_\_\_ Character Water (soft, medium, hard)

Date Commenced June 6 Date Completed June 10

Bonded Driller H. P. Norbeck Address Redfield, S. D



Section 23

CASING DETAIL (old)

Type	Size	Length	Depth
<u>Blk Std</u>	<u>2"</u>	<u>240'</u>	<u>240'</u>

RECORD OF WELL AFTER REPAIR

Depth 237 Date Completed June 10, 1951  
 Flow (gpm) 2 1/2 Date Measured June 10, 1951  
 Water Level Below Ground Surface \_\_\_\_\_

CASING DETAIL (new)

Type	Size	Length	Depth
<u>Std Casing</u>	<u>3"</u>	<u>31'</u>	<u>37'</u>
<u>driven over old 2" with 600# hammer</u>			
<u>in Casing tube</u>	<u>1 1/2"</u>	<u>231'</u>	<u>237'</u>

PERFORATIONS

Type	Size	Length	Depth
_____	_____	_____	_____

PERFORATIONS

Type	Size	Length	Depth
<u>Drilled</u>	<u>1/4"</u>	<u>158' to 168'</u>	<u>220'</u>
			<u>230'</u>

SOURCE OF INFORMATION

Norbeck Co. Report

Repaired by: H. P. Norbeck

Address Redfield

Did you reach bottom on this well? No

If not, how far down did you get? 237'

What do you think caused this well to fail?  
2" corroded out permitting water to come up out side

Do you believe the repair was successful? Very

Well flowed only 2 GPM when drilled - this is a Dakota Sandstone well about 2 mi from outc.



B-4

DB - GW 676

W/ORGANICS

6" TOP SOIL - DK BROWN, DRY

5' → SANDY SILT, RED, DRY

TO 10' → SILTY SAND, RED, DRY

SAME TO 13'

SILTY

@ 13' → SANDY GRAVEL W/ COBBLES, RED TO BROWN, DRY TO MOIST

SAME TO 20'; WET @ 17.5'

Same to 22½' Sat.

B-5

DB - GW 679

6" Top Soil - DK Brn, Dry

5' Sandy Silt, Red Dry

10' Silty Sand, Rd to Tan, Dry to moist

15' Same Red

17' Same

17½ - 17¾ Sand w/ gravel, Red, moist

17¾ - 18 cobbles, no clay

25' Silty Sand to Sand, Rd to Tan, moist

27' Sand w/ gravel, Red, moist

29' Sandy lean Clay, Red, wet

30' Sand w/ gravel, Red, moist, 6" Gray layer of Sand.

35' Sand w/ gravel, Red, moist sat @ 34.

36½' Same

39' Shale, Dk Black, moist

COMPLETED BY:

REVIEWED BY:

PAGE 2 OF 2



**DewBurdGW675**

Location Marietta

Construction Details

Total Depth	14.4'
Screen Interval	4.4 - 14.4'
Sand pack	3 - 14.4'
Bentonite	1 - 3'
Cement	0 - 1'
Distance from surface to top of casing	2.5'

Water Level ~9' below surface

Lithology

0 - 4 ft	fine to med grain sand, tan color, mostly quartz and feldspar, some dark minerals (5%)
4 - 9 ft	poorly sorted, coarse sand, few small pebbles
9 - 12.5 ft	poorly sorted, coarse sand, mostly quartz and feldspar with dark minerals (10%), some pebbles, wet
12.5 - 14.4 ft	dark gray, fissile shale



**DewBurdGW677**

Location south of Putnam house

Construction Details

Total Depth	14.5'
Screen Interval	4.5 - 14.5'
Sand pack	3 - 14.5'
Bentonite	1 - 3'
Cement	0 - 1'

Water Level -9' below surface

Lithology

0 - 4 ft	med tan, sandy silt
4 - 6 ft	sandy silt
6 - 7.5 ft	cobbles in silty sand, poorly sorted
7.5 - 9 ft	tan, silty sand
9 - 12.5 ft	wet, tan, very fine grained sand
12.5 - 14.5 ft	dark gray, fissile shale (Belle Fourche Fm)



**DewBurdGW678**

Location    along Pass Creek west of Burdock

Construction Details

Total Depth	14.5'
Screen Interval	4.5 - 14.5'
Sand pack	3 - 14.5'
Bentonite	1 - 3'
Cement	0 - 1'

Water Level                ~8' below surface

Lithology

0 - 9 ft	very fine grained, red. silty sand
9 - 14 ft	dominantly vfg silty sand with 1" beds of med to coarse sand (did not penetrate shale)



Table B-1. Practical Quantification Limits for Radionuclides

Analytical Method	Analyte	Soil PQL	Units
EPA 901.1	Actinium-228	0.39	pCi/g
	Bismuth-212	0.8	pCi/g
	Bismuth-214	0.22	pCi/g
	Cesium-137	0.13	pCi/g
	Cobalt-60	0.16	pCi/g
	Lead-212	0.22	pCi/g
	Lead-214	0.24	pCi/g
	Potassium-40	1.5	pCi/g
	Radium-224	2.6	pCi/g
	Radium-226	See note a	pCi/g
	Thallium-208	0.12	pCi/g
	Thorium-228	0.22 via Pb-212	pCi/g
	Thorium-234	1.4	pCi/g
	Uranium-235	0.69	pCi/g
SW 6020	Uranium, natural	0.0003	mg/g
RMO-3008	Polonium-210	1.0	pCi/g
EPA 905.0 Mod.	Lead-210	1.0	pCi/g
EPA 903.01	Radium-226	0.2	pCi/g
EPA 907.0	Thorium-230	0.2	pCi/g
	Thorium-232	0.2	pCi/g
	Thorium-228	0.2	pCi/g

## Notes:

<sup>a</sup>Radium-226 requires a 21 day in-growth and is reported through its daughter product Bismuth-214

pCi/g = picocuries per gram

mg/g = milligram per gram

PQL = practical quantitation limit



Table B-2. Quality Control for Laboratory Data Evaluation: Radiological Parameters

Analytical Method	Spiking Compounds	Accuracy Percent Recovery (%)	Precision (RER) <sup>b</sup>
Matrix Spike/Matrix Spike	Duplicate/Matrix Duplicate		
EPA 901.1	Actinium-228	NA	<1.0
	Bismuth-212	NA	<1.0
	Bismuth-214	NA	<1.0
	Cesium-137	NA	<1.0
	Cobalt-60	NA	<1.0
	Lead-212	NA	<1.0
	Lead-214	NA	<1.0
	Potassium-40	NA	<1.0
	Radium-224	NA	<1.0
	Radium-226	NA	<1.0
	Thallium-208	NA	<1.0
	Thorium-228	NA	<1.0
	Thorium-234	NA	<1.0
	Uranium-235	NA	<1.0
	Uranium-238	NA	<1.0
RMO-3008	Polonium-210	NA	<1.0
	tracer Polonium-209	40-120%	<1.0
EPA 905.0 Mod.	Lead-210	NA	
	Tracer, stable lead and bismuth	40-120%	≤1.0
EPA 903.1	Radium-226	40-120%	<1.0
SW 6020	Uranium, natural	40-120%	<1.0
EPA 907.0	Thorium-230	NA	<1.00
	Thorium-232	NA	<1.00
	Tracer		
	Thorium-229	40-120%	NA

Notes:

NA = not applicable

RER = replicate error ratio (calculated between parent sample and matrix duplicate)

RPD = relative percent difference



Table B-3 Wet Radio-chemistry: Calibration Specification and Corrective Action Summary

Analytical Method <sup>(a)</sup>	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
All methods in Table A2 except 901.1	Isotopic thorium, Lead-210, Polonium-210, Natural Uranium, Radium-226	Method blank	1 per preparation batch (≤20 samples)	Result ≤ Reporting limit	Recount/reanalyze preparation blank and all associated samples or NCM and note in narrative, as appropriate
		Matrix spike	See chemical recovery below	60-140 percent (guidance limits)	If not in guidance limits, flag and note in narrative
		Matrix Duplicate	1 per preparation batch (≤20 samples)	RPD ≤ 40 percent RER ≤ 1.0 (for values >MDA)	Recount/reanalyze sample and duplicate, if not in control limits, reanalyze batch or flag and note in narrative, as appropriate
		LCS	1 per preparation batch (≤20 samples)	64-145 percent	Recount LCS, and if fails second time, reanalyze LCS and all associated samples or NCM and note in narrative, as appropriate
		Chemical Recovery	Every sample (thorium-229 tracer)	20-120 percent	Recount/reanalyze sample, if not in control limits, flag and note in narrative

Notes:  
 LCS = laboratory control sample  
 MDA = minimum detectable activity  
 RER = relative error ratio  
 RPD = relative percent difference



Table B-4. Gamma Spectrometry: Calibration Specification and Corrective Action Summary

Analytical Method <sup>a)</sup>	Parameter	QC Element	Frequency	Acceptance Criteria	Corrective Action
EPA 901.1 Gamma spectrometry	Bismuth-212	Instrument Background Check	Daily	Control chart $\pm 3$ sigma	Recount twice, if not in control limits place detector on hold for maintenance, as necessary
	Bismuth-214	Instrument blank	1 per preparation batch ( $\leq 20$ samples)	Result $\leq$ Reporting limit	Reanalyze blank and all associated samples analyzed on that detector
	Lead-212				To be determined;
	Lead-214				To be determined;
	Potassium-40				To be determined;
	Radium-224				To be determined;
	Radium-226				To be determined;
	Thallium-208				To be determined;
	Thorium-228				To be determined;
	Thorium-234				To be determined;
	Uranium-235				To be determined;

Notes

LCS = laboratory control sample

MDA = minimum detectable activity

REr = relative error ratio

RPD = relative percent difference



# BASELINE SAMPLING PLAN FOR DEWEY-BURDOCK IN SITU URANIUM PROJECT

Topical Report RSI-1956

*prepared for*

Powertech (USA) Inc.  
145 N. Chicago Avenue, Suite C  
Hot Springs, South Dakota 57747

November 2007





RECEIVED

NOV 12 2007

MINERALS & MINING PROGRAM

# **BASELINE SAMPLING PLAN FOR DEWEY-BURDOCK IN SITU URANIUM PROJECT**

Topical Report RSI-1956

*prepared for*

**Powertech (USA) Inc.**  
145 N. Chicago Avenue, Suite C  
Hot Springs, South Dakota 57747

November 2007



## CONTRIBUTORS TO THE REPORT

**Paul Bergstrom**

Knight Piésold and Co.  
1050 17th Street  
Suite 450  
Denver, CO 80265

**Crystal Hocking**

**Dan Hoyer**

RESPEC  
P.O. Box 725  
Rapid City, SD 57709

**Ken Baker**

Environmental Restoration Group, Inc.  
8809 Washington St., NE  
Suite 150  
Albuquerque, NM 87113

**Gwyn McKee**

Jones & Stokes  
1901 Energy Court, Suite 115  
Gillette, WY 82718

**Brenda Schladweiler**

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, WY 82717

**Tim Gillen**

Archeology Laboratory  
Augustana College  
2032 South Grange Avenue  
Sioux Falls, SD 57105



## TABLE OF CONTENTS

<b>1.0 BASELINE SAMPLING PLAN.....</b>	<b>1</b>
<b>2.0 GROUNDWATER SAMPLING PLAN.....</b>	<b>3</b>
2.1 INTRODUCTION .....	3
2.2 PERMIT REQUIREMENTS .....	3
2.3 DATA COLLECTION .....	3
2.4 GEOCHEMICAL ANALYSIS .....	3
2.5 GROUNDWATER SAMPLING SUBSET .....	4
2.6 CHEMICAL ANALYSIS.....	4
2.7 POTENTIOMETRIC SURFACE .....	4
<b>3.0 SURFACE WATER SAMPLING PLAN .....</b>	<b>7</b>
3.1 INTRODUCTION .....	7
3.2 WATER IMPOUNDMENTS .....	7
3.3 STREAMS.....	7
3.4 CHEMICAL ANALYSIS.....	8
<b>4.0 RADIOLOGICAL SAMPLING PLAN .....</b>	<b>12</b>
4.1 INTRODUCTION .....	12
4.2 AIR MONITORING .....	13
4.3 VEGETATION, FOOD, AND FISH.....	13
4.4 SOILS.....	13
4.4.1 Global Positioning System-Based Gamma Survey.....	13
4.4.2 Surface Soils .....	15
4.4.3 Subsurface Soils .....	16
4.5 DIRECT RADIATION .....	16
4.6 RADON FLUX.....	16
<b>5.0 WILDLIFE BASELINE STUDIES .....</b>	<b>17</b>
5.1 SPECIES LIST .....	17
5.2 HABITAT DESCRIPTION .....	17
5.3 BIG GAME.....	17
5.4 UPLAND GAME BIRDS .....	18
5.5 RAPTORS .....	18
5.6 BREEDING BIRDS .....	19
5.7 OTHER AVIAN SPECIES.....	20
5.8 SMALL MAMMALS .....	20



## TABLE OF CONTENTS

### (Continued)

5.9 OTHER MAMMALS .....	21
5.10 REPTILES AND AMPHIBIANS .....	22
5.11 SPECIES OF CONCERN .....	22
5.12 AQUATIC SPECIES .....	22
5.12.1 Stream Condition .....	22
5.12.2 Fish .....	22
5.12.3 Macroinvertebrates .....	23
5.12.4 Periphyton .....	23
5.13 RADIOLOGICAL TESTING .....	23
5.14 OTHER SPECIES .....	23
<b>6.0 VEGETATION BASELINE STUDIES .....</b>	<b>24</b>
6.1 INTRODUCTION .....	24
6.2 VEGETATION COMMUNITY CLASSIFICATION AND MAPPING .....	25
6.3 TRANSECT ORIGIN SELECTION .....	25
6.4 LINE TRANSECT LAYOUT .....	25
6.5 GROUND COVER .....	26
6.6 TOTAL VEGETATION COVER .....	26
6.7 TOTAL GROUND COVER .....	26
6.8 SPECIES DIVERSITY .....	26
6.9 PRODUCTION .....	27
6.10 SHRUB DENSITY .....	27
6.11 TREE DENSITY .....	27
6.12 SAMPLE ADEQUACY .....	27
6.13 PLANT SPECIES LIST .....	29
6.14 OTHER DATA COLLECTED .....	29
6.15 EXTENDED REFERENCE AREA MAPPING AND JUSTIFICATION .....	29
<b>7.0 CULTURAL RESOURCES .....</b>	<b>32</b>
7.1 PRELIMINARY RECORD SEARCH .....	32
7.2 LEVEL III ARCHEOLOGICAL SURVEY .....	33
<b>8.0 REFERENCES .....</b>	<b>35</b>
<b>APPENDIX A. WELL COMPLETION REPORTS FOR SAMPLED WELLS .....</b>	<b>A-1</b>
<b>APPENDIX B. PLATES .....</b>	<b>B-1</b>



## LIST OF TABLES

TABLE	PAGE
2-1 Constituents to Be Analyzed in Groundwater Samples .....	5
3-1 Surface Water Impoundment Sample Sites.....	8
4-1 Vegetation Map Units and Associated Acreages.....	24
4-2 Vegetation Baseline Sampling—Measured Parameters.....	24
4-3 Vegetation Monitoring Minimum/Maximum Sample Population Requirements for Upland Grassland, Ponderosa Pine Woodland, and Riparian Communities .....	28
4-4 Threatened and Candidate Species to Be Sampled .....	30
4-5 Species of Special Concern to Be Sampled.....	31



## LIST OF FIGURES

FIGURE	PAGE
1-1 Dewey Burdock General Site Map.....	2
2-1 Potentiometric Map of the Fall River Aquifer Near the Dewey-Burdock Site.....	5
3-2 Impoundment Sampling Locations Near the Dewey-Burdock Site.....	9
3-3 Stream Sampling Locations Near the Dewey-Burdock Site.....	10



## 1.0 BASELINE SAMPLING PLAN

Powertech Uranium Corporation has proposed to conduct in situ mining within a uranium-enriched ore deposit on the proposed permit area known as the Dewey-Burdock project. This area is located approximately 12 to 15 miles north-northwest of Edgemont, South Dakota, and spans northern Fall River and southern Custer Counties. The proposed permit area consists of approximately 11,000 acres of private land on either side of County Road 6463 and encompasses portions of Sections 1-4 and 9-15, T7S, R1E and Sections 26-35, T6S, R1E. Figure 1-1 shows the site boundary.

A baseline environmental study in the Dewey-Burdock area is being completed per the requirements of the South Dakota Department of Environment and Natural Resources (SD DENR), U.S. Nuclear Regulatory Commission (US NRC), and U.S. Environmental Protection Agency (US EPA). The purpose of this report is to summarize the baseline sampling plan for groundwater and surface water, radiological monitoring, wildlife, plants, and archaeology.



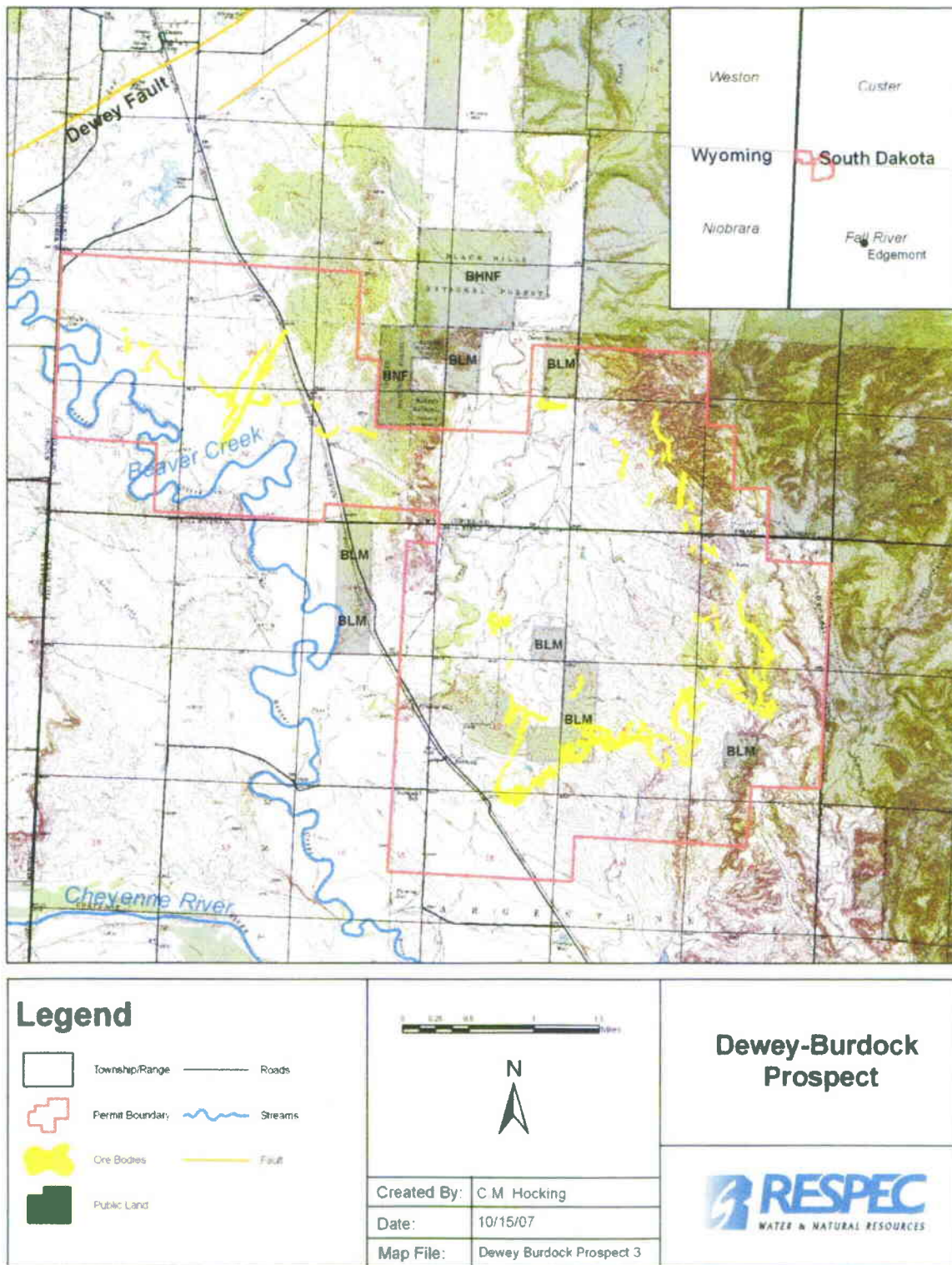


Figure 1-1. Dewey-Burdock General Site Map.



## 2.0 GROUNDWATER SAMPLING PLAN

### 2.1 INTRODUCTION

In situ leach mining occurs directly in the subsurface; therefore, it is vital to characterize the baseline water quality. The permit requirements, overview of data and results, and proposed sampling plans are described below.

### 2.2 PERMIT REQUIREMENTS

The SD DENR Large-Scale Mine Permit (ARSD Rule 74:29:11:07) requires a baseline sampling plan to include "an adequate number of wells and samples to adequately characterize baseline water quality in production and nonproduction zones." The SD DENR permit also states that samples should be taken once a month for a minimum of 6 months before mining. US NRC Guide 4.14 (RG 4.14) *Radiological Effluent and Environmental Monitoring at Uranium Mills* states that every well within 2 kilometers of the mining area used for domestic, livestock, or irrigation purposes must be sampled quarterly for 1 year's time. Of those wells included in sampling, there must be one well that is hydrologically upgradient from the site as well as three wells downgradient.

### 2.3 DATA COLLECTION

Data from the United States Geological Survey (USGS), well completion reports, and various Tennessee Valley Authority (TVA) data reports were used to generate Geographic Information System (GIS) files of wells. Because of the quality of data, the location of nearly all the wells was not precisely known. In an effort to increase the accuracy and understanding of the data, field efforts focused on locating water wells, primarily those within 2 kilometers of the permit boundary. To date, 77 wells of approximately 250 total wells have been field verified, photographed, and described. Of the 84 wells within 2 kilometers of the permit boundary, over 60 wells were located. Most wells serve as water supply for livestock, although some wells are used for domestic or other purposes or are abandoned. Available well completion reports are found in Appendix A. Sampled wells without well completion reports will be logged in the near future to determine depth and completion.

### 2.4 GEOCHEMICAL ANALYSIS

In an effort to understand the current groundwater geochemistry, the historical TVA data were analyzed. Twenty-four geochemical maps were created that displayed the median value for water-quality samples taken from wells between 1979 and 1984. Descriptive statistics, box



plots, and Kruskal-Wallis analysis were performed for wells which were considered to be statistically viable (i.e., having ten samples or more over the 5-year time period). Trilinear diagrams were also created for water-quality samples collected June 8, 1979, and September 12, 1979. Based on these geochemistry results, it was determined that the water chemistry does not vary much by date or member of the Inyan Kara Aquifer.

## **2.5 GROUNDWATER SAMPLING SUBSET**

Because of the significant number of groundwater wells and their noted geochemical similarities, sampling a representative subset of the wells was proposed. The wells were selected based on type of use, aquifer, and location. For the baseline study, 19 groundwater wells (14 existing and 5 newly drilled) were selected as making up a representative sampling group for the area (see Plate 1 in Appendix B). The wells selected for sampling include all eight domestic wells within 2 kilometers of the permit boundary and six stock watering wells, with three wells being hydrologically upgradient of the mining area. The subset includes wells within the Fall River Formation (4), Lakota Formation (7), Inyan Kara Group (Fall River or Lakota) (2), Sundance Formation (1), and alluvium (5). Initial baseline sampling will be conducted quarterly, although monthly sampling will commence 6 months before mining operations. US EPA standard operating procedures for monitor well sampling as well as quality assurance/quality control (QA/QC) samples will be followed [U.S. Environmental Protection Agency, 2005].

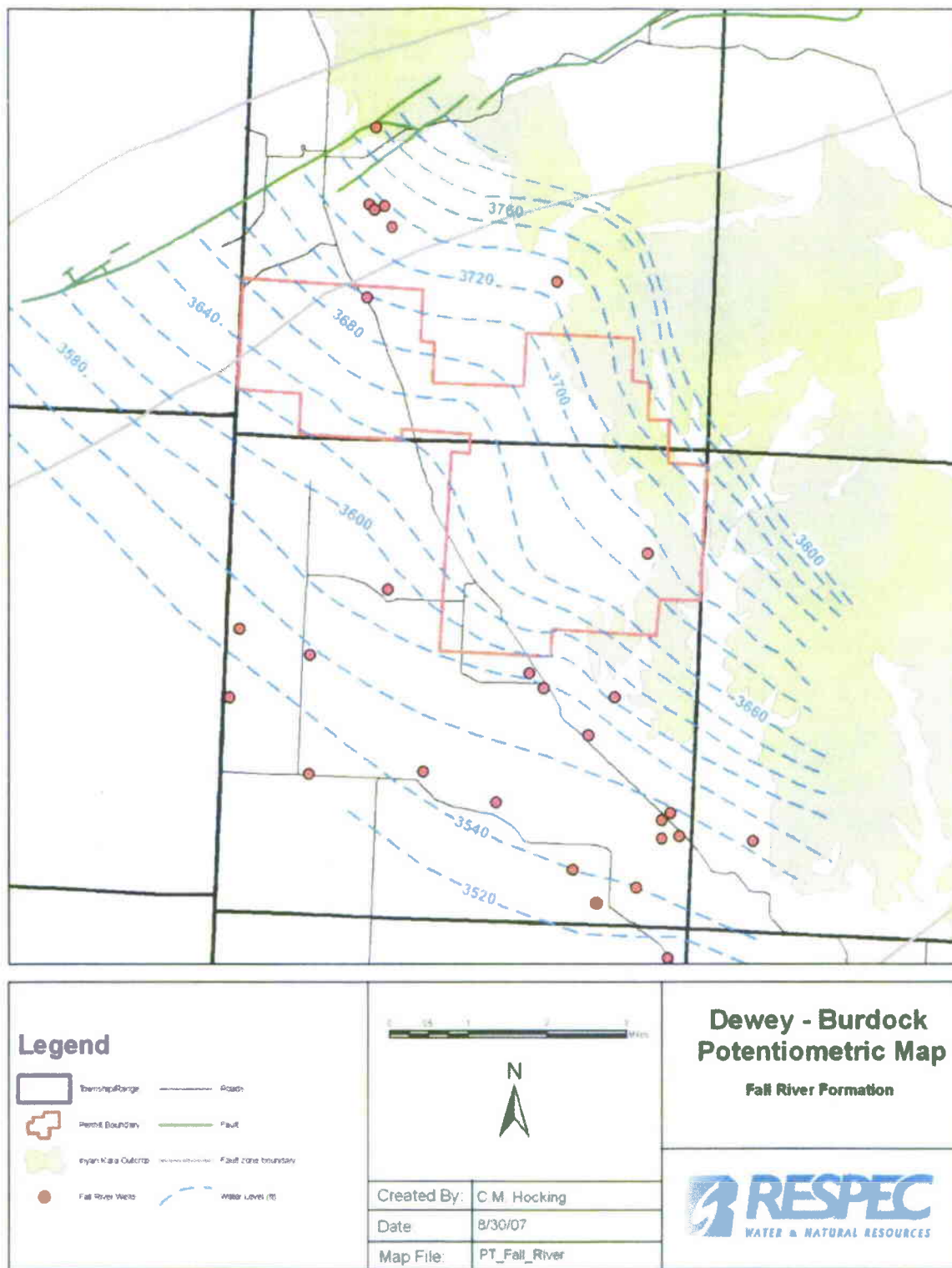
## **2.6 CHEMICAL ANALYSIS**

In the field, in situ measurements will be made for specific conductance, temperature, turbidity, and pH. Groundwater samples will also be analyzed in the laboratory for a variety of constituents listed in Table 2-1. Ra-228 will be added to the laboratory analysis if initial sampling indicates the presence of Th-232. QA/QC samples, including field replicates and field blanks, will also be analyzed.

## **2.7 POTENTIOMETRIC SURFACE**

Water levels will be measured at 18 groundwater wells, including 5 shallow alluvial wells (see Plate 3 in Appendix B). Measurements will be taken periodically to establish natural fluctuations in the water table. Maps of the potentiometric surface for the Fall River (Figure 2-1) and Lakota aquifers were generated using historical TVA data and will be revised as new water level measurements dictate.





**Figure 2-1.** Potentiometric Map of the Fall River Aquifer Near the Dewey-Burdock Site.



**Table 2-1. Constituents to Be Analyzed in Groundwater Samples**

Aluminum <sup>(d)</sup>	Selenate <sup>(d)</sup>
Ammonia	Silica <sup>(d)</sup>
Arsenic <sup>(d)</sup>	Silver <sup>(d)</sup>
Barium <sup>(d)</sup>	Sodium <sup>(d)</sup>
Boron <sup>(d)</sup>	Sulfate
Cadmium <sup>(d)</sup>	Uranium <sup>(d,s)</sup>
Calcium <sup>(d)</sup>	Vanadium <sup>(d)</sup>
Chloride	Zinc <sup>(d)</sup>
Chromium <sup>(d)</sup>	Gross Alpha <sup>(d)</sup>
Copper <sup>(d)</sup>	Gross Beta <sup>(d)</sup>
Fluoride	Gross Gamma <sup>(d)</sup>
Iron <sup>(d)</sup>	Radon 222
Lead <sup>(d)</sup>	Radium 226 <sup>(d)</sup>
Lead 210 <sup>(d,s)</sup>	Thorium 230 <sup>(d,s)</sup>
Magnesium <sup>(d)</sup>	Thorium 232 Dissolved <sup>(d)</sup>
Manganese <sup>(d)</sup>	Anion-Cation Balance
Mercury <sup>(d,t)</sup>	Alkalinity
Molybdenum <sup>(d)</sup>	Bicarbonate
Nickel <sup>(d)</sup>	Carbonate
Nitrate	Conductivity
Nitrite	Total Dissolved Solids (TDS)
Potassium <sup>(d)</sup>	pH
Polonium 210 <sup>(d,s)</sup>	Oxygen Reduction Potential
Selenium <sup>(d)</sup>	Sodium Adsorption Ratio
Selenite <sup>(d)</sup>	

d Dissolved Concentration

s Suspended Concentration

t Total Concentration



## 3.0 SURFACE WATER SAMPLING PLAN

### 3.1 INTRODUCTION

In situ leach mines generally have minimal surface impact and do not have associated tailings impoundments; however, it is still vital to characterize the baseline water quality. The permit requirements and proposed sampling plans for water impoundments and streams are described below.

### 3.2 WATER IMPOUNDMENTS

US NRC Guide 4.14 (RG 4.14) requires that one grab sample be taken quarterly from all "large permanent on-site water impoundments or off-site impoundments that may be subject to direct surface drainage from potentially contaminated areas or that could be affected by a tailings impoundment failure." The SD DENR Large-Scale Mine Permit (ARSD Rule 74:29:11:02) indicates that background radiological data for surface waters "that could be affected by the proposed operations" need to be sampled.

In an effort to develop a sampling plan, surface water impoundments, including stock dams and mine pits, were originally identified on topographic maps and aerial photographs. Several days in early July were spent in the field gathering data. All together, 39 impoundments were verified, photographed, and described (see Table 3-1 and Figure 3-1). Although the study area received approximately 1 inch of rain just 2 days before field work, 14 impoundments were dry. Four wet stock dams were observed to be under the direct influence of water from free-flowing artesian wells. Field observations and watershed analysis of digital elevation models (DEMs) revealed that the drainage basins of many of the impoundments are extremely small.

Because of the number of impoundments and their characteristics, sampling a representative subset of the water impoundments was proposed. Impoundments were selected based on the presence of water, drainage area, and location. Ten surface water impoundments were selected as making up a representative sampling group for the area (see Table 3-1 and Figure 3-1).

### 3.3 STREAMS

In compliance with US NRC Guide 4.14 (RG 4.14) and other permits, each of the streams (perennial or ephemeral) will be sampled upstream and downstream of the permit boundary. One monthly sample will be collected on Beaver Creek both at the USGS gage station (BVC04) and near Burdock (BVC01) (see Figure 3-2). Although it does not pass through the permit boundary, the Cheyenne River will also be sampled monthly upstream of the confluence with



Beaver Creek (CHR01) and south of the confluence at Marietta (CHR05). When flowing, samples will be taken using passive samplers on intermittent streams, including Pass Creek (PSC01 and PSC02), Bennett Canyon (BEN01), and one unnamed tributary west of Bennett Canyon (UNT01) (see Figure 3-2).

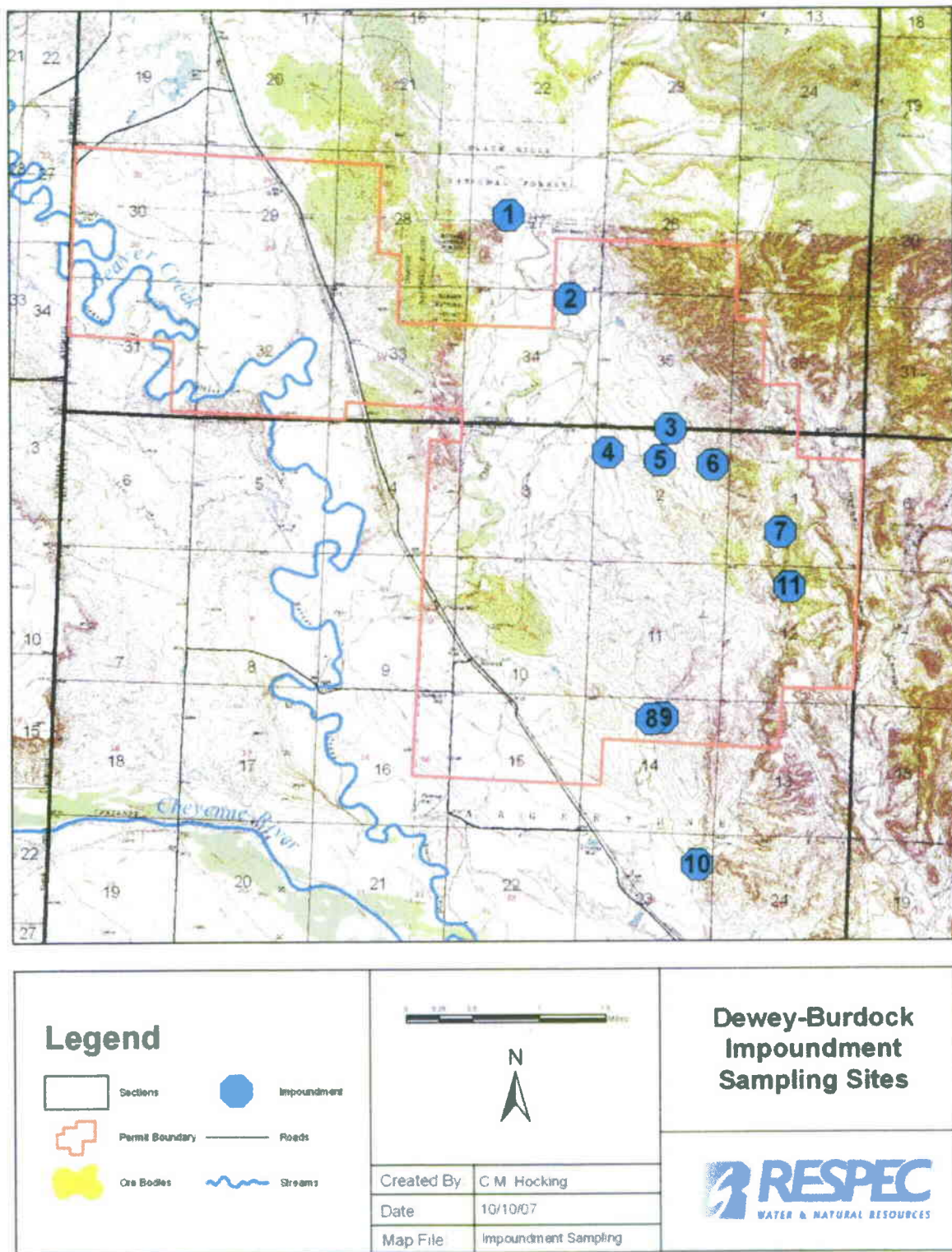
**Table 3-1. Surface Water Impoundment Sample Sites**

ID Number	Location	Name/Comment	Water	Groundwater Influence
1	Sec. 27, T6S, R1E	Stock Dam west of Doran Ranch	×	
2	Sec. 34, T6S, R1E	Triangle Mine Pit	×	×
3	Sec. 2, T7S, R1E	Stock Dam—drainage from Spencer-Richardson Mine	×	
4	Sec. 2, T7S, R1E	Stock Dam west of Darrow Mine	×	
5	Sec. 2, T7S, R1E	Darrow Mine Drainage Dam	×	
6	Sec. 2, T7S, R1E	N Darrow Mine Pit	×	
7	Sec. 1, T7S, R1E	Stock Dam east of Darrow Mine	×	
8	Sec. 14, T7S, R1E	Stock Dam fed from flowing well	×	×
9	Sec. 14, T7S, R1E	Stock Dam East of #8	×	
10	Sec. 23, T7S, R1E	Large Stock Dam	×	
11	Sec. 12, T7S, R1E	Stock Dam SE of Darrow Mine	×	

### 3.4 CHEMICAL ANALYSIS

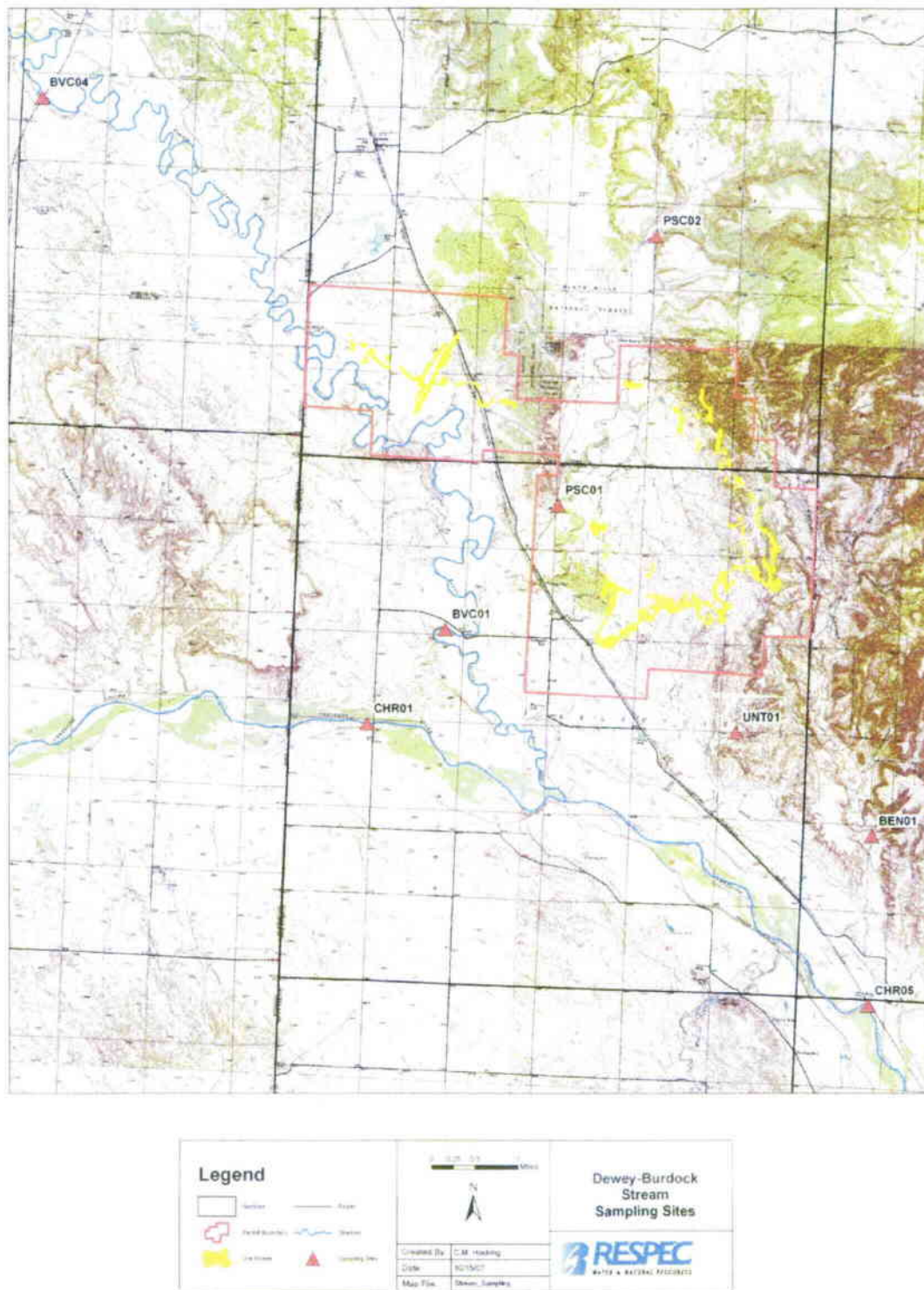
In the field, in situ measurements will be made for specific conductance, temperature, turbidity, dissolved oxygen, and pH. Surface water samples will also be analyzed in the laboratory for a variety of constituents listed in Table 3-2. Ra-228 will be added to the laboratory analysis if initial sampling indicates the presence of Th-232. For those samples taken by passive samplers where holding times exceed the recommended time from collection to analysis, certain constituents will not be reported (fecal coliforms, for example). In addition to the water sample taken from each of the ten impoundments, a sediment sample will be taken once from each site and analyzed for uranium, radium-226, thorium-230, and lead-210 (per the requirements of US NRC Guide 4.14 (RG 4.14)). Sediment samples will also be taken twice at the upstream (BVC04) and downstream (BVC01) sites on Beaver Creek, “once following spring runoff and late summer following extended low flow” (US NRC Guide 4.14 (RG 4.14)).





**Figure 3-1.** Impoundment Sampling Locations Near the Dewey-Burdock Site.





**Figure 3-2.** Stream Sampling Locations Near the Dewey-Burdock Site.



**Table 3-2. Constituents to Be Analyzed in Surface Water Samples**

Aluminum <sup>(d,t)</sup>	Selenate <sup>(d,t)</sup>
Ammonia	Silica <sup>(d,t)</sup>
Arsenic <sup>(d,t)</sup>	Silver <sup>(d,t)</sup>
Barium <sup>(d,t)</sup>	Sodium <sup>(d,t)</sup>
Boron <sup>(d,t)</sup>	Sulfate
Cadmium <sup>(d,t)</sup>	Uranium <sup>(d,s,t)</sup>
Calcium <sup>(d,t)</sup>	Vanadium <sup>(d,t)</sup>
Chloride	Zinc <sup>(d,t)</sup>
Chromium <sup>(d,t)</sup>	Gross Alpha
Hexavalent Chromium <sup>(t)</sup>	Gross Beta
Trivalent Chromium <sup>(t)</sup>	Gross Gamma <sup>(t)</sup>
Copper <sup>(d,t)</sup>	Radium 226 <sup>(d,s,t)</sup>
Fluoride	Thorium 230 <sup>(d,s,t)</sup>
Iron <sup>(d,t)</sup>	Thorium 232 <sup>(d,s,t)</sup>
Lead <sup>(d,t)</sup>	Anion-Cation Balance
Lead 210* <sup>(d,s,t)</sup>	Alkalinity
Magnesium <sup>(d,t)</sup>	Bicarbonate
Manganese <sup>(d,t)</sup>	Carbonate
Mercury <sup>(d,t)</sup>	Conductivity
Molybdenum <sup>(d,t)</sup>	Total Dissolved Solids (TDS)
Nickel <sup>(d,t)</sup>	Total Suspended Solids (TSS)
Nitrate	pH
Potassium <sup>(d,t)</sup>	Fecal Coliform Bacteria
Polonium 210* <sup>(d,s,t)</sup>	Sodium Adsorption Ratio
Selenium <sup>(d,t)</sup>	Suspended Sediment Concentration
Selenite <sup>(d,t)</sup>	

d Dissolved Concentration

s Suspended Concentration

t Total Concentration

\* Semiannual Analysis



## 4.0 RADIOLOGICAL SAMPLING PLAN

### 4.1 INTRODUCTION

Recommendations in US NRC Regulatory Guide 4.14 (RG 4.14), Revision 1 originally were used to establish baseline (preoperational) radiological monitoring requirements for Powertech Uranium's proposed Dewey-Burdock uranium in situ recovery (ISR) facility located near Edgemont, South Dakota. The RG 4.14 was used because it is specifically mentioned in Nuclear Regulatory Guide (NUREG) 1569 *Standard Review Plan for In Situ Leach Uranium Extraction License Application*, and the data are typical of what licensing organizations expect to see in an application. Current licensing activities in the uranium ISR industry are revealing that recommendations in RG 4.14 may not provide the most appropriate methods to establish baseline radiological conditions of an ISR facility in general. Some of the general characteristics of ISR facility which may make application of RG 4.14 recommendations inappropriate are as follows:

- Uranium ISR facilities have no tailings impoundments, and in the case of satellite facilities, may not have a centralized processing location or yellowcake dryer. In these cases, establishing the polar coordinate sampling system originating at the central processing facility, as recommended by RG 4.14, is ambiguous.
- Typically, radon-222 is the only routine or planned emission from uranium ISR facilities, so airborne emission and off-site deposition of long-lived radionuclides in the uranium-238 decay series, such as radium-226, thorium-230, and natural uranium, is not as significant when compared to a conventional uranium mill.
- Unplanned releases of radioactive materials most likely will involve spills of production or restoration fluids. Surface environmental impacts from these types of releases would be localized and likely contained within the permit boundary of the facility.

The proposed Dewey-Burdock facility has site-specific characteristics which also make strict application of RG 4.14 less appropriate. These site-specific characteristics include the following:

- The current plan is to operate as a satellite facility with a mobile ion exchange system. The ion exchange system will be moved near active well fields. Once a well field is mined, the ion exchange system will be moved to the next active well field. Given this scenario, there is no centralized processing facility.
- The proposed permit boundary contains inactive open pit uranium mines, historic uranium exploration holes, and rail track with high coal train traffic. These surface features act as potential radionuclide sources which are unrelated to the proposed activities at the site. The methods recommended in RG 4.14 are not adequate to properly characterize these potential sources.



An alternative baseline sampling program is proposed to provide a better estimate of background radiological conditions at the Dewey-Burdock site. The following sections describe the proposed alternative program and how it differs from RG 4.14 and the basis for the approach.

## **4.2 AIR MONITORING**

No alternatives to the approach in RG 4.14 are suggested. Eight high-volume air monitoring stations were established within and surrounding the proposed permit area. The samplers will be operated continuously with quarterly filter composites sent for laboratory analysis of natural uranium, radium-226, thorium-230, and lead-210. Passive radon-222 detectors (track etch detectors) will be placed near each high-volume air sampler as well as seven other locations within the permit boundary. The location of the high-volume monitoring stations in relation to the proposed permit boundary is shown on Plate 3 in Appendix B.

## **4.3 VEGETATION, FOOD, AND FISH**

No alternatives to the approach in RG 4.14 are suggested. Vegetation samples will be collected from each high-volume air monitoring location and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210. Sampling will occur three times during the grazing season.

Meat samples from locally grazing livestock will be collected once and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210. No crops are currently being grown near the site. Four fish samples will be collected and analyzed for natural uranium, radium-226, thorium-230, lead-210, and polonium-210.

## **4.4 SOILS**

### **4.4.1 Global Positioning System-Based Gamma Survey**

A Global Positioning System- (GPS-) based gamma survey will be conducted across the site. Currently, the site was divided into two areas: the mined area and the remaining site area. For the mined area, gamma survey transects spacing of 100 meters will be conducted. For the remaining site area, the transect spacing will be 500 meters (see Figure 4-1). In addition, gamma surveys of service roads along the rail tracks will be performed to evaluate radiological impacts from coal trains. If tighter transects are needed as evidenced by field data, spacing adjustments will be made in the field following input and approval from team members.



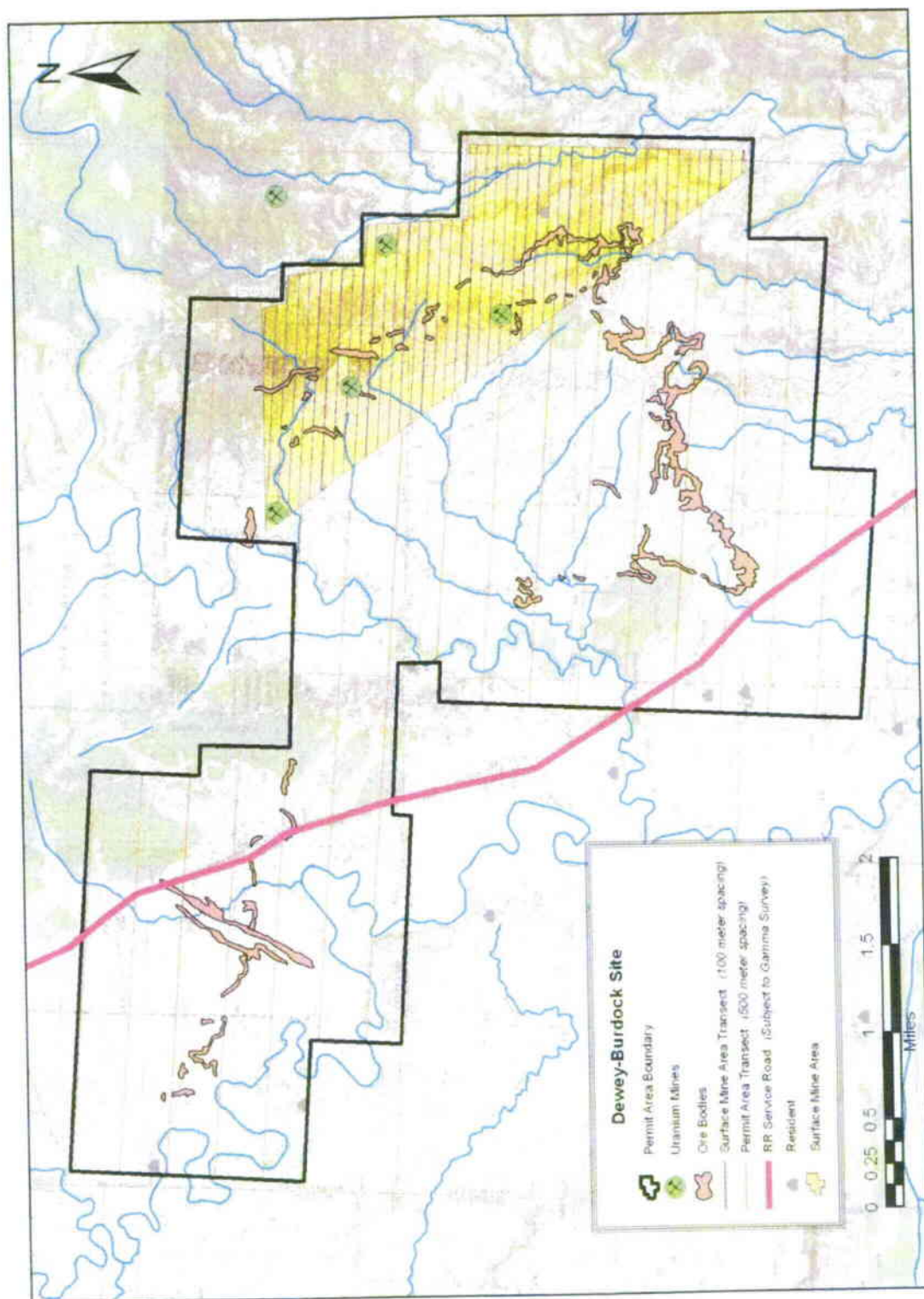


Figure 4-1. Gamma Survey Transects.



#### 4.4.2 Surface Soils

Surface soils at a depth interval of 0-5 centimeters will be collected once at the air monitoring locations and analyzed for natural uranium, radium-226, thorium-230, and lead-210. This is consistent with the recommendations of RG 4.14. This sampling recommendation was retained because the 0-5-centimeter-depth interval is the most sensitive to aerial deposition of radionuclides.

The remaining surface soil sampling is an alternative to the methods described in RG 4.14. The polar coordinate sampling grid was abandoned and a stratified random sampling design coupled with GPS-based gamma surveys developed. In addition, the 0-5-centimeter sample depth for the polar coordinate sampling grid was changed to a 0-15-centimeter sample depth. This change reflects the sample depth established for radium-226 soil cleanup standards in 10 CFR 40. The samples will be analyzed for the radionuclides described in RG 4.14.

The soil sampling strategy will be developed using information obtained from the GPS-based gamma survey. The soil sampling plan (i.e., number and location of samples) will be based on the following criteria:

- The number and location of radiological anomalies attributable to naturally occurring or anthropogenic land surface features (i.e., open pit mining, historic exploration activities, rail tracks) as determined by the gamma survey.
- Mean and variability of the gamma survey data.
- Stratified random sampling design in order to estimate the central tendency of radionuclide distributions.
- Biased soil sampling, if needed, to encompass the range of radionuclide concentrations.

Once the gamma survey is complete, Environmental Restoration Group, Inc. (ERG) will develop a draft soil sampling plan based on data obtained from the gamma survey. This strategy will then be submitted to the Powertech team for review. Once the team has reviewed the soil sampling plan, ERG will incorporate comments and recommendations to form a consensus soil sampling plan.

For each soil sampling location identified, the following data will be collected:

- Direct gamma radiation measurements using the same geometry as measurements taken in the GPS-based survey. This data will be correlated to radium-226 concentrations. The correlation will be applied to data collected in the gamma survey to provide estimated radium-226 soil concentrations.
- Laboratory data for radium-226 with 10 percent of the samples analyzed for natural uranium, thorium-230, and lead-210.



#### **4.4.3 Subsurface Soils**

Consistent with RG 4.14, nine subsurface soil samples will be collected, but not along the polar coordinate sampling grid which, as mentioned above, was abandoned. The locations of the subsurface samples will be determined in the same manner as the 0-15-centimeter surface soils stated previously. Samples will consist of soil composites of 15-30-centimeter and 30-100-centimeter depth intervals. All samples will be analyzed for radium-226 and at least one set analyzed for natural uranium, thorium-230, and lead-210.

#### **4.5 DIRECT RADIATION**

Gamma exposure rate measurements will be collected using thermoluminescent dosimeters (TLDs) at each air monitoring location. The TLDs will be exchanged quarterly for 1 year.

Exposure rate measurements using a High Pressurized Ion Chamber (HPIC) will be made in areas encompassing the expected range of exposure rates at the site. These HPIC data will be correlated to count rate data from NaI detectors using the same geometry used in the gamma survey. Using this correlation, the count rate data from the gamma survey will be used to estimate exposure rates along transects shown in Figure 4-1.

#### **4.6 RADON FLUX**

Consistent with RG 4.14, nine radon flux measurements using EPA Method 115 will be collected in each of 3 months, but not along the polar coordinate sampling grid which, as mentioned above, was abandoned. The locations of the flux measurements will be determined in the field and will be concentrated in the area of the surface uranium mines. These open pit mines are expected to be a significant source of ambient radon-222 in the mine permit area.



## **5.0 WILDLIFE BASELINE STUDIES**

The purpose of the surveys will be to determine the baseline aquatic and wildlife characteristics of the Dewey-Burdock property and the potential impacts of uranium extraction.

### **5.1 SPECIES LIST**

Before initiating field studies, a potential vertebrate species list for the study area will be developed. Information on species' range and occurrence will be obtained from available literature. This will include standard field guides, regional faunal texts and checklists, previous wildlife studies in the vicinity, and any available state and federal agency data. During all field investigations, lists of species actually observed on and near the proposed permit area will be maintained.

### **5.2 HABITAT DESCRIPTION**

Wildlife habitats within the proposed permit area will be described in terms of general physical and vegetative characteristics, using terminology that corresponds with vegetative maps of the study area generated from field surveys conducted by BKS Environmental Associates, Inc. (BKS). Special emphasis will be placed on documenting and describing any high value, unusual, or critical wildlife habitats. Specific vegetation sampling itself will be coordinated between BKS and South Dakota Game, Fish & Parks (SD GFP) staff following standard and accepted methodology and designations. Results and maps from that vegetation sampling will be provided in a separate document, as for previous permit applications. General discussion of wildlife habitats will be included in the wildlife baseline report.

### **5.3 BIG GAME**

During a site visit with Mr. Mark Hollenbeck (Powertech Uranium Corporation), Mr. Stan Michals (SD GFP), Ms. Gwyn McKee (Jones & Stokes (J&S)), and Mr. Brian Grasman (J&S) in July 2007, it was agreed that big game pellet counts would not be required for baseline studies associated with the Dewey-Burdock project. No such counts were required for other baseline studies at other South Dakota properties in the recent past. In keeping with methods used for those projects, J&S biologists will document all big game observations on and within 1 mile of the proposed permit area during each site visit throughout the baseline study period. Data collected will include the date, location, species and number of animals, habitat type, and activity. Each sighting will be provided in a table appended to the wildlife baseline report. Those data, plus a review of existing information, will be used to describe big game use of the area in the report text.



## 5.4 UPLAND GAME BIRDS

The Dewey-Burdock project is within the known range of a variety of upland game bird species, including the sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus*), wild turkey (*Meleagris gallopavo*), and mourning dove (*Zenaidura macroura*). Other introduced species could also be present in the region. Seasonal observations of game birds and their sign, as well as habitat assessments, will be used to determine the current and potential use of the proposed permit area by these species throughout the year, with special attention during the breeding, brood-rearing, and winter months.

No grouse leks are known to exist near the proposed Dewey-Burdock permit area, with the nearest known lek located approximately 6 to 8 miles northwest of the project site. Lek searches will be conducted from late March through April and will include the proposed permit area and 1-mile perimeter. Searches will be conducted between dawn and 1 hour after sunrise. Biologists will drive existing roads and two-tracks through suitable habitat in the survey area, stopping at intervals of 1 mile or less to scan and listen for displaying grouse. All newly discovered leks will be noted. Any new areas where displaying activity is observed will be checked two more times during the breeding season at 7- to 10-day intervals, when weather permits. Lek attendance counts at those locations will be conducted from ½ hour before to ½ hour after sunrise. Peak male numbers will be determined using repeated counts until the observer is confident in the tally. The number of females observed will also be recorded. Survey results will be incorporated into the wildlife baseline report.

If grouse leks are discovered, J&S biologists will search the permit area to determine whether birds are using the area for brood production. If warranted, brood surveys will occur in June 2008 and will be conducted using pedestrian surveys in or along creeks or other mesic drainages. Surveys will begin no sooner than 9 a.m. to allow time for hens to take their broods to water or other moist areas. Winter use will be assessed from December 2007 to mid-February 2008. In addition to data from systematic surveys, all incidental observations (including nests) of game birds made during other surveys will be recorded throughout the year. Data presentation and analysis for upland game birds will include a map of any historic and current lek locations, peak attendance numbers at active leks, and a summary of incidental game bird observations. A table listing all upland game bird occurrences will be appended to the baseline wildlife report.

## 5.5 RAPTORS

J&S biologists will document all raptor sightings on and within 1 mile of the proposed Dewey-Burdock permit area throughout the baseline study period. Seasonal raptor use of the area will be determined by reviewing existing data and compiling results from specific surveys and incidental observations. The baseline wildlife report will include a discussion of raptor use



of the area, including a topographic map depicting all nests within the study area and the nesting history of each site, when available. Nests will be mapped in the field using hand-held GPS receivers; those efforts will be timed to prevent disruption of active nest sites. A table listing all raptor sightings made within the survey area during baseline studies will be appended to the report.

Searches for nesting raptors will be conducted within the proposed permit area and 1-mile perimeter. Efforts will consist of pedestrian searches in potential nesting areas during the nonbreeding season and remote observations from vantage points using binoculars and a spotting scope during the nesting season. Initial surveys for early-nesting species, such as golden eagles (*Aquila chrysaetos*) and great horned owls (*Bubo virginianus*), will be conducted in February 2008. Surveys for other raptor species will be conducted periodically from late March through early May that year. All known nests will be monitored to determine their nesting status (active/inactive) for the year. Active nests will be visited in May and June to obtain production information. Nest checks during all periods will be brief and conducted from a distance to avoid flushing raptors from their nests [Grier and Fyfe, 1987].

Winter use of the study area by raptors will be determined through specific surveys and incidental observations. Searches for bald eagle (*Haliaeetus leucocephalus*) winter roost sites will be conducted once per month from December 2007 through February 2008, per current survey guidelines. Roost searches will be conducted during one of two survey windows during each visit: from ½ hour before to 1 hour after sunrise, or from 1 hour before to ½ hour after sunset. Surveys will likely consist of two evening searches and one morning search to maximize observations. All raptor species observed during those surveys and other winter site visits will also be recorded, including date, species and number of birds, location, habitat, and activity.

## 5.6 BREEDING BIRDS

Per the July 2007 site visit with Powertech, SD GFP, and J&S, surveys for breeding birds, primarily passerines, will be conducted within the proposed permit area once during the baseline study period. Additional surveys may be requested as part of the permitting process. At least one belt transect measuring 100×1,000 meters will be established in each habitat type of sufficient acreage on the Dewey-Burdock property, with additional transects in dominant habitats. Surveys will be conducted on three consecutive mornings between late May and mid-June 2008. Results will describe avian species richness and relative abundance within the proposed permit area. This methodology will provide the desired presence/absence information.



## 5.7 OTHER AVIAN SPECIES

Occurrence of other avian species, such as waterfowl and shorebirds, will be documented through review of literature and existing data (from agency files and previous baseline studies in the area) and incidental observations within the permit area during each site visit throughout the baseline study period. All sightings will be recorded on a species list that will be appended in table format to the baseline wildlife report.

## 5.8 SMALL MAMMALS

Small mammal presence/absence within the Dewey-Burdock permit area will be determined using a combination of live, snap, and pitfall traps (1-gallon food cans buried with open top even with ground surface). Per the July 2007 project meeting with Powertech, SD GFP, and J&S, trapping will occur once (September 2007) during the baseline study period. Additional trapping may be requested as part of the permitting process. A SD GFP Scientific Collector will be obtained for both small mammal and aquatic sampling before any collection.

Per the July 2007 site visit meeting, one or two trap lines will be established in dominant habitats: four in grassland (two east and two west), one in ponderosa pine, one along the pine/sagebrush edge, one in greasewood, one in cottonwood-riparian, and one in the bentonite breaks west of Pass Creek. Each trap line will consist of 35 traps placed at 20 stations spaced at 15-meter intervals: 20 Sherman live traps (roughly 8×9×23 centimeters, 1 per station), 10 Museum Special snap traps (1 at each even-numbered station), and 5 pitfall traps (1 each at Stations 1, 5, 10, 15, and 20). Where possible, pitfall traps will be placed in existing rodent runways to increase the possibility of capturing any shrew (*Sorex* spp.) species that may inhabit the area.

Sherman live traps will be baited with a mixture of birdseed, rolled oats, peanut butter, and bacon grease. Snap traps will be baited with a blend of peanut butter and birdseed. Pitfall traps will be lined with a thin layer of dirt on the floor and baited with mealworms, earthworms, crickets, or other similar invertebrates, depending on their availability. All bait will be replenished as needed, and bedding material (cotton balls) will be placed in live and pitfall traps. Each trap line will be checked for three consecutive evenings and mornings (i.e., traps monitored twice daily), beginning with the evening of the set day. All animals captured will be identified to species, aged, and sexed, and their condition will be noted. Live captures other than shrews will be marked by clipping the front, outside right toenail and/or using permanent marker under the chin, and released. All shrews will be sent to the SD GFP for identification, with skulls intact.

The proposed trapping protocol (trap types, trap number, trap nights, and distribution) for the Dewey-Burdock project is the same as that used for the recent similar baseline studies in



South Dakota. Additionally, J&S has used live traps and three trap nights as the standard approach during regular sampling at two surface coal mines in northeast Wyoming from the mid-1980s through 2002. These efforts and published literature demonstrate that a variety of trapping methods (both transects and grids), trap days, bait mixes, and prebaiting efforts have successfully been used to obtain small mammal data. Review of results from similar trapping efforts for recent bentonite projects (Dobesh, Kudlock, Shear-Clarkson) near Belle Fourche, South Dakota, indicated that the rate of new captures typically drops below 50 percent by the second or third morning. Similar results were revealed from the Wyoming data. No new species were captured after the second morning during the recent South Dakota projects; no shrews were captured there at all. Shrews have rarely been collected during trapping efforts in northeast Wyoming, as well, and those that were captured were found in live traps (versus pitfalls). Review of literature (available on the Internet under any search engine) for Merriam's shrews, a species of interest for previous trapping efforts in the region, indicates that it is commonly, but not exclusively, associated with sagebrush habitats, which are quite limited in the Dewey-Burdock area. As noted above, pitfall traps will be placed in or near existing rodent runways to increase trapping opportunity for shrews.

As the purpose of these baseline studies is primarily to determine presence/absence rather than population indices, a sampling schedule of three consecutive afternoons and mornings should be sufficient, especially given the variety of trap types used in each line.

## 5.9 OTHER MAMMALS

As agreed during the July 2007 site visit, occurrence of predators, furbearers, and other mammals will be documented through review of existing data and literature, as well as incidental sightings of individuals or sign throughout the baseline study period. No specific surveys will be conducted for these species. Biologists will watch for bats hunting over tree stands or waterbodies within the permit area during site visits occurring from spring through fall and will record the presence/absence of these animals. If equipment and expertise are readily available, bat calls and flight patterns will be recorded to aid in species identification. Lagomorph abundance will be documented through driving spotlight surveys conducted on two consecutive nights during summer or early fall 2007. All targeted and incidental observations for these species will be provided in a table appended to the report, including dates, species and number of individuals, locations, habitats, and activities. Should individuals or sign (i.e., tracks, scat) of mammalian species of interest (e.g., black-footed ferrets (*Mustela nigripes*)) be observed, the appropriate agency personnel will be notified and follow-up surveys will be conducted. The lone, occupied black-tailed prairie dog (*Cynomys ludovicianus*) colony will be delineated using hand-held GPS receivers and included on the baseline wildlife report map.



## **5.10 REPTILES AND AMPHIBIANS**

Existing data and pertinent literature will be reviewed to identify herptile species likely to occur within the permit area. Actual occurrence will be documented through targeted searches and incidental observations of likely habitats during appropriate months between July 2007 and June 2008. Specific surveys will consist of nocturnal visits to ponds and creek channels on and within ¼ mile of the proposed permit area to listen for calls and diurnal observations of egg masses, adults, and/or young. All observations of these species will be recorded and listed in table format appended to the baseline wildlife report, with text discussion summarizing their occurrence.

## **5.11 SPECIES OF CONCERN**

Species of concern include those on federal and state threatened and endangered lists, as well as others monitored by the South Dakota Natural Heritage Program. Current lists for those species will be obtained before the baseline studies. Personnel will watch for species of concern and habitats that could support them during all site visits. Any sightings will be recorded and passed on to the appropriate agencies. One prairie dog colony is present within the western portion of the proposed permit area. However, during a previous telephone conversation with J&S on August 25, 2004, Mr. Scott Larson, U.S. Fish and Wildlife Service, Pierre, South Dakota, stated that specific surveys for black-footed ferrets were not required, as that agency issued a block clearance for this species throughout the entire state a few years ago.

## **5.12 AQUATIC SPECIES**

The purpose of the aquatic surveys will be to determine the baseline aquatic and stream characteristics of the Dewey-Burdock property and the potential impacts of uranium extraction.

### **5.12.1 Stream Condition**

Stream and riparian area conditions will be documented through the use of South Dakota Department of Environment and Natural Resources' *Standard Operating Procedures for Field Samplers* [2005]. Baseline conditions for Beaver Creek, the only perennial stream in the project area, will be documented in the same locations as other water sampling stations to maximize data collection and comparisons.

### **5.12.2 Fish**

Electrofishing will be conducted on two 100-meter sections of Beaver Creek: one upstream and one downstream of the Dewey-Burdock project area. The upstream and downstream



extents of each sample section will be blocked using seines, and sampling will continue until the capture for a given pass is less than 25 percent of the capture for the previous pass or until three passes have been made. Immediately upon capture, the fish will be weighed in grams and the length measured in millimeters. Once these measurements are taken, the fish will be returned live to the area below the downstream net. Condition class will be determined using the formula  $C = W5/L3$ , where  $C$  is the condition factor,  $W$  is the weight in grams, and  $L$  is the length in millimeters [Everhart et al., 1975]. Assuming water conditions are adequate, fish sampling will be performed seasonally (once per quarter) for the baseline conditions, beginning with the third quarter of 2007 and ending with the second quarter of 2008. Any deviations from this sampling regime will be coordinated with SD GFP personnel.

#### **5.12.3 Macroinvertebrates**

Macroinvertebrates will be sampled reachwide twice a year (fall 2007 and spring 2008) using a modified D-frame kick net, as described in Peck et al. [2001]. Species richness (identification to family level) and general abundance will be discussed within the text and listed in table format appended to the baseline wildlife report.

#### **5.12.4 Periphyton**

No periphyton sampling will be performed.

### **5.13 RADIOLOGICAL TESTING**

As discussed during the July 2007 site visit, radiological testing of tissue samples will be restricted to fish and will occur once during the baseline study period. Collection of fish for this analysis will include up to five top-level predator species (expected to be catfish species (*Ictalurus* spp.)) from each of the two sampling locations (i.e., one upstream and one downstream). The whole body specimens will be preserved and analyzed in accordance with the NRC Guide 4.14 (RG 4.14). Testing will be performed by Energy Laboratories in Gillette, Wyoming, and will include natural uranium, thorium-230, radium-226, lead-210, and polonium-210.

### **5.14 OTHER SPECIES**

No specific surveys for invertebrates are required for the Dewey-Burdock project. Invertebrates observed within the permit area are typically recorded in field notes when identified but are not usually included in specific field studies or discussed in the baseline report. Any species of federal or state concern documented during baseline studies will be reported to the appropriate agency personnel.



## 6.0 VEGETATION BASELINE STUDIES

### 6.1 INTRODUCTION

The baseline vegetation study will cover the Dewey-Burdock permit area. The project area may contain all or some of the following four native vegetation community types: upland grassland, ponderosa pine woodland, riparian, and wetland. Field work was conducted in the summer of 2007. Table 6-1 shows the mapping acreages.

**Table 6-1. Vegetation Map Units and Associated Acreages**

Vegetation Map Units	Proposed Permit Area Acreage
Upland Grassland	To be determined
Ponderosa Pine Woodland	
Riparian	
Wetland	
<b>Total</b>	<b>9,400</b>

Vegetation baseline study monitoring will be conducted using the procedures described in this document. Vegetation parameter sampling will be conducted by vegetation community type as specified in Table 6-2. For purposes of this methodology, "project area" will be the same as "study or permit area."

**Table 6-2. Vegetation Baseline Sampling—Measured Parameters**

Parameter	Upland Grassland	Ponderosa Pine Woodland	Riparian	Wetland <sup>(a)</sup>
% Absolute Total Ground Cover	Yes	Yes	Yes	No
First Hit % Absolute Total Vegetation Cover	Yes	Yes	Yes	No
Multiple Hit Vegetation	Yes	Yes	Yes	No
Shrub/Subshrub Density	Yes	Yes	Yes	No
Production	No	No	No	No
Tree Count and Distribution	No	Yes	No	No

(a) Wetlands will not be sampled as part of the baseline study but will be included under U.S. Army Corps of Engineers (US ACE) delineation requirements.



## 6.2 VEGETATION COMMUNITY CLASSIFICATION AND MAPPING

The baseline project area will be classified and mapped before commencing vegetation sampling. Preliminary mapping and classification, based on aerial photography, has identified the four following plant communities:

1. Upland grassland
2. Ponderosa pine woodland
3. Riparian
4. Wetland.

Plant communities will be further mapped using color infra-red (CIR) aerial photography and verified through field survey. Disturbed areas within the project will also be identified and mapped, if possible, based on the scale of available mapping. Disturbed areas will be excluded, however, from all vegetation parameter sampling. All areas within ½ mile of the project area will be mapped, based on a review of CIR aerial photography and known expression of photography within the project area. It will not be necessary to field verify this mapping within a ½ mile nor will vegetation sampling be conducted.

## 6.3 TRANSECT ORIGIN SELECTION

A computerized systematic grid (through **AutoCAD** or **ArcGIS**) will be used to randomly locate sample points within each vegetation community. These computer-generated random numbers will be uploaded to a hand-held GPS unit for actual location in the field. Sample points will be sampled in numerical order until the minimum sample size is attained and then until either sample adequacy is met or the required maximum number of samples is collected.

## 6.4 LINE TRANSECT LAYOUT

A 50-meter line transect will be used in the three vegetation communities to be sampled; i.e., upland grassland, ponderosa pine woodland, and riparian. Each 50-meter line transect will begin at its specified random origin point and extend in a randomly generated compass direction.

Transects that exceed the boundaries of the vegetation community being sampled will be redirected back into its vegetation community at a 90-degree angle from the original transect direction at the point of intercept. In instances where a 90-degree angle of reflection does not place the transect within the sampled community, a 45-degree angle of reflection will be used.



## **6.5 GROUND COVER**

Line-transect point-intercept methods will be used to collect percent absolute cover data from the three vegetation communities. In the upland grassland, ponderosa pine woodland, and riparian communities, each 50-meter transect will represent a single sample point. Percent cover measurements will be taken from point-intercepts at 1-meter intervals along a 50-meter transect using a laser pointer. Should a transect run out of the vegetation community boundary or a nonvegetated feature, it will be redirected as described above. Each point-intercept will represent 2 percent toward cover measurements.

Percent cover measurements will record "first-hit" point-intercepts by live foliar vegetation species, litter, rock, or bare ground. Litter will include all organic material that is dead, including manure. Rock fragments will be recorded when they are equal to or greater than 2 centimeters in size (i.e., sheet flow, minimum nonerodible particle size). First-hit data will be recorded and tabulated to evaluate total ground cover and total vegetation cover. Multiple hits on vegetation will be recorded but used only for the purpose of constructing a plant species list for each plant community. Total ground cover is the sum of cover values for percent vegetation, percent litter, and percent rock.

## **6.6 TOTAL VEGETATION COVER**

Vegetation cover data will be recorded by species using first-hit data. All point intercepts of living vegetation and growth produced during the current growing season will be counted toward total vegetation cover. Total vegetation cover measurements will be expressed in absolute percentages for each sample point. Relative cover values for percent species cover will be provided. Percent vegetation cover is the vertical projection of the general outline of plants to the ground surface. Total vegetation cover will include moss.

## **6.7 TOTAL GROUND COVER**

Total ground cover data will be recorded by live vegetation, litter, rock, or bare ground. Litter will include all dead organic matter and manure that is recognizable as well as lichen and moss. Total ground cover measurements will be expressed in absolute percentages for each sample point.

## **6.8 SPECIES DIVERSITY**

The total number of plant species within a 1x50-meter belt transect will be summarized for each vegetation type.



## 6.9 PRODUCTION

No production sampling will be necessary for the 2007 baseline vegetation assessment.

## 6.10 SHRUB DENSITY

Shrub density data will be collected in conjunction with randomly selected cover transects, wherever possible. All shrubs, full, half, or sub, will be counted within 50 centimeters on either side of the 50-meter cover transect (1-meter×50-meter belt transect). Sample adequacy will not be calculated on shrub density transects; however, shrub density data will be qualitatively evaluated. The number of belt transects will equal the number of cover transects for a given vegetation type. No shrub height measurements will be collected.

## 6.11 TREE DENSITY

Within the ponderosa pine woodland vegetation community, tree density will be estimated by gridding the aerial photograph for the project area and counting the number of ponderosa pine per unit area, based on a small number of randomly selected grid intervals. In addition, a range of age distribution will be determined using nondestructive techniques, such as correlating known measures of age and height, or age and diameter at breast height (DBH), or ring counts from recent timber harvest stumps and logs.

Within other vegetation communities, individual ponderosa pine or other tree species found will be directly counted for numbers. Height and DBH may be more appropriate in these vegetation types based on lack of downed timber, such as is present in the ponderosa pine woodland.

## 6.12 SAMPLE ADEQUACY

A minimum of 20 cover transects per vegetation type will be sampled in upland grassland, ponderosa pine woodland, and riparian communities. Sample adequacy will be calculated and an incremental number of cover transects will be sampled up to the maximum of 50.

Minimum and maximum sample sizes are listed in Table 6-3. The following sample adequacy formula will be utilized to determine the minimum required size of the sample population:

$$n_{\min} \geq \frac{2(sz)^2}{(dx)^2} \quad (6-1)$$



where:

$n_{min}$  = minimum number of sampled line transects needed to adequately represent native vegetation types

$s$  = sample standard deviation

$z$  = the  $z$  statistic

$d$  = the amount of reduction desired

$\bar{x}$  = sample mean for cover.

**Table 6-3. Vegetation Monitoring Minimum/Maximum Sample Population Requirements for Upland Grassland, Ponderosa Pine Woodland, and Riparian Communities**

Vegetation Community	Parameter	Sample Size	
		Minimum	Maximum
Upland Grassland	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
Ponderosa Pine Woodland	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
Riparian	Ground Cover	20	50
	Vegetation Cover		
	Shrub Density		
	Vegetation Cover		
	Shrub Density		
<b>Total</b>		<b>60</b>	<b>150</b>

The three vegetation communities have been identified as "grassland" or "shrubland." Upland grassland is identified as grassland while the ponderosa pine woodland and riparian communities are identified as shrublands. The constant values to be used in statistical test are:  $z=1.28$  and  $d=0.1$  for grasslands. The shrubland values are  $z=0.84$  and  $d=0.2$ . All sampled vegetation will be included in the sample adequacy test (i.e., "undesirable" species will not be eliminated from the equation).



### **6.13 PLANT SPECIES LIST**

A vegetation species list by scientific name, common name, and lifeform will be developed individually for each of the three vegetation communities. This list will be compiled from species noted during all vegetation monitoring activities, including point-intercept line transect cover measurements and other opportunistic observations of the sampling area.

### **6.14 OTHER DATA COLLECTED**

Any United States Fish and Wildlife Service (US FWS) threatened or candidate species or any state species of special concern listed in the South Dakota Natural Heritage database will be surveyed and any known location identified on the map. Table 6-4 lists the threatened and candidate species along with their habitat and flowering dates. Table 6-5 lists the species of special concern along with their habitats and flowering dates. All state-listed noxious weed will be noted and significant concentrations identified on the vegetation baseline report map.

Photographs will be taken of the vegetation communities. Photographic locations will be documented and illustrated on a map.

### **6.15 EXTENDED REFERENCE AREA MAPPING AND JUSTIFICATION**

As noted in the Vegetation Community Classification and Mapping section (Section 6.2), all lands within the project area are to be mapped as one of three plant community types. Upland grassland, ponderosa pine woodland, and riparian areas unaffected by the mining operation will serve as an Extended Reference Area (EXREFA). Wetlands will not be sampled under baseline evaluation but included in US ACE delineation. For the purposes of this study, EXREFA means a native land unit which will be used to evaluate revegetation success for each of the same native plant communities which was affected by the mining operation. The EXREFA will be a subset of the mapped native communities and will be included as potential sample points for the cover sampling program. The EXREFA will remain unaffected over the course of the mining operation and will be as large as practical, at least 2 acres, considering land ownership patterns and land management history. The permit application will show the EXREFA on the vegetation map and will include text justifying the choice of the EXREFA.



Table 6-4. Threatened and Candidate Species to Be Sampled

Scientific Name	Common Name	Flowering Date	Habitat	Classification
<i>Botrychium campestre</i>	Prairie Moonwort	May–Early June	Dry prairies and sand dunes, as well as sandy, dry disturbed sites, such as roadsides and old fields	Not ranked (under review)
<i>Botrychium lineare</i>	Moonwort Grape-Fern	May–Early June	Meadows with tall grasses and forbs, beneath trees in wooded areas, on north-facing limestone cliff shelves, and in streamside edges	Not ranked
<i>Botrychium multisided</i>	Leathery Grape-fern	May–Early June	Savannah, prairie, meadow, field	Not ranked (under review)
<i>Carex alopecoidea</i>	Tawny Sedge	July	Seasonally saturated soils in wet meadows, openings in alluvial woods, stream banks, particularly on calcareous substrates	S2
<i>Cypripedium parviflorum</i>	Lesser Yellow Lady's Slipper	May–June	Bogs, shady swamps, wet woods	Not ranked (under review)
<i>Eleocharis elliptica</i>	Elliptic Spikerush	June–August	Very wet, calcareous (or brackish) shores, pool margins, fens, meadows, prairies	Not ranked
<i>Epipactis gigantea</i>	Stream Orchid	April–July	Ledges, stream, river banks	S1
<i>Lycopodium complanatum</i>	Ground Cedar	Unknown	Dry open coniferous or mixed forest alpine slopes	S1
<i>Platanthera orbiculata</i>	Round-Leaved Orchid	July	Moderate moisture; woods, forests; in rich soil	S2
<i>Salix candida</i>	Sage Willow	April–May	Cold, open fens, swamps and bogs	S1
<i>Salix serissima</i>	Autumn Willow	Unknown	Swamp, marsh, bog, fen, lakeshores	S1
<i>Sanguinaria canadensis</i>	Bloodroot	March–April	Rich, deciduous, upland and floodplain woods	S4
<i>Viburnum opulus var. americana</i>	American Cranberrybush	May–July	Cool woods, thickets, rocky shores, slopes	Not ranked (under review)
<i>Viola selkirkii</i>	Great-Spurred Violet	April–June	Cold areas	S1



**Table 6-5. Species of Special Concern to Be Sampled**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Flowering Date</b>	<b>Habitat</b>	<b>Classification</b>
<i>Adiantum capillus-veneris</i>	Southern Maidenhair-Fern	June–August	Moist, well-drained sand, loam or limestone	S1
<i>Carex bella</i>	Elegant Sedge	June–August	Moist subalpine meadows	S1
<i>Eleocharis rostellata</i>	Beaked Spikerush	July–September	Saline or alkaline wetlands	S1
<i>Gentiana affinis</i>	Northern Gentian	Unknown	Moist	S2
<i>Listera convallarioides</i>	Broad-Lipped Twayblade	June–August	Moist woods	S1
<i>Lycopodium annotinum</i>	Bristly Clubmoss	Unknown	Swampy or moist coniferous forests, mountain forests, and exposed grassy or rocky sites	S1
<i>Oxyria digyna</i>	Mountain Sorrel	June–September	Gravel bars, mudflats, tundra, scree slopes, crevices in rock outcrops, talus slopes	S1
<i>Petasites sagittatus</i>	Sweet-Coltsfoot	May–June	Wet, forests, meadows	S1
<i>Polystichum lonchitis</i>	Northern Holly-Fern	Unknown	Woodland, rocky bluff	S1
<i>Salix lucida</i>	Shining Willow	April–May	Stream and swamp banks, fens, beaches, wet meadows, mud flats	S1



## 7.0 CULTURAL RESOURCES

The objective of the cultural resources investigation of the Dewey-Burdock permit area is the completion of a preliminary record search and Level III archeological survey of the entire project area; a final report documenting all work will be produced. To this end, an established research orientation was adhered to, and field methodology was implemented pursuant to governing state [South Dakota State Historic Preservation Office, 2005] and federal [Advisory Council on Historic Preservation, 2006] standards for the management and protection of cultural resources.

### 7.1 PRELIMINARY RECORD SEARCH

Mr. Michael Fosha, Assistant State Archeologist, provided maps depicting the locations of previously recorded sites and surveys within the project area before field work. Pertinent site forms were accessed and printed through the state database for review before field work.

The Dewey-Burdock project area is contained within the Black Hills Region as defined by the South Dakota State Plan for Archaeological Resources [Winham and Hannus, 1990]. Occasional archeological investigations within the Black Hills Region began during the early 1920s and continued through the early 1970s [Winham and Hannus, 1990].

By the mid-1970s, systematic, intensive archeological surveys was adopted into the Black Hills National Forest cultural resources management program. Also occurring during this period was an increase in mineral exploration and highway construction throughout much of the southern Black Hills. Between 1985 and 1989, the United States Forest Service (USFS) reported the submission of over 800 cultural resource reports, the majority of which detailed small-scale surveys and the documentation of few or no archeological sites [Winham and Hannus, 1990]. Two separate culture history overviews were compiled for the Black Hills Region during this time [Cassells, 1986; Sundstrom, 1989]. From the 1990s forward, numerous additional investigations have taken place throughout the Black Hills Region for federal and state road projects, utility work, and mineral exploration.

Although data for most temporal/cultural periods are generally better documented within the Black Hills than within other archeological regions throughout the state, a large majority of this has been generated by means of surface collections [Winham and Hannus, 1990]. As a result, the continuance of basic inventory and systematic data collection procedures remains a primary research objective within the Black Hills Region.



## 7.2 LEVEL III ARCHEOLOGICAL SURVEY

The pedestrian survey conducted began on April 18, 2007, and concluded on August 4, 2007. Slightly less than 10,000 acres were surveyed, resulting in the identification of 262 archeological sites. The final number of sites will change if two or more smaller sites are combined into a single entity or one or more larger sites are split into smaller localities. Adherence to requisite specifications for a Level III cultural resources survey was maintained for the duration of the investigations. The South Dakota State Historic Preservation Office (SHPO) defines a Level III cultural resources survey as follows:

**Level III: 100 Percent Survey.** Level III surveys require a visual inspection of the project APE. Survey transects must be no more than 30 meters (100 feet) apart. The report must explain survey methods and the rationale for their use, for instance, why the archaeologist did or did not conduct subsurface testing [South Dakota State Historic Preservation Office, 2005].

Archeology Laboratory, Augustana College (ALAC) field crews were comprised of between four and seven individuals throughout the duration of the project. ALAC was provided with GIS data and USGS 7.5-minute series 1:24,000 scale topographic quadrangle maps highlighting the proposed project area.

Pedestrian reconnaissance of the Dewey-Burdock project area was conducted with parallel linear transects, maintaining distances of 30 meters (98.43 feet) between field personnel. The crew utilized a Trimble Pro XT model GPS unit, fence lines, compass bearings, well-defined landforms, and visual line-of-site to maintain transects.

In certain instances, an adjustment to the survey strategy was necessary to allow for a more detailed examination of areas possessing higher site location potential. Such locales included surfaces or landforms in an advanced erosional state (e.g., cutbanks, blowouts, ditches, slopes, animal/vehicle trails, rodent burrows), as well as those situated upon high terraces/terrace remnants above major established waterways. Survey strategy in these locales typically adopted the form of shorter-spaced transects (15-meter intervals) and a focus of attention directed toward the inspection of erosional or burrow features where present.

Field data for all archeological sites documented during the current survey were recorded by means of standardized methodological practices. Archeological sites were defined as being any extant manifestations of human cultural activity having occurred before the calendar year A.D. 1958.

Transect widths were reduced to between 1- and 5-meter intervals within identified sites, depending on ground surface visibility. All observed artifacts were marked with pin flags and piece-plotted individually with the use of the Trimble Pro XT model GPS unit.



Specific field data collected from each site included the following: field number, any previously assigned Smithsonian number, component type, cultural affiliation, dimensions and physiographic position, general site description and condition, presence/description of relevant features and cultural materials present, soil and nearest water source information, and tentative National Register of Historic Places (NRHP) evaluation status. Also documented for each site were legal locations and Universal Transverse Mercator (UTM) coordinates. Sites were documented with both film and digital photographs.

Descriptions of documented sites were also recorded in field notes. All relevant site information was recorded in these notes, including artifact inventories identifying respective type, modification, raw material utilized, and count, and additional site feature descriptions and measurements (including features such as hearths, structures, cairns, wells). General environmental descriptions of each respective site area were also made; these descriptions included land use, vegetation, visibility, and evidence of past disturbances (cultivation, erosion, deflation, removal of features). Certain culturally diagnostic artifacts (projectile points) and formal tools (scrapers, knives, bifaces) were collected for illustration, photographs, metric, and other analyses. All artifacts remain the property of the landowners and will be returned to the landowner; artifacts may be donated to the state of South Dakota if desired.

South Dakota state site forms will be completed for each new archeological site documented in accordance with established guidelines [State Archeological Research Center, 2003]. Additionally, existing site forms will be updated in those instances where boundaries of previously recorded sites were redefined.

Subsurface testing was not necessary during the course of the pedestrian survey. A combination of conditions in the project area at the time of the survey, such as sparse vegetation, heavily grazed pastureland, and numerous extant animal burrows (prairie dog, badger), resulted in extremely sparse ground cover within the majority of the project area. These factors produced nearly ideal visibility conditions in most instances, thereby precluding the necessity of substantial subsurface testing to satisfy requisite specifications for reconnaissance cultural resource surveys [South Dakota State Historic Preservation Office, 2005]. Recommendations concerning the testing of geomorphic landforms considered to possess significant potential for containing deeply buried, intact cultural deposits may be discussed in the final report.

The final report will provide all background information, methodology, and site descriptions for each site identified. Specific clearance recommendations for each site will also be addressed.



## 8.0 REFERENCES

**Advisory Council on Historic Preservation, 2006.** *Section 106 Regulations: Text of ACHP's Regulations, "Protection of Historic Properties" (36 CFR Part 800) (incorporates amendments effective Aug. 5, 2004)*, Advisory Council on Historic Preservation, Washington, DC, accessed January 15, 2007, from <http://www.achp.gov/work106.html>

**Cassells, E. S., 1986.** *Prehistoric Hunters of the Black Hills*, Johnson Publishing Company, Boulder, CO.

**Everhart, W. H., A. W. Eipper, and W. D. Youngs, 1975.** *Principles of Fishery Science*, Cornell University Press, Ithaca, NY, pp 288.

**Grier, J. W. and R. W. Fyfe, 1987.** *Preventing Research and Management Disturbance*, Raptor Management Techniques Manual, B. A. Giron Pendleton, B. A. Milsap, K. W. Cline, and D. M. Bird (eds.), National Wildlife Federation, Washington, DC, pp. 173-182.

**Peck, D. V., J. M. Lazorchak, and D. J. Klemm (eds.), 2001.** *Environmental Monitoring and Assessment Program-Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams*, (unpublished draft), Environmental Protection Agency, Washington, DC.

**South Dakota Department of Environment and Natural Resources Water Resources Monitoring Team, 2005.** *Standard Operating Procedures for Field Samplers Vol II: Biological and Habitat Sampling*, South Dakota Department of Environment and Natural Resources, Pierre, SD, pp. 123.

**South Dakota State Historic Preservation Office, 2005.** *Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance)*, South Dakota State Historical Society, Office of History, Pierre, SD.

**State Archeological Research Center, 2003.** *The Archaeological Research Center Field Site Form*, retrieved August 16, 2007, from the World Wide Web: <http://www.sdsmt.edu/wwwsarc/downloads/site-manual.pdf>

**Sundstrom, L. 1989.** *Culture History of the Black Hills With Reference to Adjacent Areas of the Northern Great Plains*, Reprints in Anthropology, Vol. 40, J&L Reprint Company, Lincoln, NE.

**U.S. Environmental Protection Agency, 2005.** *Standard Operating Procedure*, retrieved September 4, 2007, from the World Wide Web: <http://www.state.sd.us/denr/DES/ground/Spills/Handbook/SOP6.pdf>

**Winham, R. P. and L. A. Hannus, 1990.** *South Dakota State Plan for Archeological Resources: Introduction and Overview of Study Units and Archeological Management Regions*, report on file, State Archaeological Research Center, Rapid City, SD, and Archeology Laboratory, Augustana College, Sioux Falls, SD.



**APPENDIX A**

**WELL COMPLETION REPORTS FOR  
SAMPLED WELLS**



# NOTICE OF WELL CONSTRUCTION

## (1) WELL CONSTRUCTION

Location of well: NW 1/4 NW 1/4 Section 3 Township 7S Range 1E

Well owner Kathryn Spencer Dewey Route Edgemont, SD 57735  
(Name) (Address)

Date well drilling completed 10-22-80 Purpose of well Domestic  
(domestic, irrigation, municipal, industrial, other)

## WELL LOG

(Litho Log Footages)	Layers, top to top in feet	Description of layer	Depth to top of water producing equifer	
Ksc →	0-320	Dark gray shale	580	ft.
Kfu →	320-395	Gray mudstone with 10% gray siltstone	flows	ft.
	395-445	Gray mudstone with 5% 20% gray vfss	Name of producing equifer (if known)	Lakota
Klf →	445-490	Green mudstone	Total depth of drill hole	625
	490-520	AA w/10-30% G & GR Mt slst	Depth to bottom of casing	580
	520-545	Gray fgss	Casing information: In the space below show kind, size, weight, lengths per diameter, etc., for production casing and surface casing, if used.	
	545-560	Well cemented vt - fgss		
	560-575	Gray mudstone with 10% dark brown mudstone	5 1/2" 14 lbs/ft.	
	575-590	AA with 10-20% gray vfss	Random	twenties
	590-615	Gray fine grain sandstone	Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.	
	615-620	Green mudstone with <5% gray vfss		
	620-625	Green mudstone with 50% Brown-red mudstone	45 ft. open hole	
Attach sheet if more space is needed			If a flowing well, flow of completed well	
			1.00	G.P.M.

Silver King Mines, Inc.  
Name of Drilling Contractor

## (2) PUMP INSTALLATION

Company name and size of pump \_\_\_\_\_ HP \_\_\_\_\_  
Type of pump \_\_\_\_\_ Capacity of installed pump \_\_\_\_\_ G.P.M.  
Depth of pump placement \_\_\_\_\_ ft., Date of pump installation \_\_\_\_\_

## (3) WATER SURFACE MEASURING TUBE

On some wells an air-tight water surface measuring tube is required: See Section 46.40B of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.

Show exact vertical length of water surface measuring tube, when installed \_\_\_\_\_ ft., tube diameter \_\_\_\_\_, tube material \_\_\_\_\_

\_\_\_\_\_  
Name of Pump Installation Contractor



TVA well pump test 76-77 2 miles  
N 1/4 20'

NOTICE OF WELL CONSTRUCTION

7S 1E 3BB

Fall River

WELL CONSTRUCTION

Name of well owner Kathryn Spencer (Name)  
Bewer, Route, Township, 50-57735 (Address)  
Date well drilling completed 10-22-80 Purpose of well Domestic  
(Domestic, irrigation, municipal, industrial, other)

WELL LOG

(Litho)	Log Footages	Description of layer	Depth to top of water producing aquifer	ft.
Rsc	0-320	Dark gray shale	580	ft.
Kfu	320-395	Gray mudstone with 10% gray siltstone	Flows	ft.
	395-445	Gray mudstone with 5% 20% gray vfss	Name of producing aquifer (if known)	Lakota
Klf	445-490	Green mudstone	Total depth of drill hole	625
	490-520	AA w/10-30% G & GR Mt silt	Depth to bottom of casing	580
	520-545	Gray fgss	Casing information: In the space below show kind, size, weight, length per diameter, etc., for production casing and surface casing, if used.	
	545-560	well cemented vt - fgss	5 1/2" 14 lbs/ft.	
	560-575	Gray mudstone with 10% dark brown mudstone	Random twenties	
	575-590	AA with 10-20% gray vfss	Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.	
	590-615	Gray fine grain sandstone	45 ft. open hole	
	615-620	Green mudstone with <5% gray vfss		
	620-625	Green mudstone with 50% Brown-red mudstone		

Attach sheet if more space is needed

If a flowing well, flow of completed well 1.00 G.P.M.

Silver King Mines, Inc.  
Name of Drilling Contractor

(2) PUMP INSTALLATION

Company name and size of pump \_\_\_\_\_ HP  
Type of pump \_\_\_\_\_ Capacity of installed pump \_\_\_\_\_ G.P.M.  
Depth of pump placement \_\_\_\_\_ ft., Date of pump installation \_\_\_\_\_

(3) WATER SURFACE MEASURING TUBE

On some wells an air-tight water surface measuring tube is required: See Section 46.408 of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.  
Show exact vertical length of water surface measuring tube, when installed \_\_\_\_\_ ft., tube diameter \_\_\_\_\_, tube material \_\_\_\_\_

Name of Pump Installation Contractor



# NOTICE OF WELL CONSTRUCTION

7-1-16

*Felt River*

## (1) WELL CONSTRUCTION

Location of well SE 1/4 SE 1/4 Section 16 Township 7S Range 1E

Well owner Peterson & Son, Inc. Edgemont, SD  
(Name) (Address)

Date well drilling completed 11-17-81 Purpose of well Domestic  
(domestic, irrigation, municipal, industrial, other)

### WELL LOG

Layers, top to top in feet	Description of layer	Depth to top of water producing aquifer
0-380	Blk Sh	555
380-470	lb gy clst & ss	Depth to static water level flowing
470-495	Gy ss & clst	Name of producing aquifer (if known) Lakota
495-565	Gy, rd-brn & gn clst	Total depth of drill hole 650
565-580	Gy ss	Depth to bottom of casing 650
580-650	Gy clst	
		Casing information: In the space below show kind, size, weight, length per diameter, etc., for production casing and surface casing, if used.
		4" blk iron 10#/ft
		Screen information: In the space below show length of screen below bottom of casing, diameter and kind of screen or casing perforations.
		slotted 566-608 629-650
		If a flowing well, flow of completed well 30 G.P.M.

Attach sheet if more space is needed

Silver King Mines, Inc.

Name of Drilling Contractor

## (2) PUMP INSTALLATION

Company name and size of pump HR

Type of pump Capacity of installed pump G.P.M.

Depth of pump placement ft., Date of pump installation

## (3) WATER SURFACE MEASURING TUBE

On some wells on oil-tight water surface measuring tube is required. See Section 46.40B of Chapter 46.4, MINIMUM WELL CONSTRUCTION STANDARDS.

Show exact vertical length of water surface measuring tube, when installed ft., tube diameter tube material

Name of Pump Installation Contractor









ARTESIAN WELL REPAIR

OFFICE OF STATE ENGINEER  
PIERRE, S. DAK.

OFFICE OF STATE ENGINEER  
Pierre, South Dakota

Well No. 24-6R  
(do not fill in)

Fall River COUNTY

Location SE 1/4 Section 23 Twp. 7S Range 1E

Owner J. E. Stewart Address Dickinson, N. Dak.

Depth 240 Drawdown \_\_\_\_\_ Type Rig Used Repair

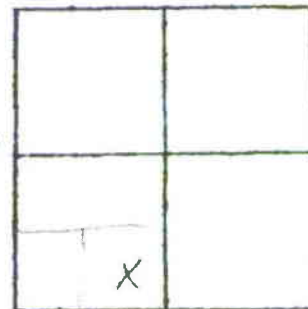
Flow (gpm) 2 1/2 Pressure Strong Date Measured June 10, 1951

Grd. Elev. \_\_\_\_\_ Water Level Below Ground Surface \_\_\_\_\_

Temperature \_\_\_\_\_ Character Water (soft, medium, hard)

Date Commenced June 6 Date Completed June 10

Bonded Driller H. P. Norbeck Address Redfield, S. D.



Section 23

CASING DETAIL (old)

Type	Size	Length	Depth
<u>Blk Std</u>	<u>2"</u>	<u>240'</u>	<u>240'</u>

PERFORATIONS

Type	Size	Length	Depth

Perforations of WATER BEARING SANDS  
From 160' To 165'

222' 227'

SOURCE OF INFORMATION

Norbeck Co. Report

Repaired by: H. P. Norbeck

Address Redfield

RECORD OF WELL AFTER REPAIR

Depth 237 Date Completed June 10, 1951

Flow (gpm) 2 1/2 Date Measured June 10, 1951

Water Level Below Ground Surface \_\_\_\_\_

CASING DETAIL (new)

Type	Size	Length	Depth
<u>Std Casing</u>	<u>3"</u>	<u>31'</u>	<u>37'</u>

driven over old 2" with 500 lb hammer

1" Copper tube 1 1/2" 231' 237'

PERFORATIONS

Type	Size	Length	Depth
<u>Drilled</u>	<u>1/2"</u>	<u>158' to 168'</u>	
		<u>220</u>	<u>230</u>

Did you reach bottom on this well? No

If not, how far down did you get? 237'

What do you think caused this well to fail?  
2" corroded out permitting water to come up out side

Do you believe the repair was successful? Very

Well flowed only 2 G.P.M. when drilled - this is a Dakota Sandstone well about 2 mi from outc.



B-4

DB - GW 676

6" <sup>W/ ORGANICS</sup> TOP SOIL - DK BROWN, DRY

TO 5' → SANDY SILT, RED, DRY

TO 10' → SILTY SAND, RED, DRY

SAME TO 13'

@ 13' → <sup>SILTY</sup> SANDY GRAVEL W/ COBBLES, RED TO BROWN, DRY TO MOIST

SAME TO 20'; WET @ 17.5'

Same to 22½' Sat.

B-5

DB - GW 679

6" Top Soil - Dk Bn, Dry

TO 5' Sandy Silt, Red Dry

TO 10' Silty Sand, Rd to Tan, Dry to moist

TO 15' Same Red

TO 17' Same

17-17½ Sand w/ Gravel, Red, moist

17½-18 cobbles, no clay

TO 25 Silty Sand to Sand, Rd to Tan, moist

T 27 Sand w/ gravel, Red, moist

TO 29 Sandy lean Clay, Red, wet

TO 30 Sand w/ gravel, Red, moist, 6" Gray layer of Sand.

TO 35 Sand w/ gravel, Red, moist sat @ 34.

TO 36½ Same

TO 39 Shale, Dk Black, moist

COMPLETED BY:

REVIEWED BY:

PAGE 2 OF 2



## DewBurdGW675

Location Marietta

### Construction Details

Total Depth	14.4'
Screen Interval	4.4 - 14.4'
Sand pack	3 - 14.4'
Bentonite	1 - 3'
Cement	0 - 1'
Distance from surface to top of casing	2.5'

Water Level ~9' below surface

### Lithology

0 - 4 ft	fine to med grain sand, tan color, mostly quartz and feldspar, some dark minerals (5%)
4 - 9 ft	poorly sorted, coarse sand, few small pebbles
9 - 12.5 ft	poorly sorted, coarse sand, mostly quartz and feldspar with dark minerals (10%), some pebbles, wet
12.5 - 14.4 ft	dark gray, fissile shale



## DewBurdGW677

Location south of Putnam house

### Construction Details

Total Depth	14.5'
Screen Interval	4.5 - 14.5'
Sand pack	3 - 14.5'
Bentonite	1 - 3'
Cement	0 - 1'

Water Level ~9' below surface

### Lithology

0 - 4 ft	med tan, sandy silt
4 - 6 ft	sandy silt
6 - 7.5 ft	cobbles in silty sand, poorly sorted
7.5 - 9 ft	tan, silty sand
9 - 12.5 ft	wet, tan, very fine grained sand
12.5 - 14.5 ft	dark gray, fissile shale (Belle Fourche Fm)



**DewBurdGW678**

Location along Pass Creek west of Burdock

**Construction Details**

Total Depth	14.5'
Screen Interval	4.5 - 14.5'
Sand pack	3 - 14.5'
Bentonite	1 - 3'
Cement	0 - 1'

Water Level ~8' below surface

**Lithology**

0 - 9 ft	very fine grained, red, silty sand
9 - 14 ft	dominantly vfg silty sand with 1" beds of med to coarse sand (did not penetrate shale)



**APPENDIX B**

**PLATES**



*Powertech (USA), Inc.*  
*Pre-Permit Baseline*

Dewey-Burdock In Situ  
Uranium Project  
Permitting & Licensing

11/2007

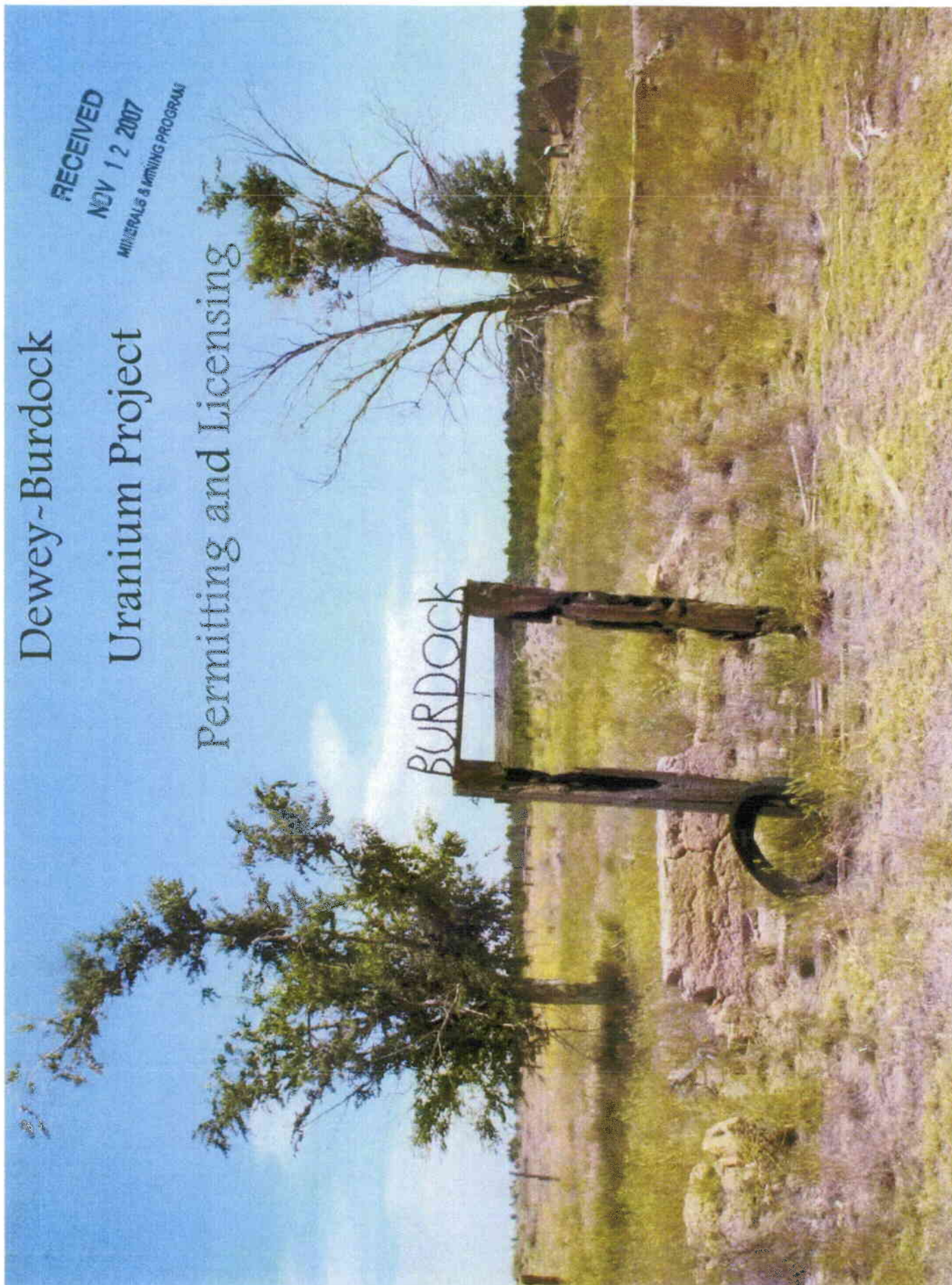


Dewey-Burdock

Uranium Project

Permitting and Licensing

RECEIVED  
NOV 12 2007  
MINERALS & MINING PROGRAM



PowerTech Baseline





## ❖ Objective of the Meeting

- ➔ Information About Project
- ➔ Feedback on Baseline Sampling Plan
- ➔ Decide on Communication Plan and protocol

## ❖ Outline

- ➔ Introduction
- ➔ Project Approach
- ➔ Project Team
- ➔ Base Line Study
- ➔ Closing







# Power Tech Uranium Corp

## ❖ Mission

➔ *Acquire and develop through in situ process, quality ore bodies that can be produced at low cost*

## ❖ Overview

*Management has:*

*permitted and constructed more than eight mines and pilot operations on quality uranium ore bodies.*

*brought more than 12 in situ operations to both mining and closure stage.*



**POWERTECH (USA) INC.**



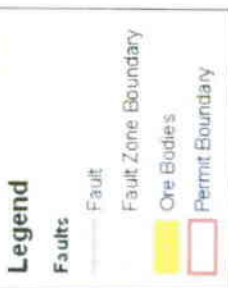
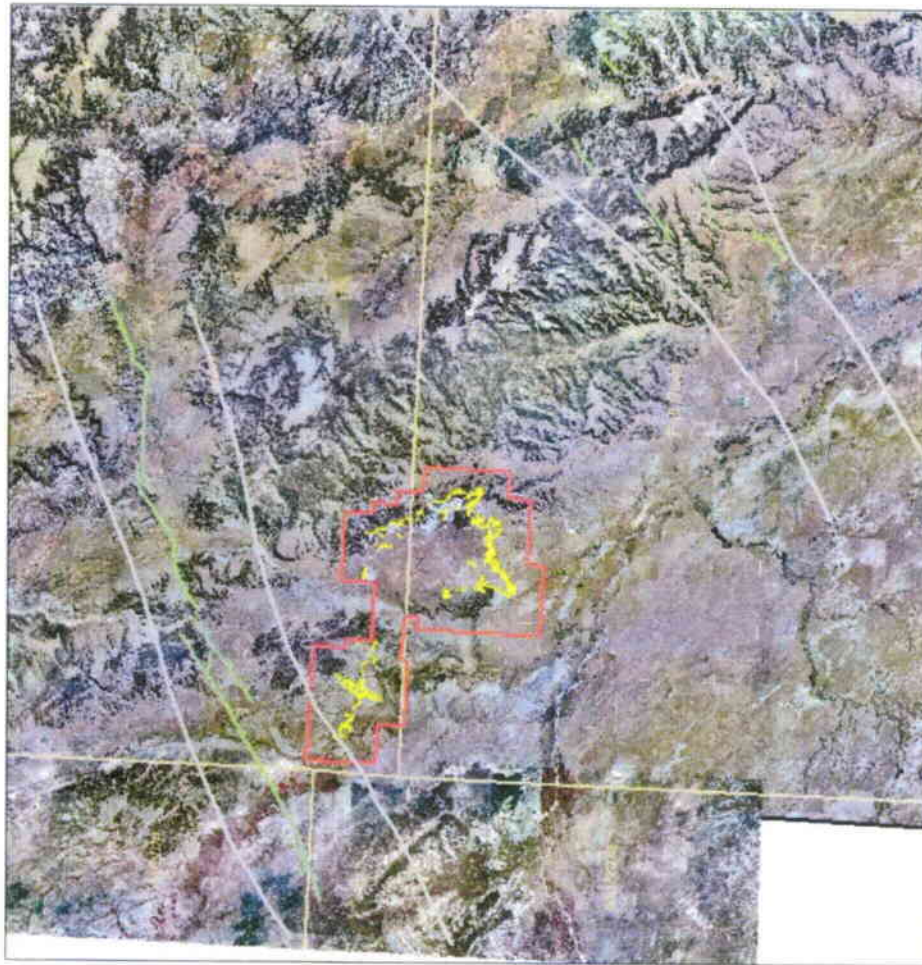
# Current Prospects



POWERTECH (USA) INC.

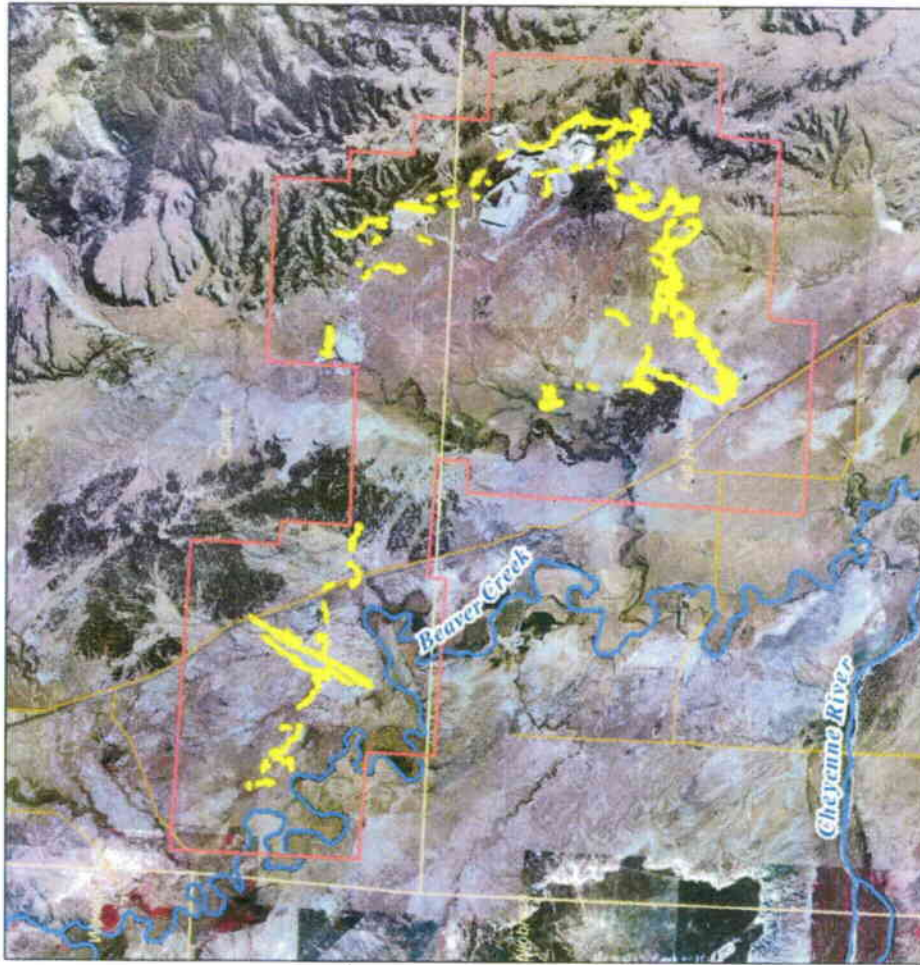


# Dewey Burdock Prospect





# Dewey Burdock Prospect



**RESPEC**  
WATER & NATURAL RESOURCES







# Dewey Burdlock History

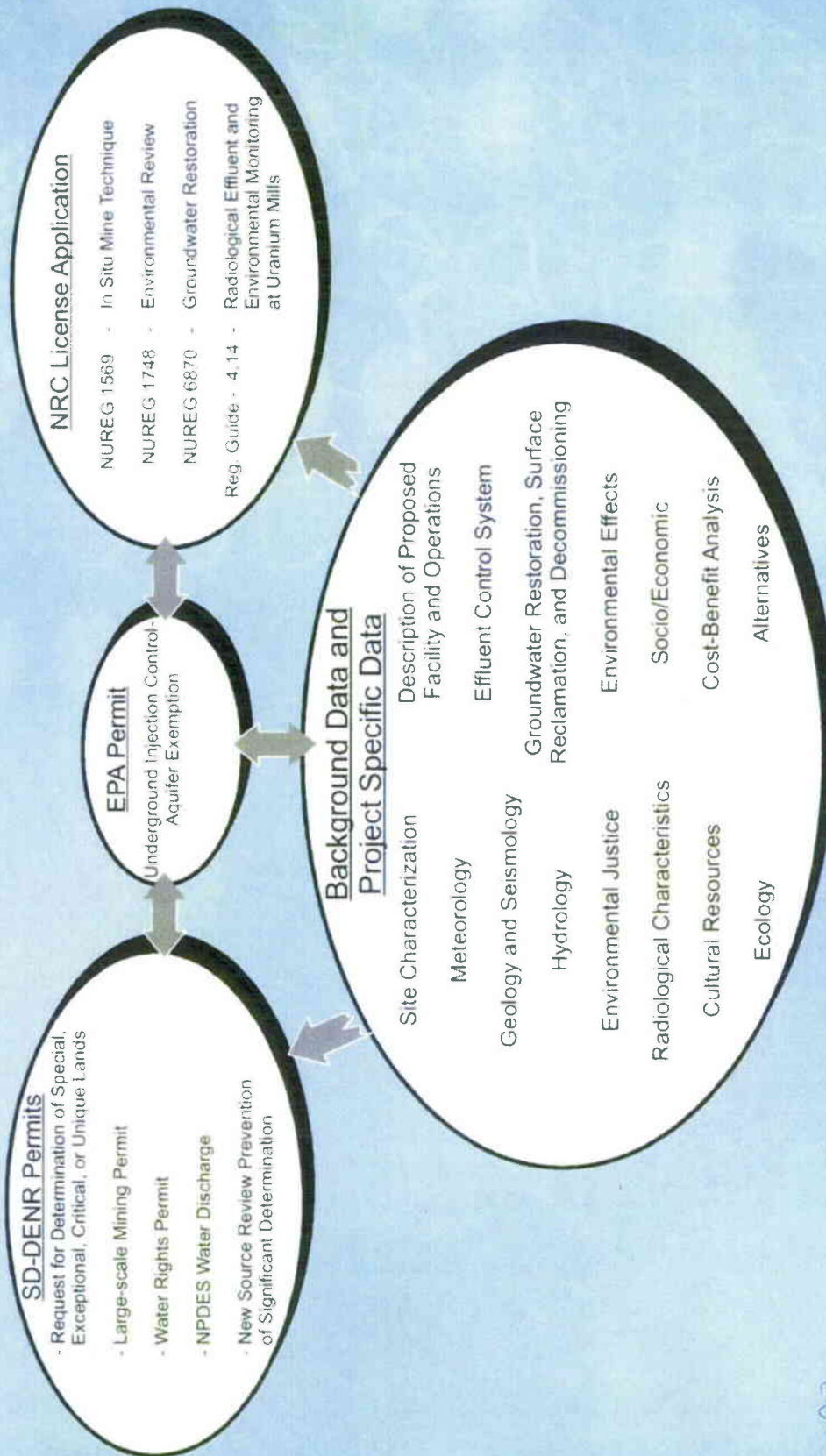
- ❖ Three Major Open Pit Mines Operated in 1950s
- ❖ USGS Investigations in 1955, 1965
- ❖ Tennessee Valley Authority Explored, Tested, and Went Through Permitting Process for Underground Mine and Processing Facility 1980s
- ❖ PowerTech has leases and claims on 11,180 acres of Federal and Private Minerals
- ❖ PowerTech Certified Resources is 7.9 Million Pounds and Expects to Spend \$15-20M



POWERTECH (USA) INC.



# Project Approach



POWERTECH (USA) INC.



# Project Team Responsibilities

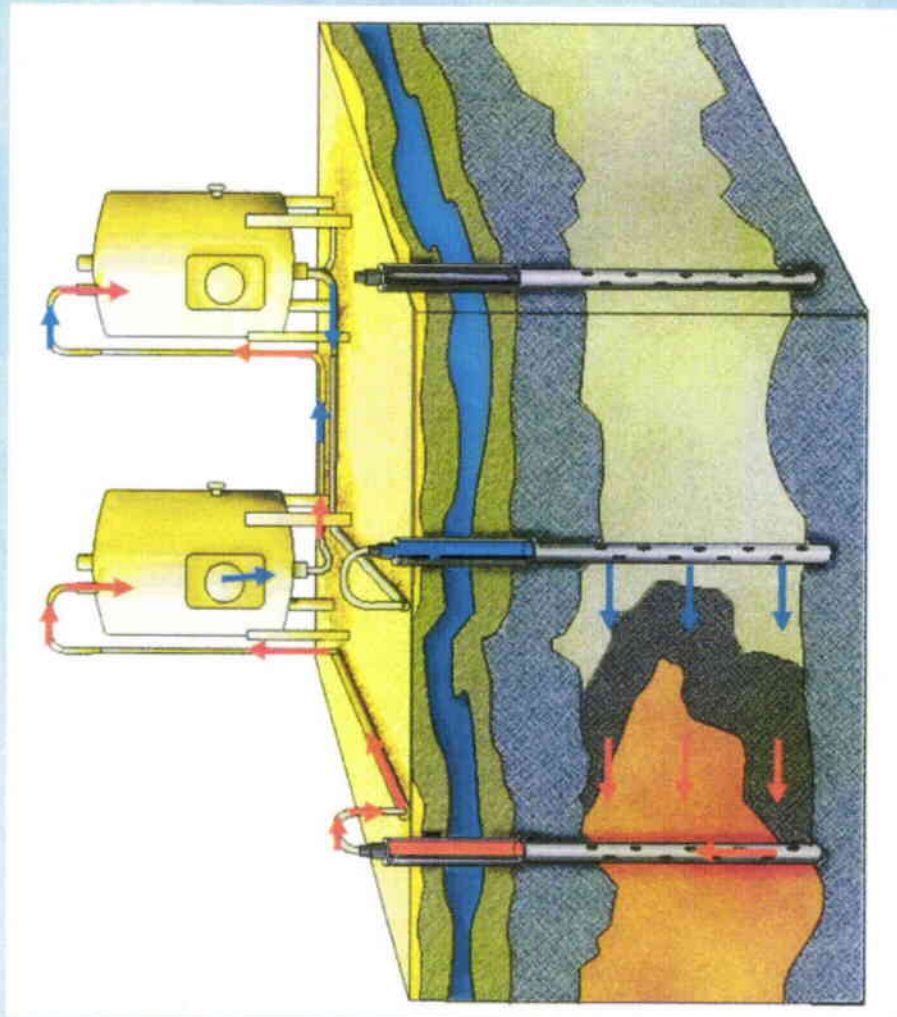
- ❖ **PowerTech**
  - ➔ Project Manager – Mark Hollenbeck
- ❖ **Knight Piésold**
  - ➔ Prime contractor
  - ➔ USNRC licensing and EPA UIC permitting
- ❖ **RESPEC/SDSMT**
  - ➔ Groundwater and surface water characterization
  - ➔ Meteorology
  - ➔ DENR permitting
- ❖ **Environmental Restoration Group, Inc. (ERG)**
  - ➔ Field radiological characterization
  - ➔ Risk assessments
- ❖ **BKS Environmental Associates**
  - ➔ Vegetation, Soils, and Wetlands
- ❖ **Jones & Stokes**
  - ➔ Wildlife and Fisheries



POWERTECH (USA) INC.



# In~Situ Recovery Process



\*\* This diagram is merely a representation of the recovery process and does not represent actual hydrogeologic conditions at the Dewey Burdock site.



**POWERTECH (USA) INC.**



# Baseline Studies Goals

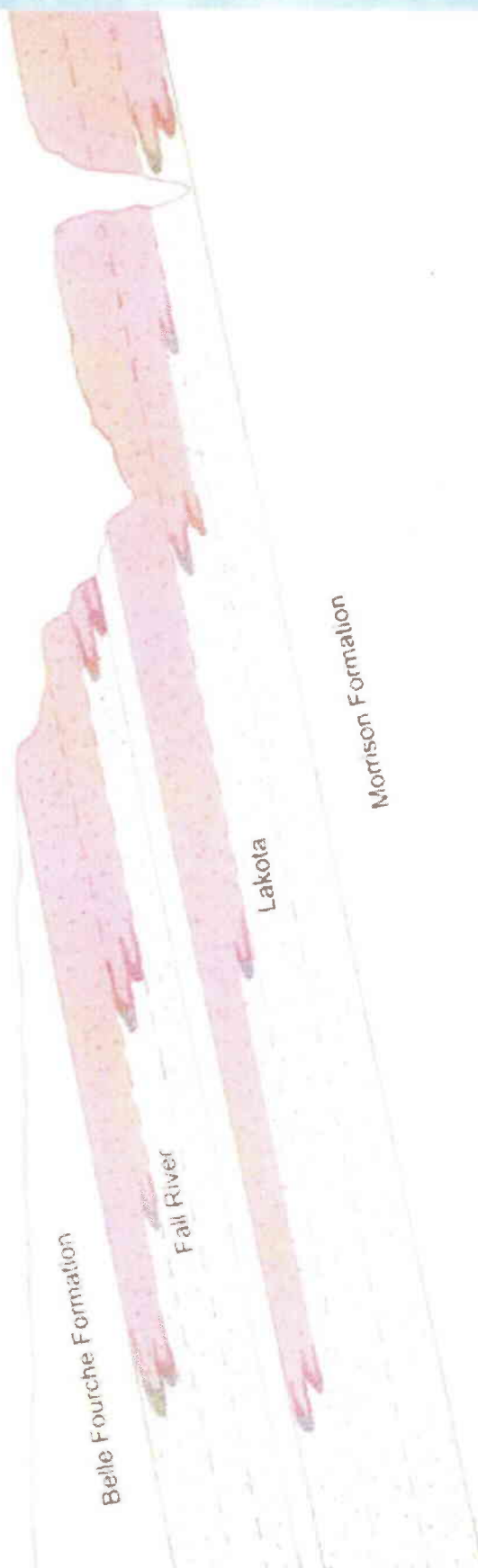
- ❖ Provide Support for Three Major Permit Efforts for SD DENR, USNRC, and USEPA
- ❖ Determine Current Background Values for all Media (water, soil, air, flora, fauna)
- ❖ Design and Plan Cost-Effective Mitigation and Restoration Measures
- ❖ Project impact Assessment



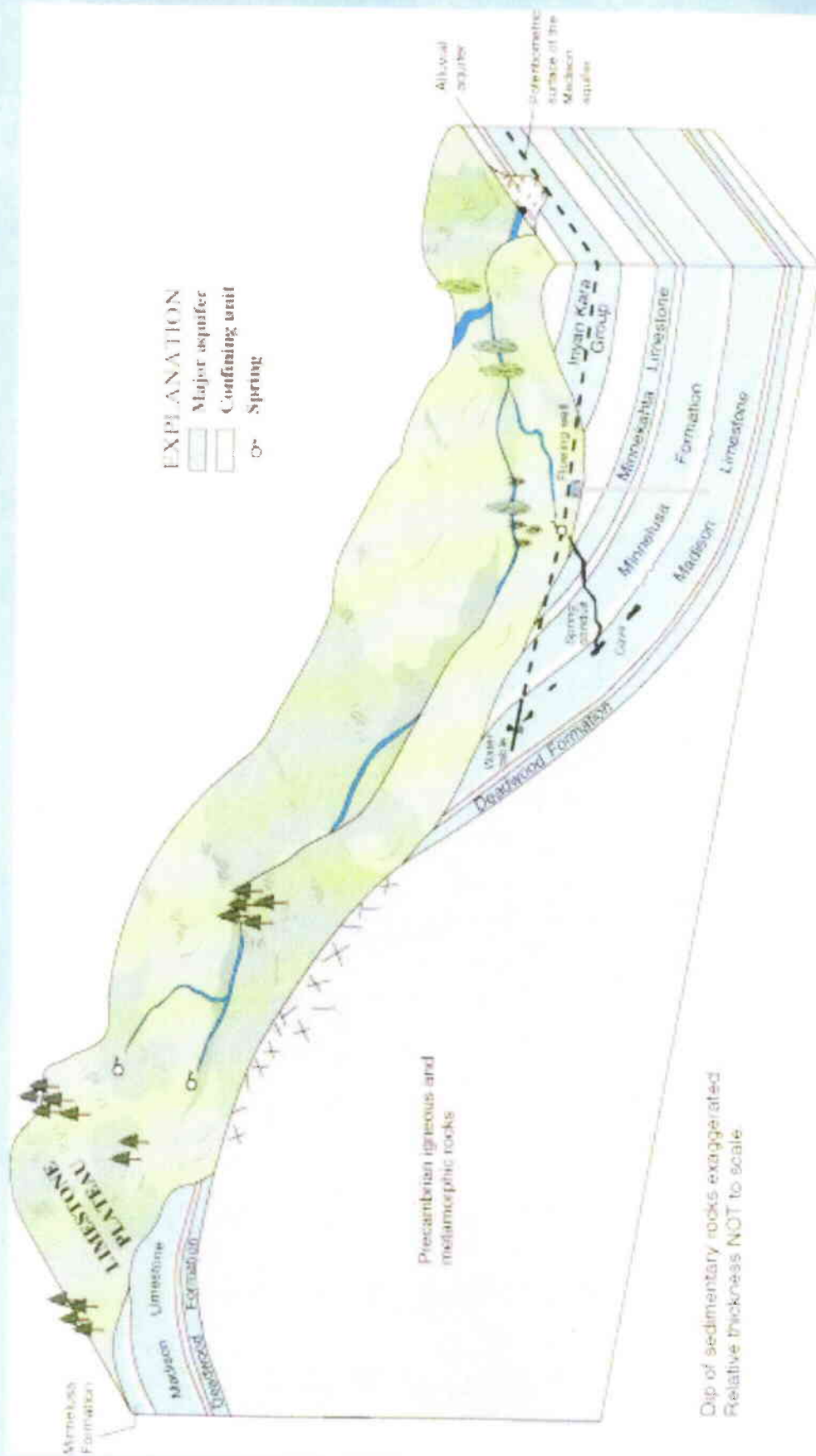
POWERTECH (USA) INC.



## CROSS-SECTION OF URANIUM OCCURRENCES BLACK HILLS URANIUM DISTRICT





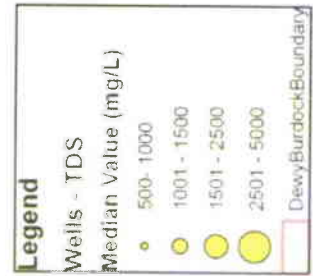
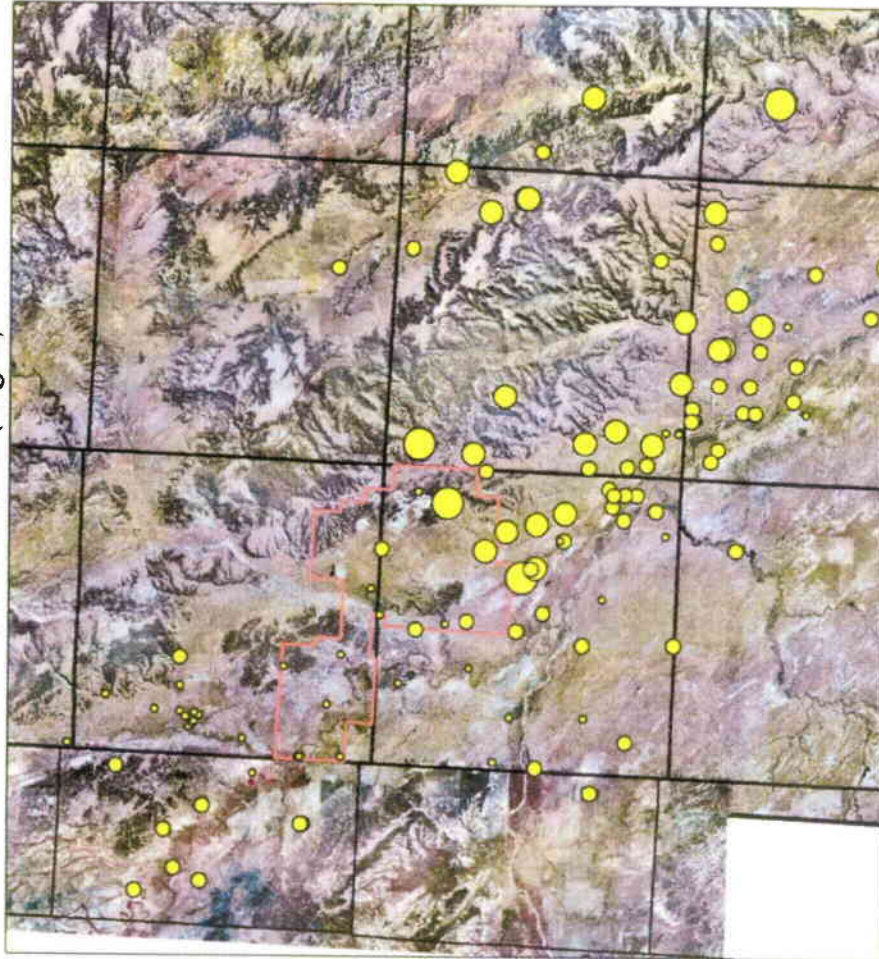


Dip of sedimentary rocks exaggerated  
Relative thickness NOT to scale

Schematic diagram showing simplified hydrologic setting of the Black Hills area. Schematic diagram generally corresponds with geologic cross section shown in figure 5.



Ground Water Quality  
Median TDS (mg/L)



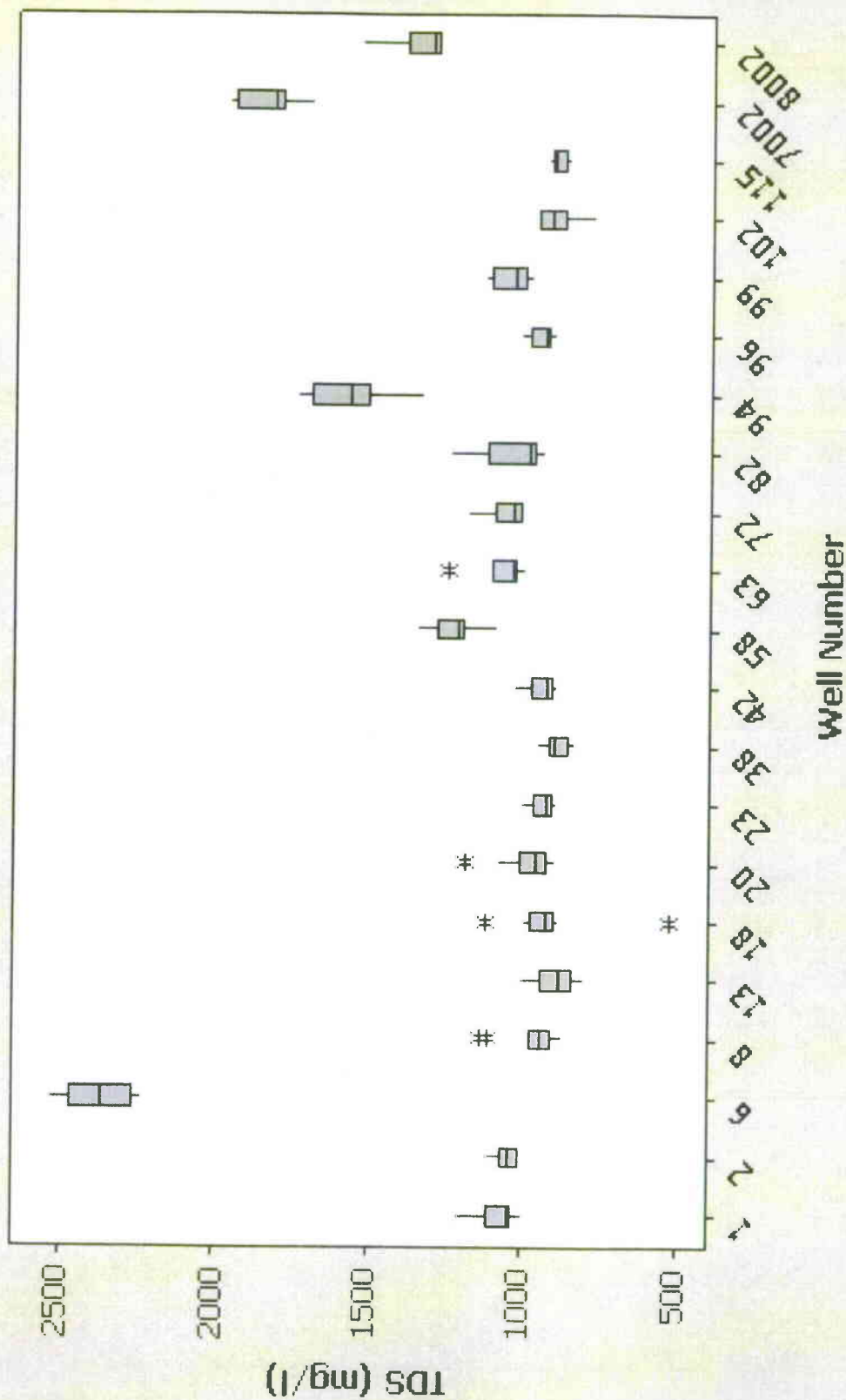


# Ground Water Quality Wells w/ Statistics





# Total Dissolved Solids Well





# Groundwater Sampling Sites







# Groundwater

## ❖ Sample and Measure Water Level and Flow on Representative Wells Within 2 km of Project

- ➔ Assume 12 wells at four samples per year
- ➔ Chemical analyses
  - ➔ 1569 constituents (U, Th-230, Ra-226)
  - ➔ If Th-232 elevated, analyze for Ra-228
  - ➔ Additional Pb-210 and Po-210 (Reg. Guide 4.14)
- ➔ Potentiometric surfaces
- ➔ Develop trilinear diagrams and cluster analysis for formation waters



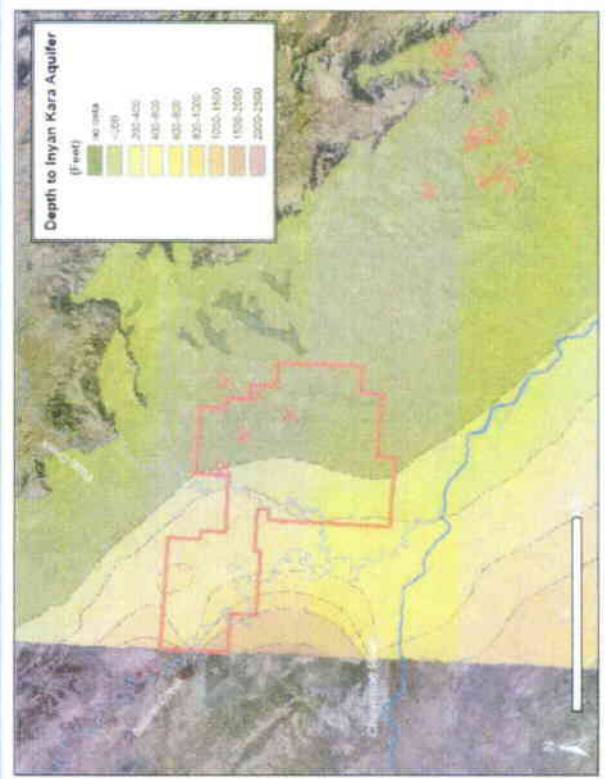
POWERTECH (USA) INC.



# Groundwater

## ❖ Model

- Model hydrology at aquifer scale with ModFlow, well tests with AQTESOLV
- Use dewatering tests and drawdown data from three TVA tests in 1977, 1979, 1982
- Develop Pump Test Plan



POWERTECH (USA) INC.



# Surface Water

## ❖ Sampling

### → Upstream/downstream on Beaver Creek (monthly) and Cheyenne River (quarterly)

- Real-time measure stage
- Collect grab samples at least monthly and during representative storms (24 samples)

### → Storm samples on intermittent streams, upstream/downstream Pass Creek and Bennett Canyon and one unnamed tributary

- Measure storm flows
- Collect grab samples (12 samples maybe)

### → Quarterly sample representative surface water impoundments and abandon pit mine

- Field-measure specific conductance, temperature, turbidity, pH
- Collect grab samples (48 samples)

## → Chemical analyses

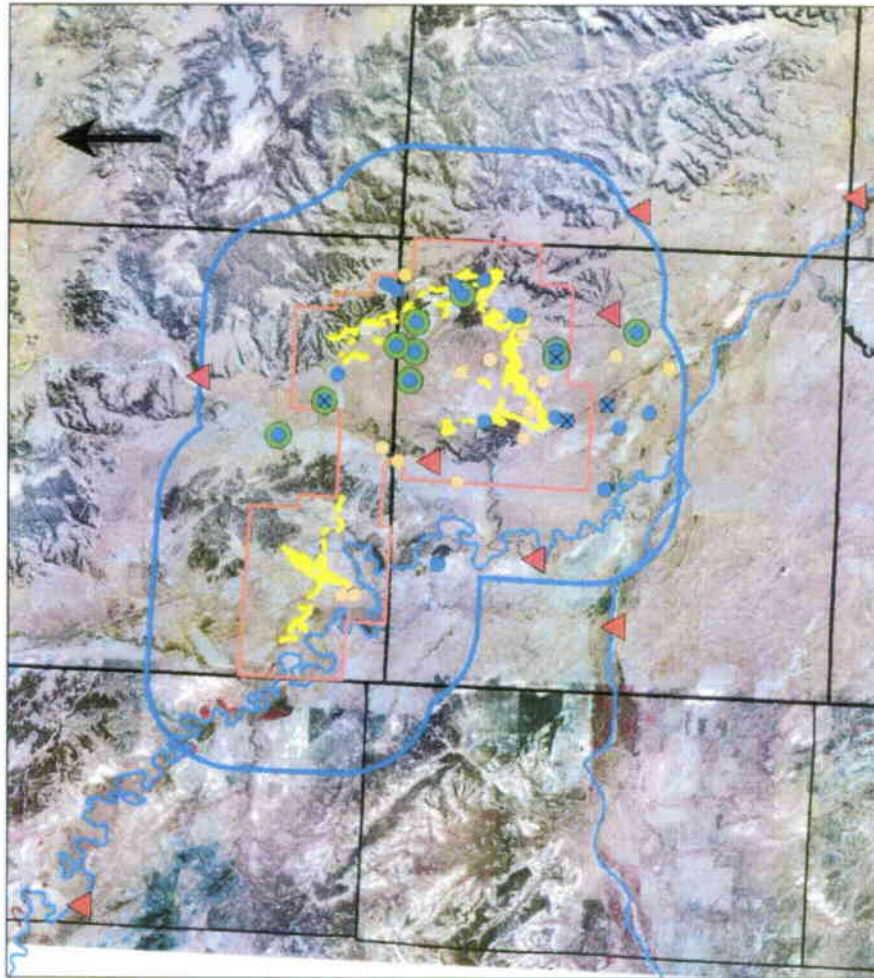
- Same as groundwater with the addition of fecal coliform bacteria, total suspended solids, and suspended solids concentration because of Beaver Creek impairment listing



POWERTECH (USA) INC.



# Surface Water and Sediment Sampling



**RESPEC**  
WATER & NATURAL RESOURCES

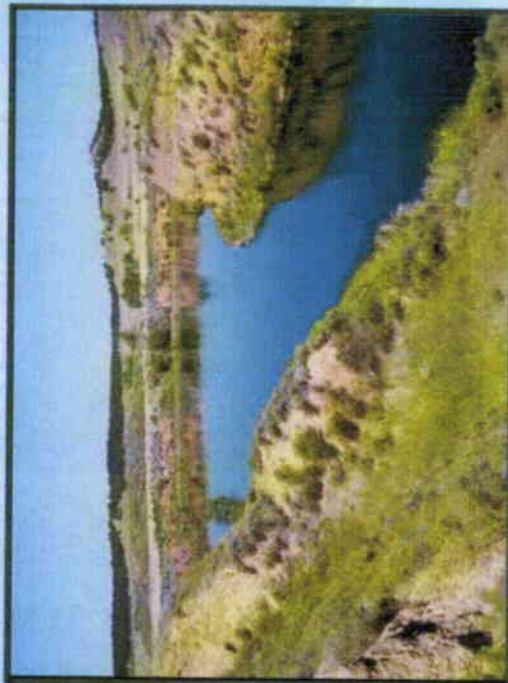
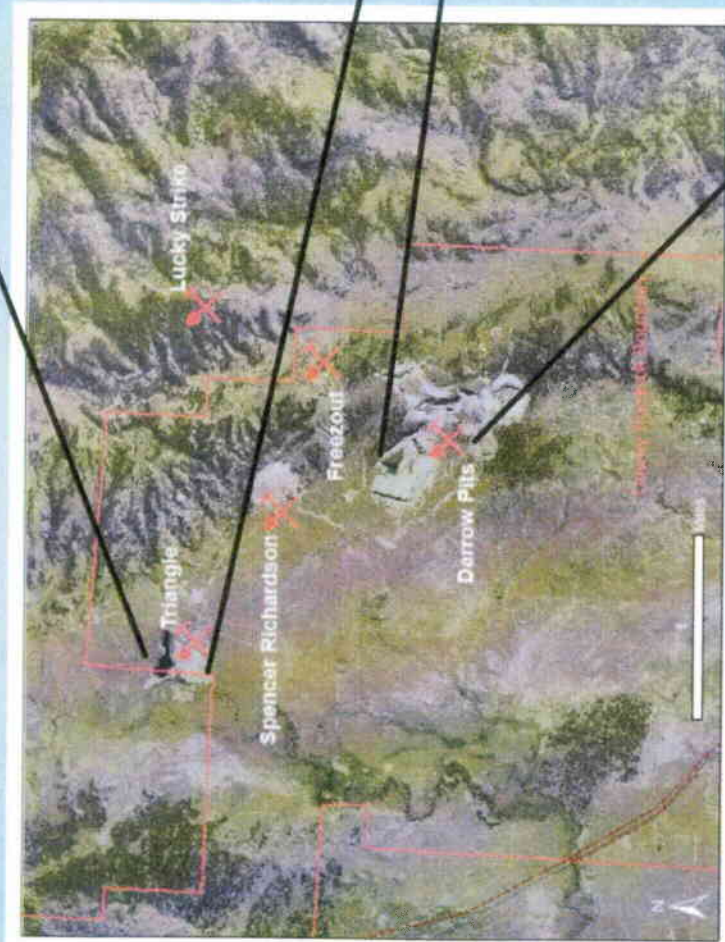


0 0.5 1 2 3 Miles





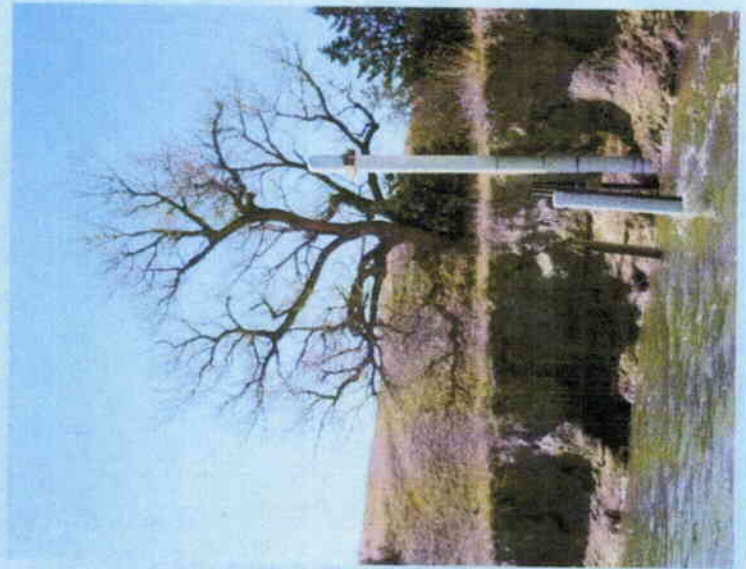
# Dewey Burdock Mine Sites



PowerTech (USA) Inc.



# Passive Sediment Sampler With Stage Recorder



POWERTECH (USA) INC.



# Site Sampling Locations



Dewey-Burdock Project

Beaver Creek at SD DENR (BG-1)



POWERTECH (USA) INC.

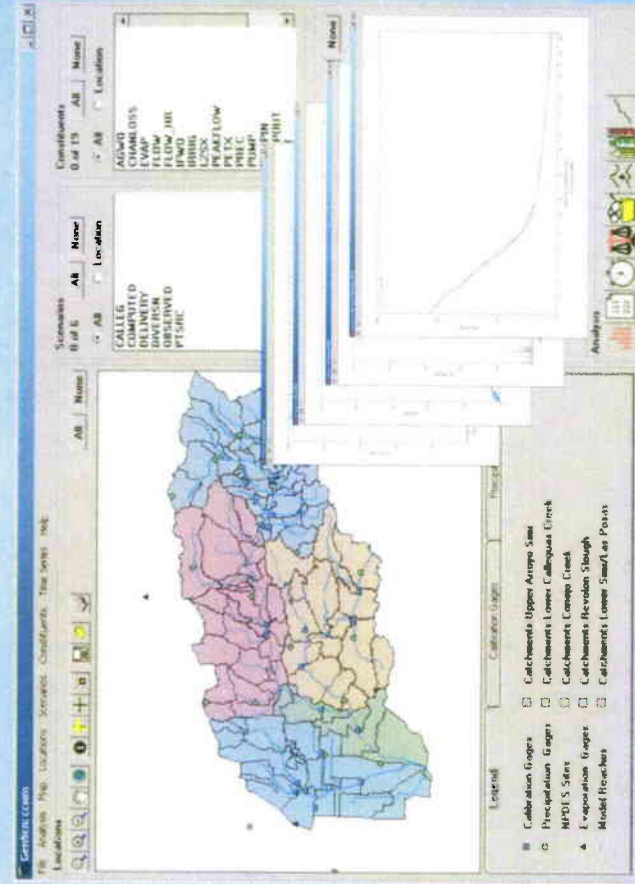
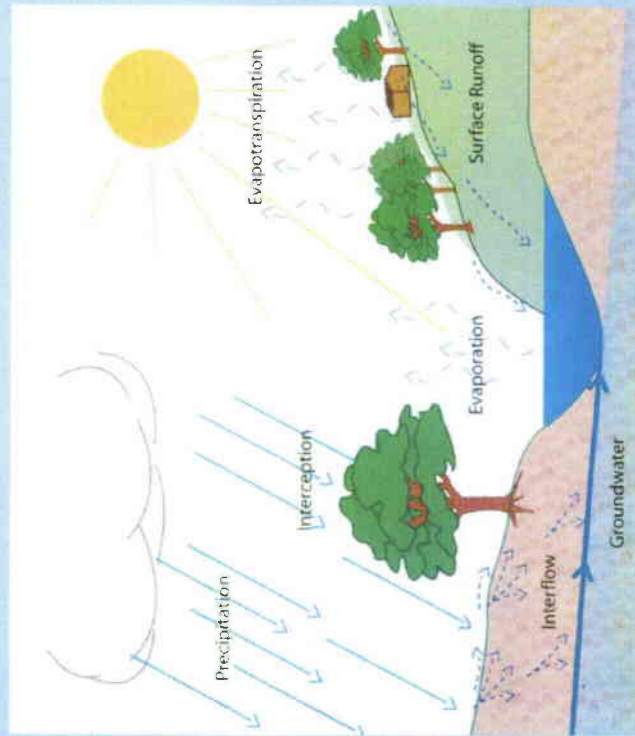


# Surface Water



**Model**

➔ **HEC-HMS and HEC RAS - Flood Plain Model**



**POWERTECH (USA) INC.**



# Meteorology

❖ Cooperating With South  
Dakota State climatologist  
Dr. Dennis Todey

## ❖ Full MET station

- ➔ Wind speed/direction
- ➔ Solar radiation
- ➔ Humidity
- ➔ Temperature
- ➔ Year-round precipitation
- ➔ Evaporation
- ➔ Soil temperature



POWERTECH (USA) INC.



# Radiological Baseline Study

❖ Establish Environmental Monitoring Stations

❖ Collect Baseline Samples/Radiological Analysis

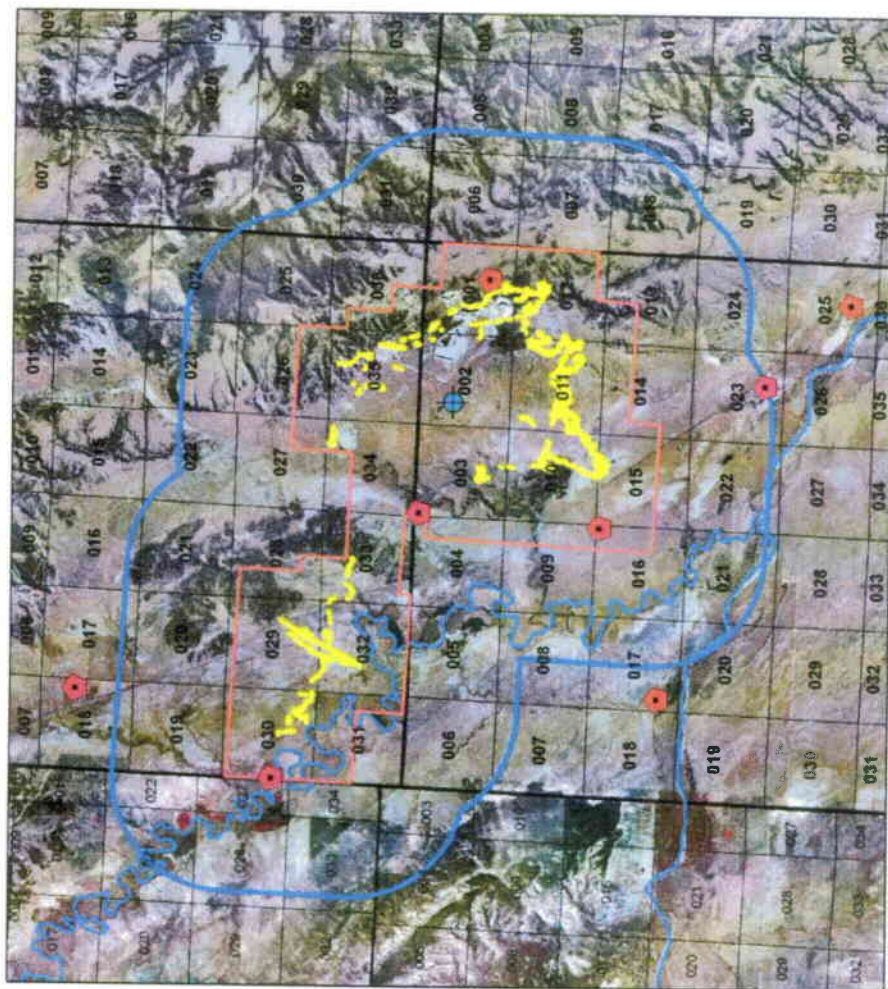
❖ Deploy Radon and Direct Radiation Detectors



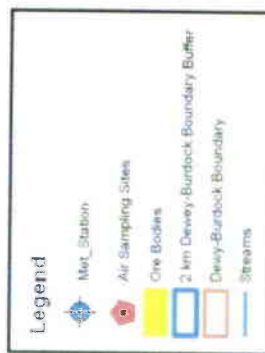
POWERTech (USA) INC.



# Meteorological and Radiological Air Quality Sampling



**RESPEC**  
WATER & NATURAL RESOURCES





# Radiological Baseline Study

## ❖ Radiological measurements and samples

- ➔ Air particulate concentrations (8 monitoring stations)
- ➔ Soil concentrations (8 + 80 surface; 18 subsurface (5, 15, 30-100 cm))
- ➔ Ambient radon in air concentrations (8 + 7)
- ➔ Direct radiation ( 8 TLD + 80 PIC)
- ➔ Radon flux (9 x 3) *near well point*
- ➔ Surface water and sediment
- ➔ Vegetation (3 times), food (once), and fish (4 times – per GFP requirement)
- ➔ Laboratory analysis per Reg Guide 4.14



POWERTECH (USA) INC.



# Additional License Application Tasks

❖ MILDOS-AREA modeling

➔ *Off-site dose assessment*

❖ Worker dose assessment

❖ Radiation protection plan

❖ Environmental monitoring plan

❖ Accident scenario/assessment

❖ Decommissioning plan



POWERTECH (USA) INC.



# BKS: Baseline

## ❖ Vegetation

- ➔ *Historical data review*
- ➔ *Tree & shrub density cover sampling*
- ➔ *Dominant vegetation community sampling*
- ➔ *Threatened and Endangered Survey*

## ❖ Soils

- ➔ *Review historical soil mapping*
- ➔ *Conduct soil survey/sampling*
- ➔ *Complete soil mapping*

## ❖ Wetlands

- ➔ *National wetland inventory review*
- ➔ *Delineate wetland areas*
- ➔ *Prepare mapping*



POWERTECH (USA) INC.





# Jones & Stokes: Baseline



## Wildlife Surveys

→ *Threatened and Endangered Species*

→ *Upland game birds*

→ *Breeding birds*

→ *Big game species*

→ *Raptors*

→ *Fisheries/Invertebrates*

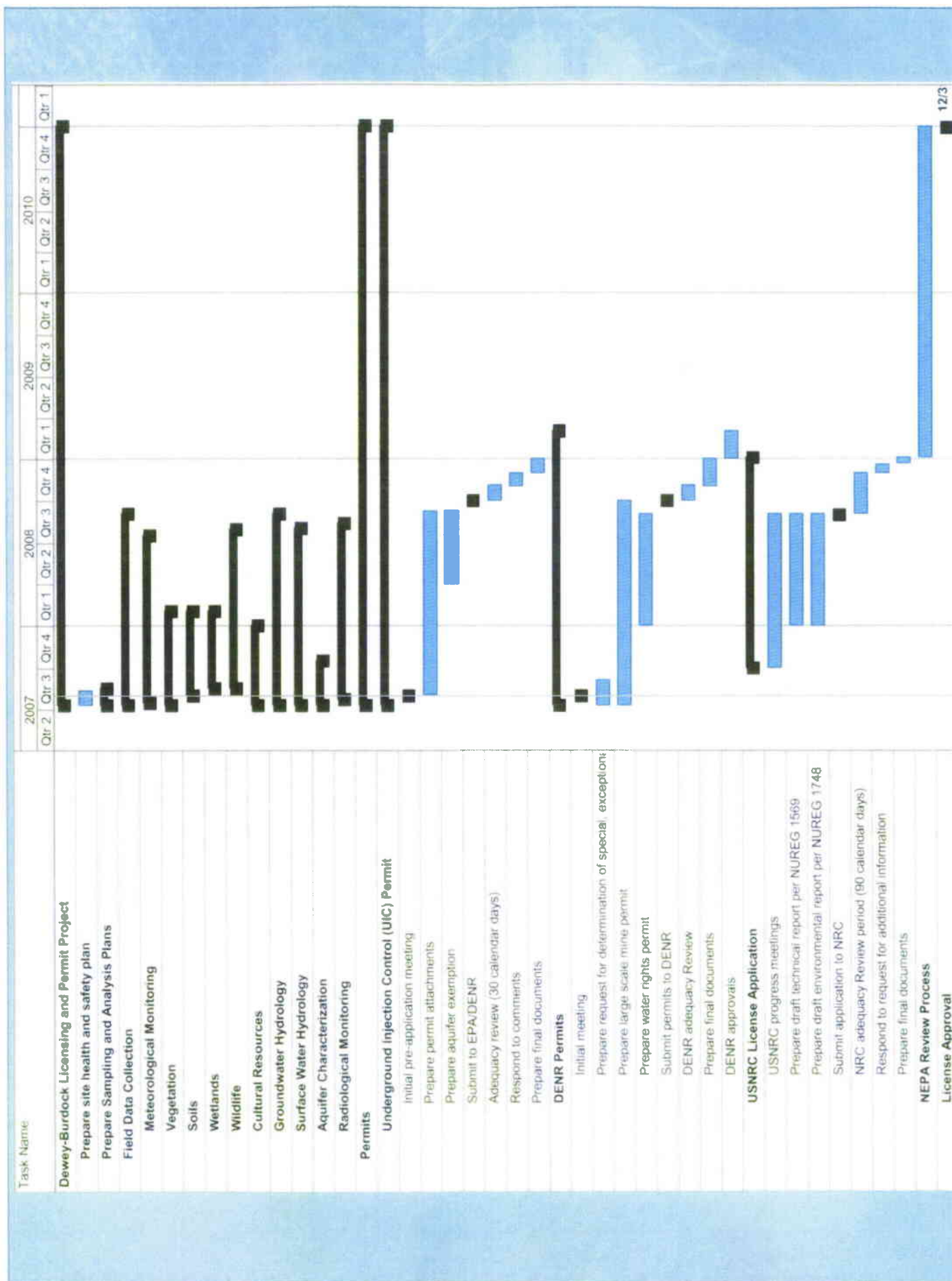
→ *Small mammal trapping*

→ *Stream Characterization*



POWERTECH (USA) INC.

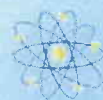






# Summary

- ❖ PowerTech has experience
- ❖ Hired team to support licensing effort with SD DENR, USNRC and USEPA
- ❖ Baseline sampling program is started
- ❖ Team wants to interact closely with regulators
- ❖ Sampling complete in June 2008, permit documents 3<sup>rd</sup> quarter 08, all permits 4<sup>th</sup> quarter 2010



POWERTECH (USA) INC.



*Powertech (USA), Inc.*  
*Pre-Permit Baseline*

Historical Geochemistry  
& Hydrology Review



rec'd  
9/27/07

# DEWEY-BURDOCK POWERTECH URANIUM PROSPECT

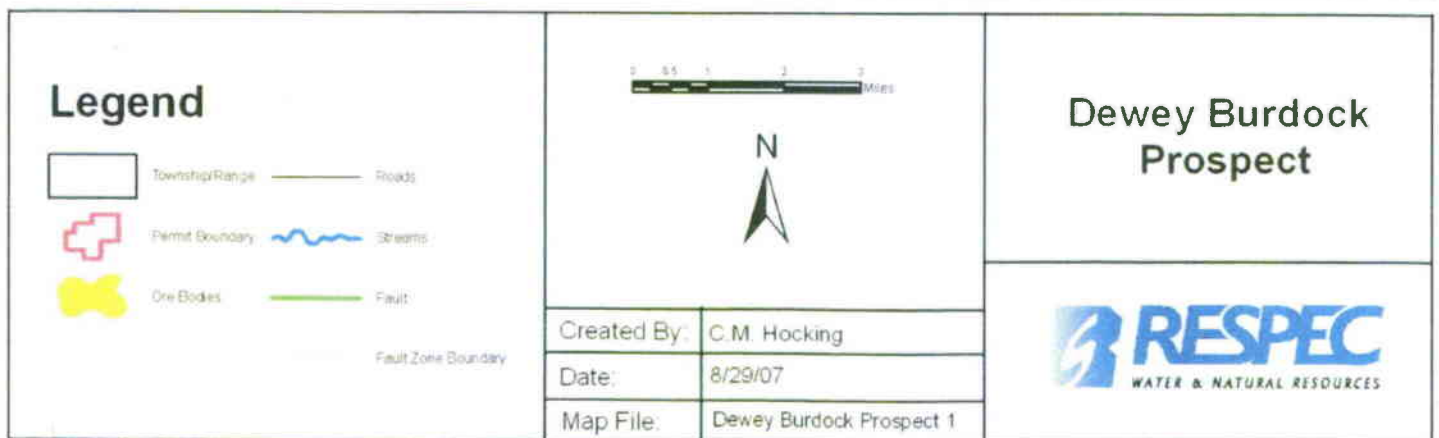
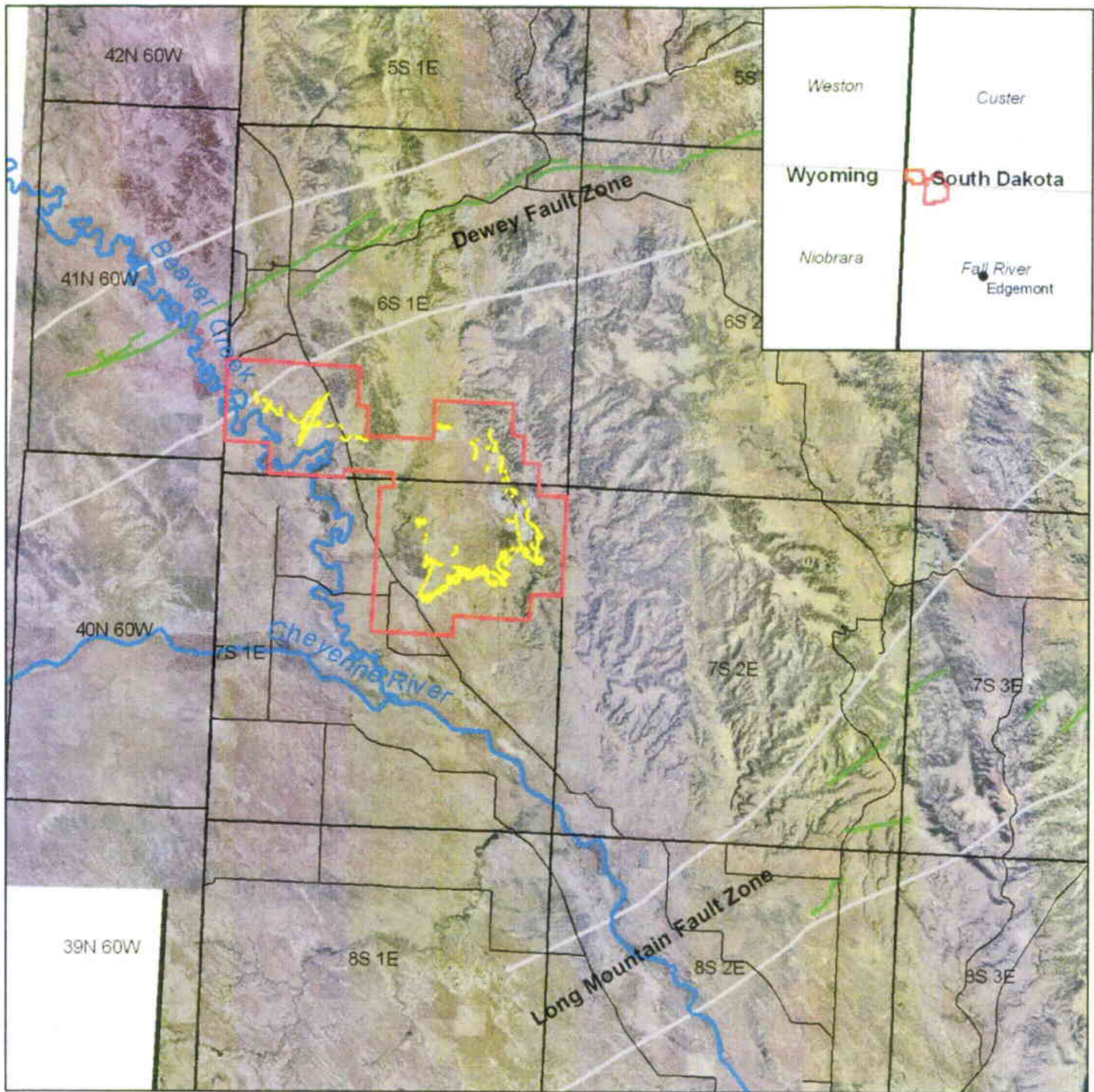
## HISTORICAL GEOCHEMISTRY AND HYDROLOGY REVIEW



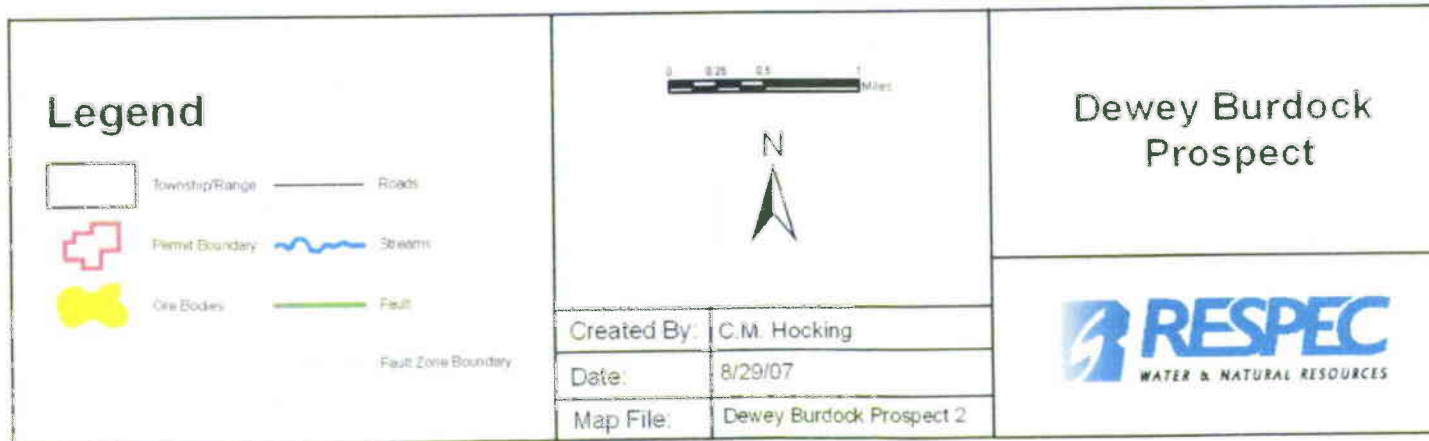
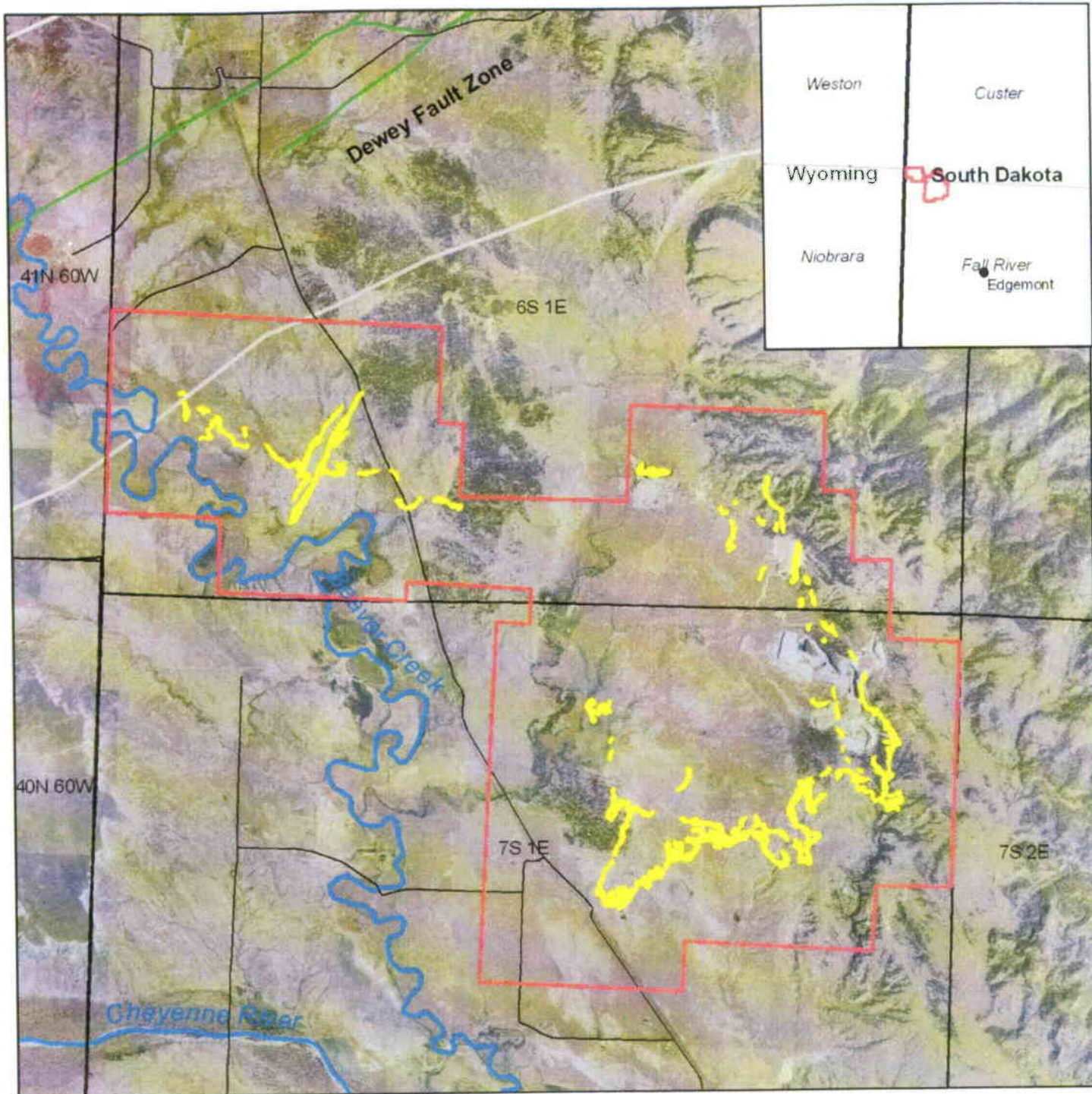


## **GENERAL SITE MAPS**

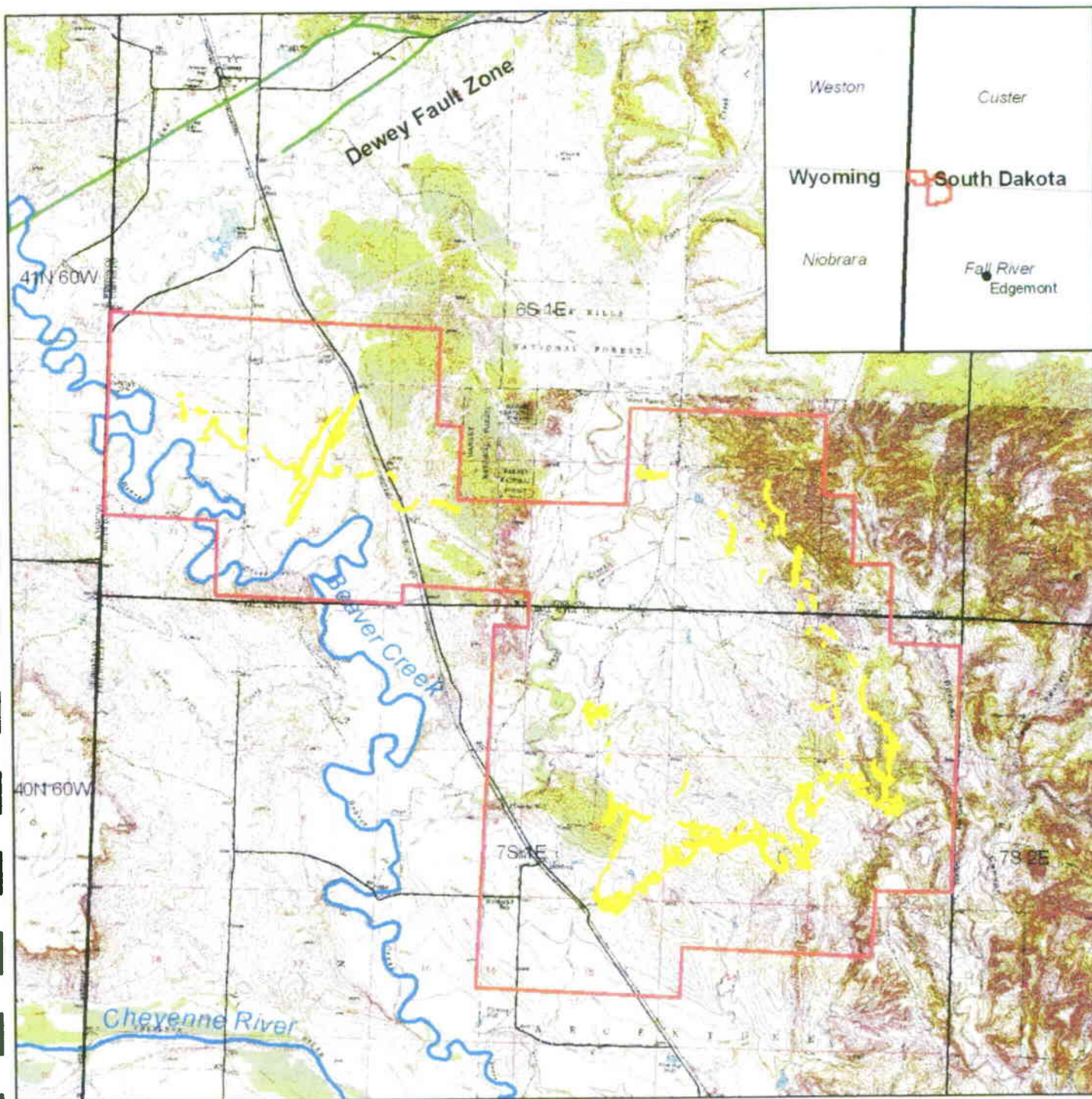




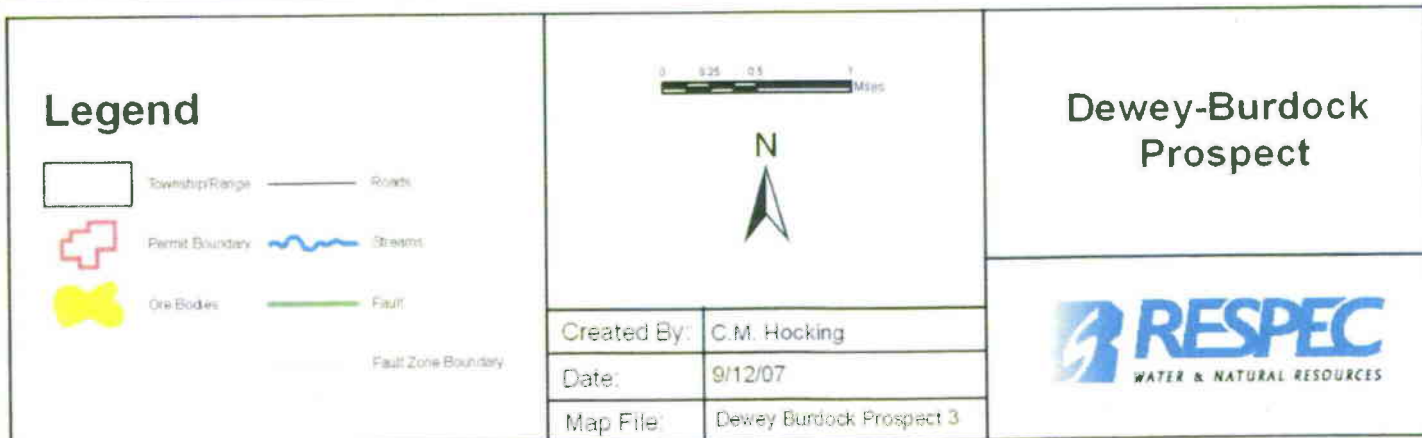




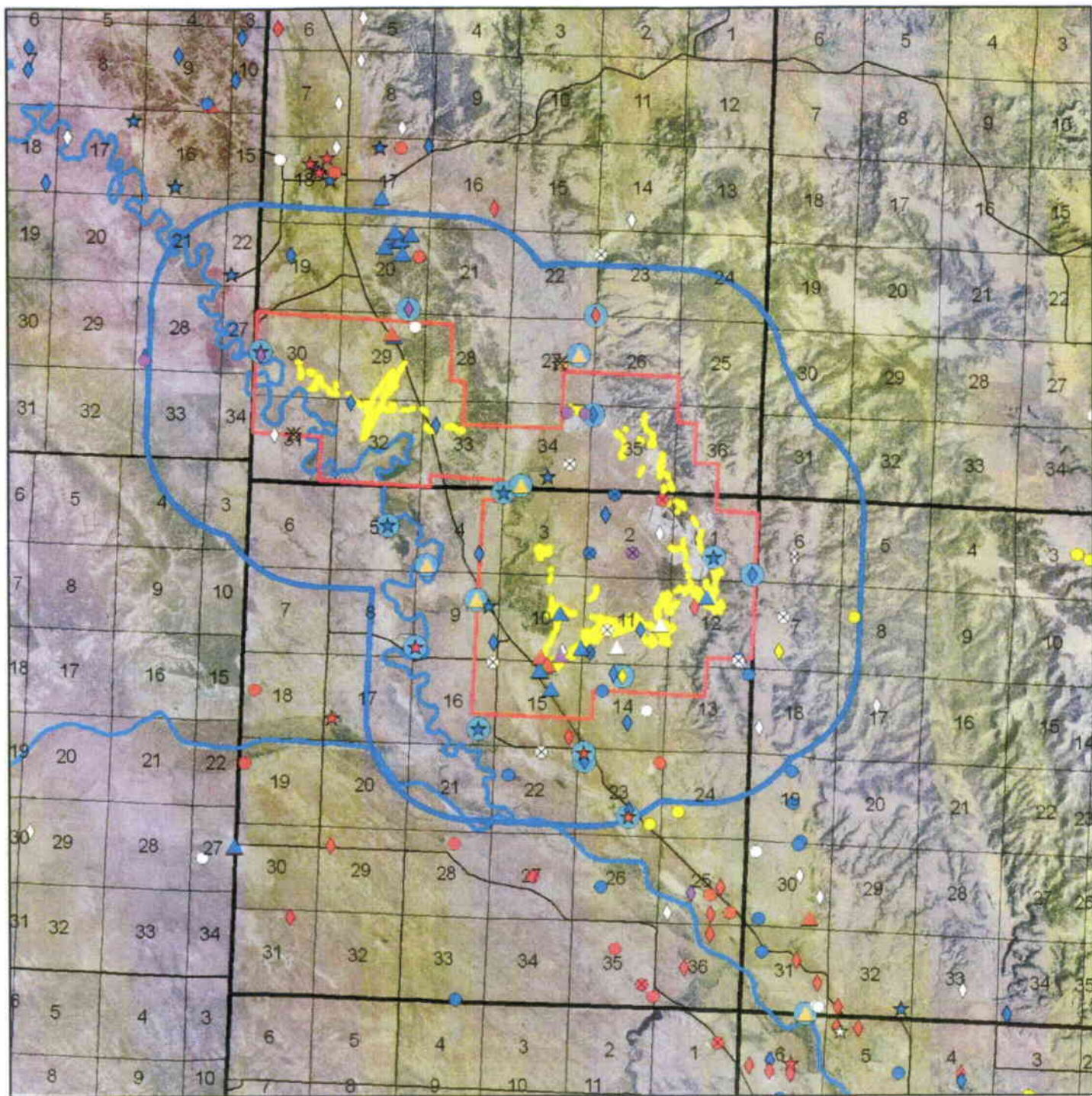




Weston	Custer
Wyoming	South Dakota
Niobrara	Fall River Edgemont







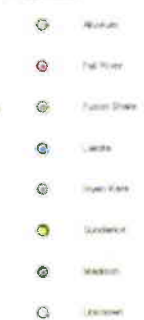
### Legend



### Well Use



### Aquifer



0 0.5 1 2 Miles



## Dewey-Burdock Ground Water Sampling Sites

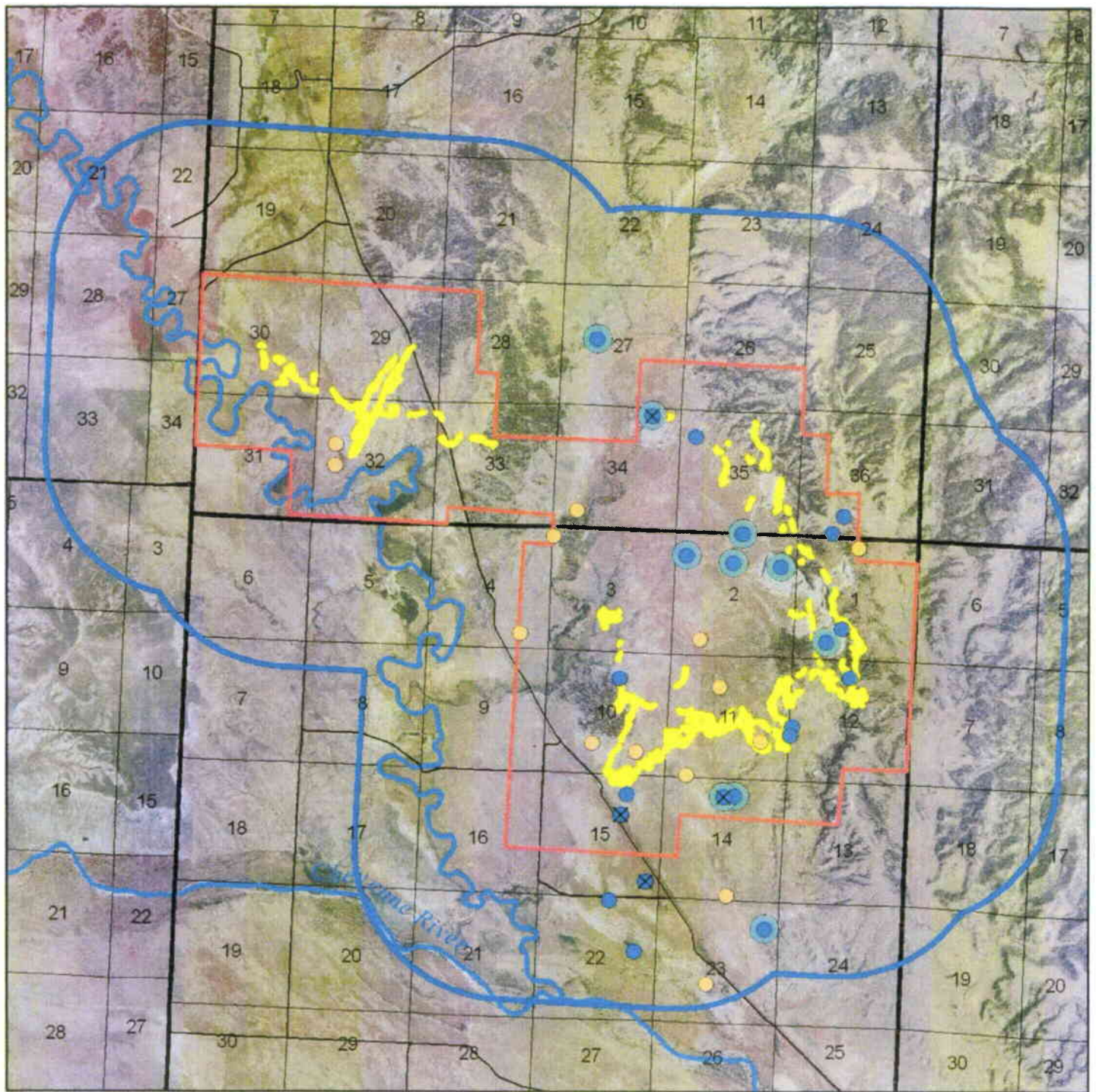


Created By: C.M. Hocking










Date: 9/12/07

Map File: Ground Water Sampling





## Legend

- |   |   |
|---|---|
|  Sections        |  Impoundments          |
|  Permit Boundary |  Influenced by Springs |
|  Ore Bodies      |  Dry                   |
|  Roads           |  Proposed Sample Sites |
|  Streams         |   |

0 0.5 1 2 Miles

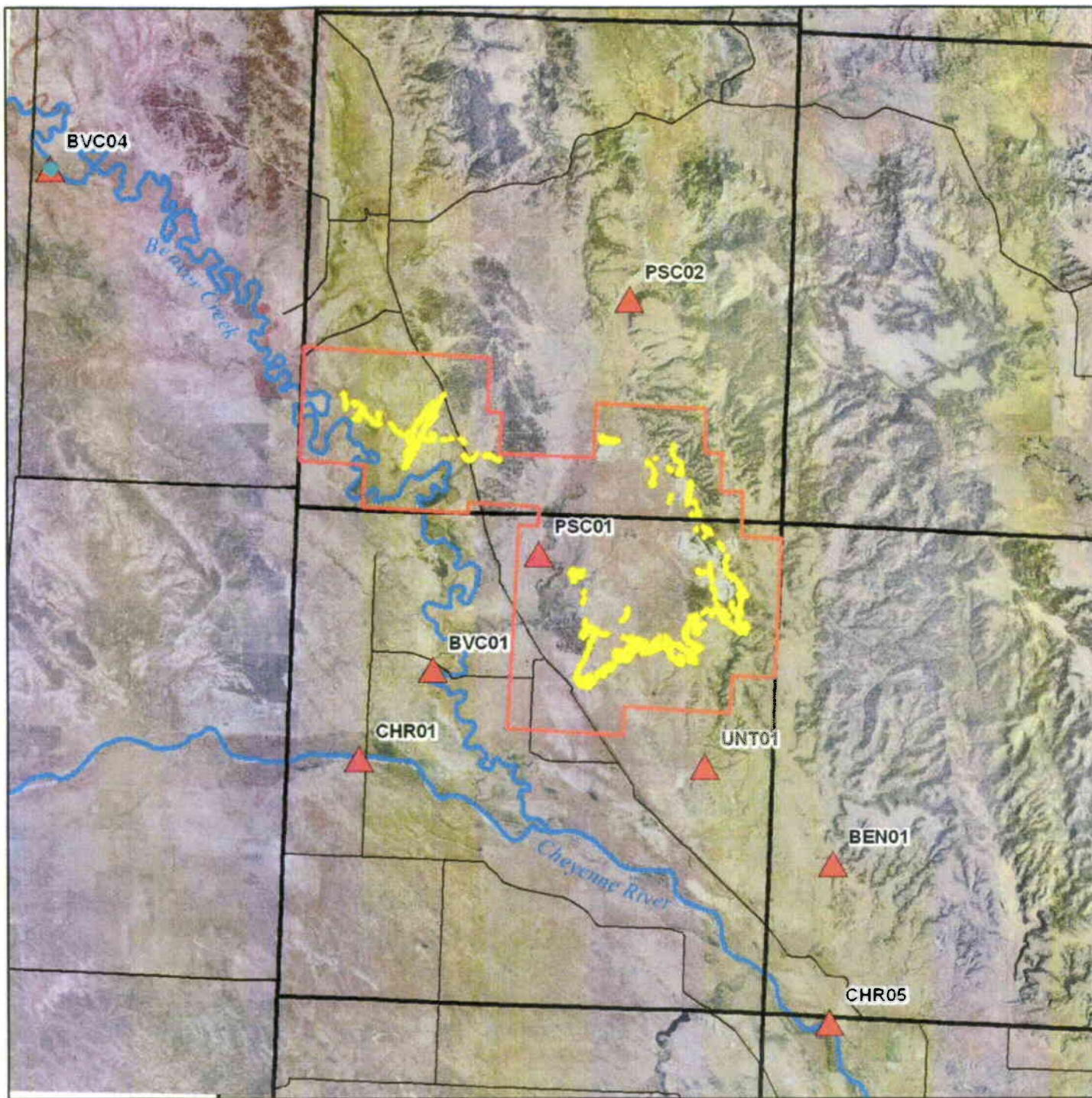


## Dewey-Burdock Impoundment Sampling Sites





Created By:	C.M. Hocking
Date:	9/12/07
Map File:	Impoundment Sampling







## Legend

- |   |                 |   |                |
|---|-----------------|---|----------------|
|  | Township/Range  |  | Roads          |
|  | Permit Boundary |  | Streams        |
|  | Ore Bodies      |  | Sampling Sites |

0 0.2 0.4 0.6 0.8 1.0 Miles

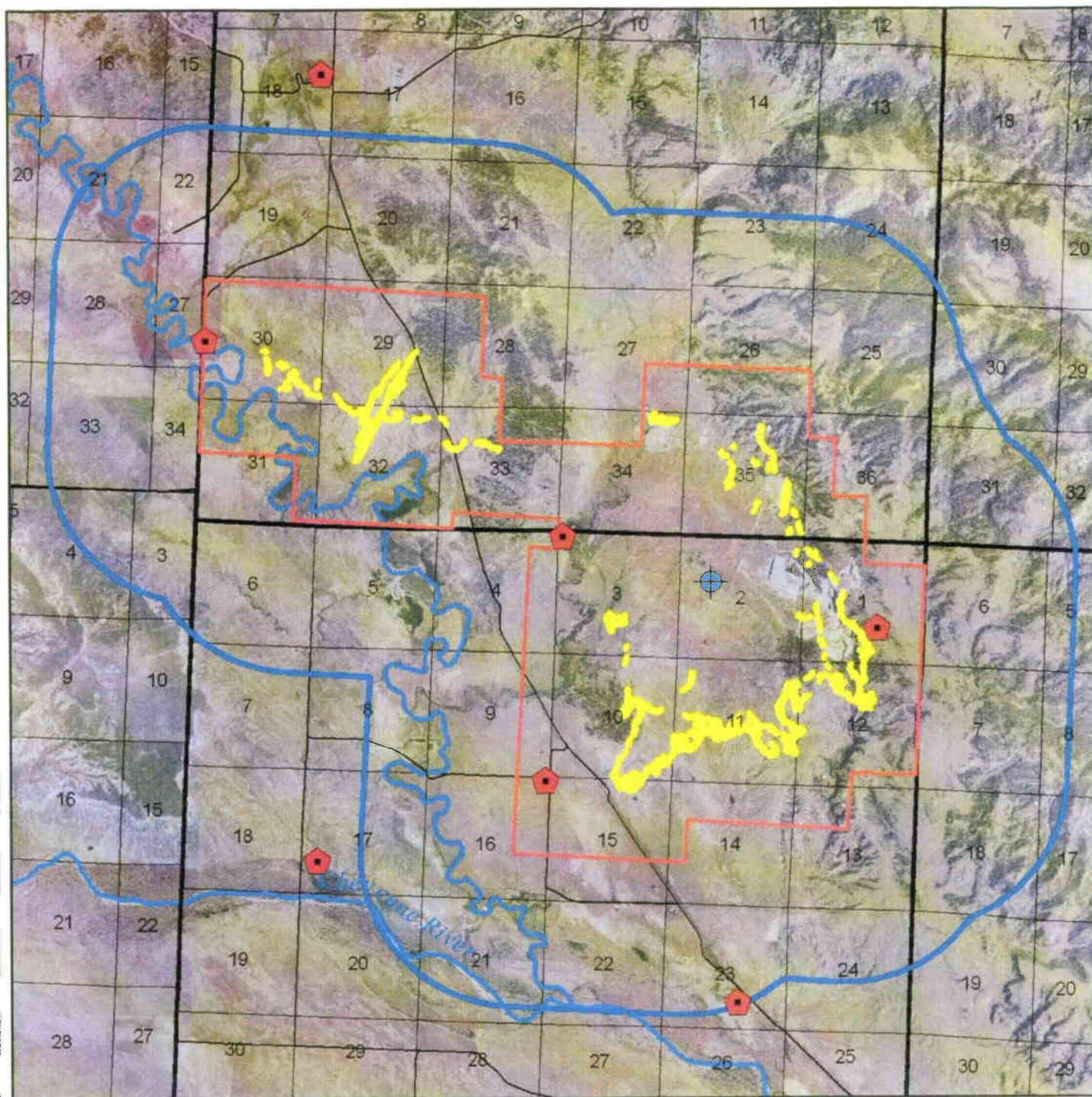


## Dewey-Burdock Stream Sampling Sites

Created By:	C.M. Hocking
Date:	9/12/07
Map File:	Stream Sampling







## Legend

- |   |                 |   |                    |
|---|-----------------|---|--------------------|
|  | Sections        |  | Met Station        |
|  | Permit Boundary |  | Radiological Sites |
|  | Ore Bodies      |   |                    |
|  | Roads           |   |                    |
|  | Streams         |   |                    |

0 0.5 1 2 Miles



## Dewey Burdock Air Sampling Sites

Meteorological and Radiological



Created By: C.M. Hocking

Date: 8/29/07

Map File: Air Sampling



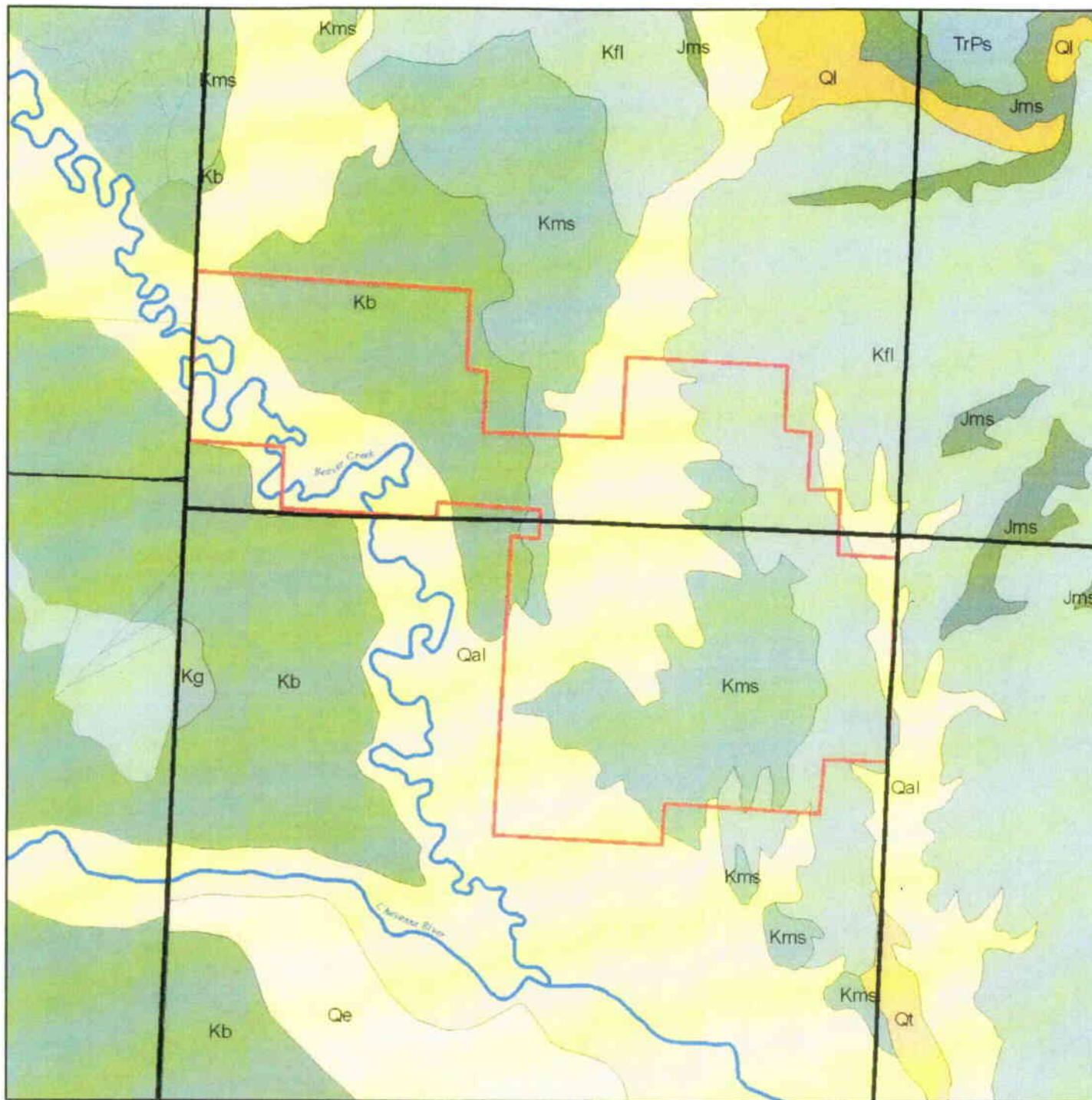
# **GEOLOGY and HYDROLOGY**



ERATHM	SYSTEM	ABBREVIATION FOR STRATIGRAPHIC INTERVAL	GEOLOGIC UNIT	THICKNESS IN FEET	DESCRIPTION
CENOZOIC	QUATERNARY & TERTIARY	Quaternary	GLACIAL LATERAL SAND AND GRAVEL WHITE SAND DUNE	2-30 40-60	Light colored clay with sandstone channels and local limestone lenses. Principal source of sandstone for the Pierre shale.
		Tertiary	PIERRE SHALE	1,200-2,000	Dark gray shale containing scattered sandstone lenses. White sandstone lenses (Pierre sandstone) in the Pierre shale. Black sandstone lenses with sandstone.
MESOZOIC	CRETACEOUS	Kp	NEBRASKA STRATIGRAPHY	100-200	Light gray and tan sandstone.
			CAULLE FORMATION	400-750	Light gray shale with numerous large concretions and sand layers.
			WAS CREEK STRATIGRAPHY	175-300	Dark gray sandstone.
			GREENHORN FORMATION	200-300	Dark gray sandstone with thin layers of sandstone.
			BELLE FOURCHE SHALE	300-500	Gray shale with sandstone and sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	JURASSIC	Ju	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	TRIASSIC	Tr	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	PERMIAN	Pm	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	PENNSYLVANIAN	Pn	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	MISSISSIPPIAN	Ms	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	DEVONIAN	Dv	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	ORDOVICIAN	Ov	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	CAMBRIAN	Cb	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
PALEOZOIC	PRECAMBRIAN	Pc	WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.
			WAS CREEK STRATIGRAPHY	100-200	Dark gray sandstone.

Modified from information furnished by the Department of Geology and Geological Engineering, South Dakota School of Mines and Technology (written in 1934, January 1934)

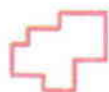




# Legend



Township/Range



Dewey Burdock Boundary



Streams



Dewey Burdock  
Surface Geology



Created By: C.M. Hocking

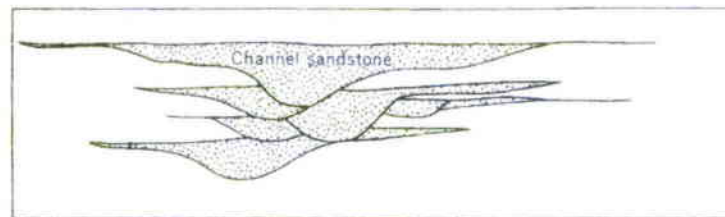
Date: 8/29/07

Map File: Geology

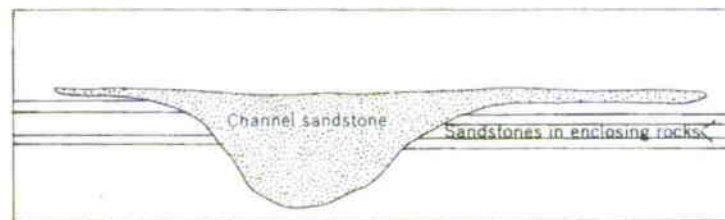




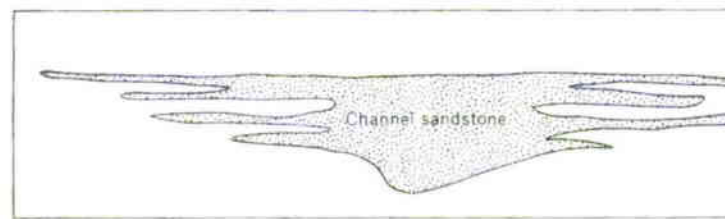




A



B

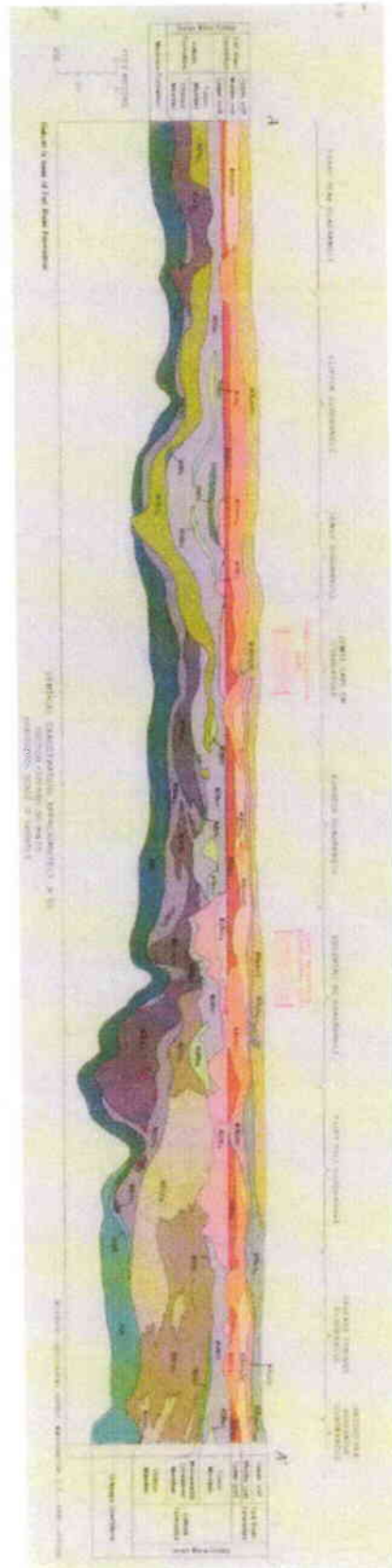


C

0 1 2 MILES  
APPROXIMATE HORIZONTAL SCALE  
VERTICAL DIMENSION GREATLY EXAGGERATED

Schematic drawing of possible relations of complex channel sandstone to the enclosing rocks (from Brobst, 1961).



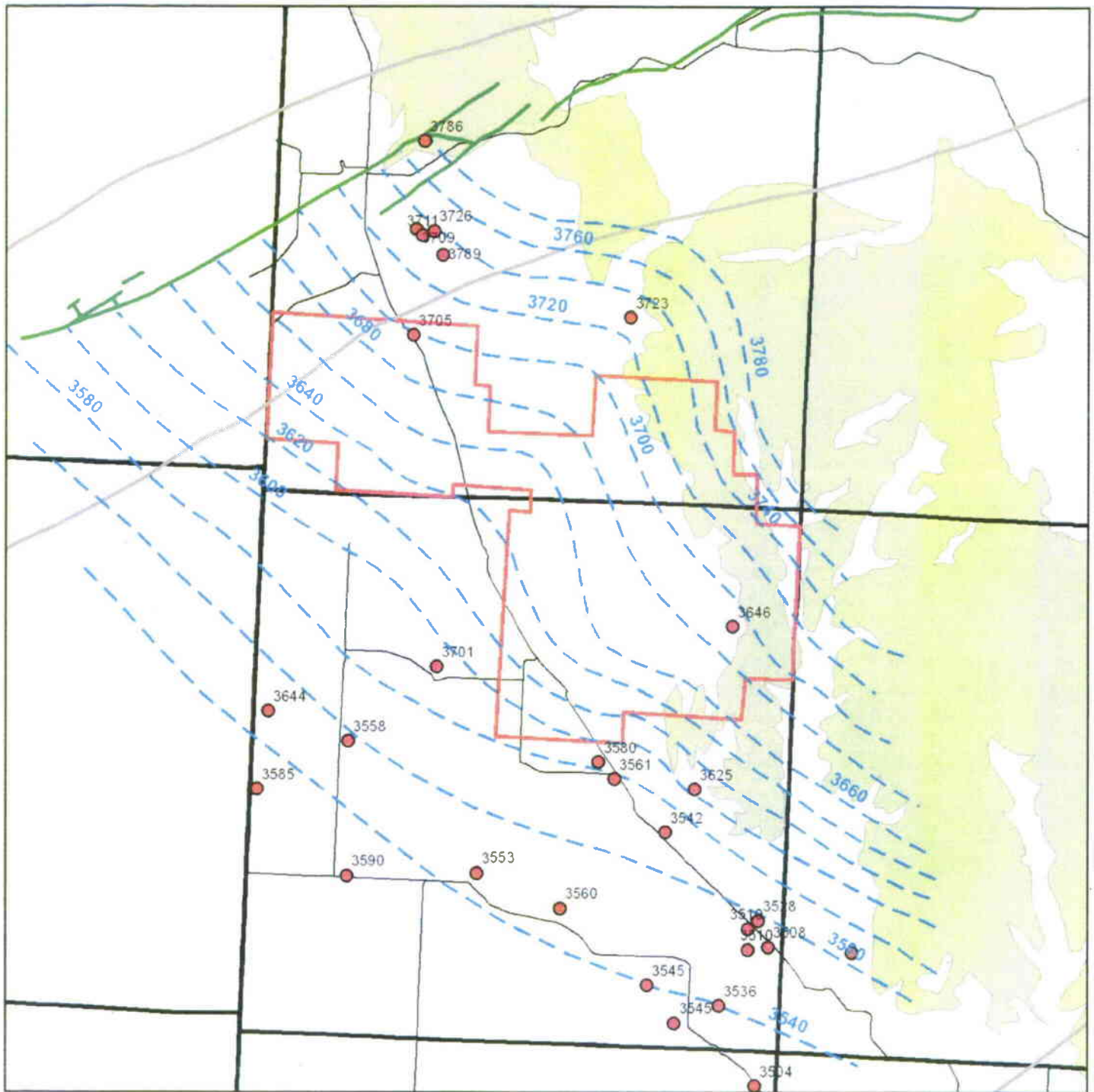


Diagrammatic cross section of the Inyan Kara across part of the southern Black Hills, South Dakota (from Gott, Wolcott, and Bowles, 1974).









## Legend

- Township/Range
- Permit Boundary
- Irwin Kara Outcrop
- Fall River Wells
- Roads
- Fault
- Fault zone boundary
- Water Level (ft)

0 0.5 1 2 3 Miles



## Dewey Burdock Potentiometric Map

Fall River Formation

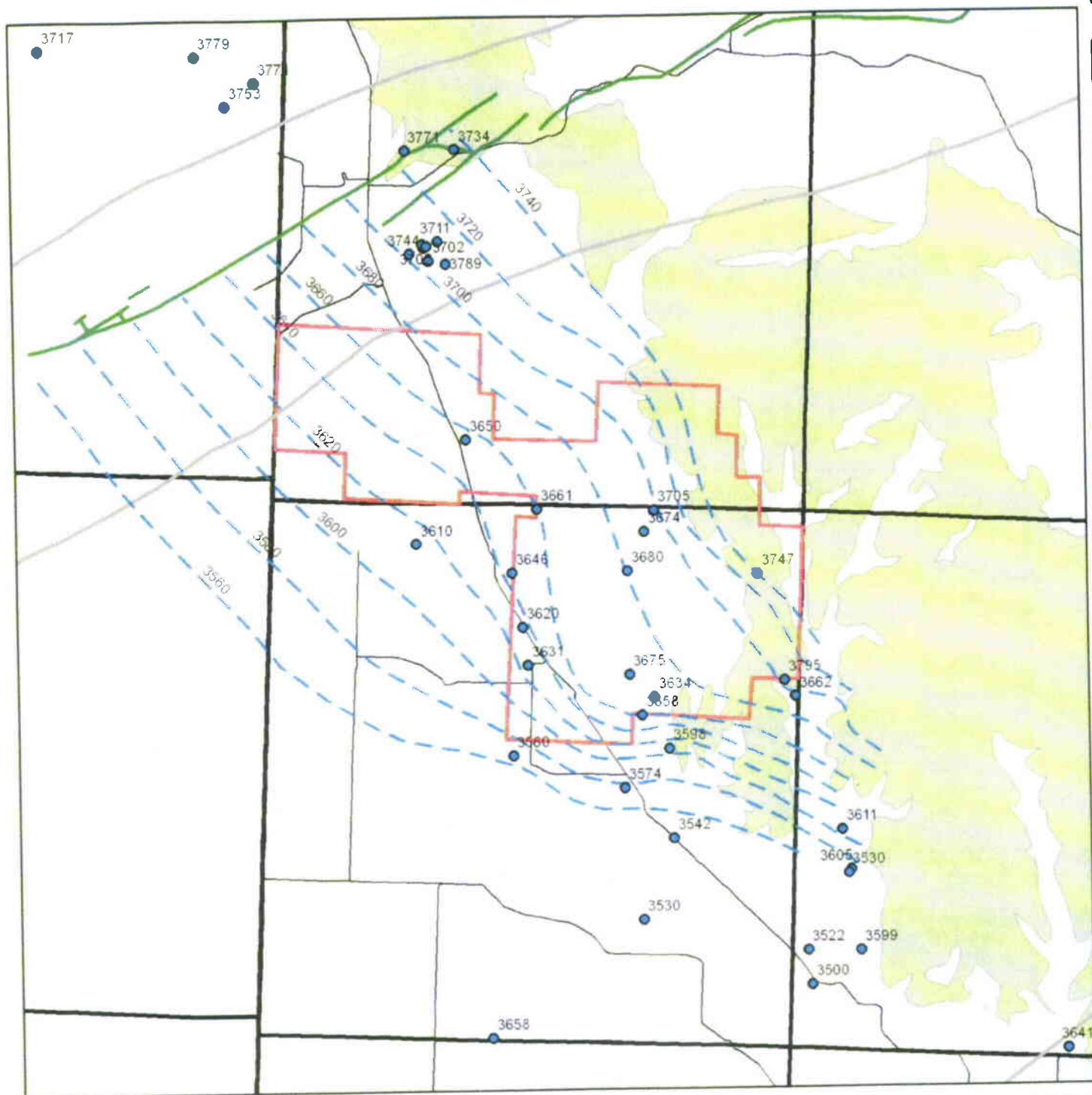


Created By: C.M. Hocking

Date: 8/30/07

Map File: PT\_Fall\_River





# Legend

- Township Range
- Permit Boundary
- Inyan Kara Outcrop
- Lakota Wells
- Roads
- Fault
- Fault zone boundary
- Water Level (ft)



## Dewey Burdock Potentiometric Map

Lakota Formation

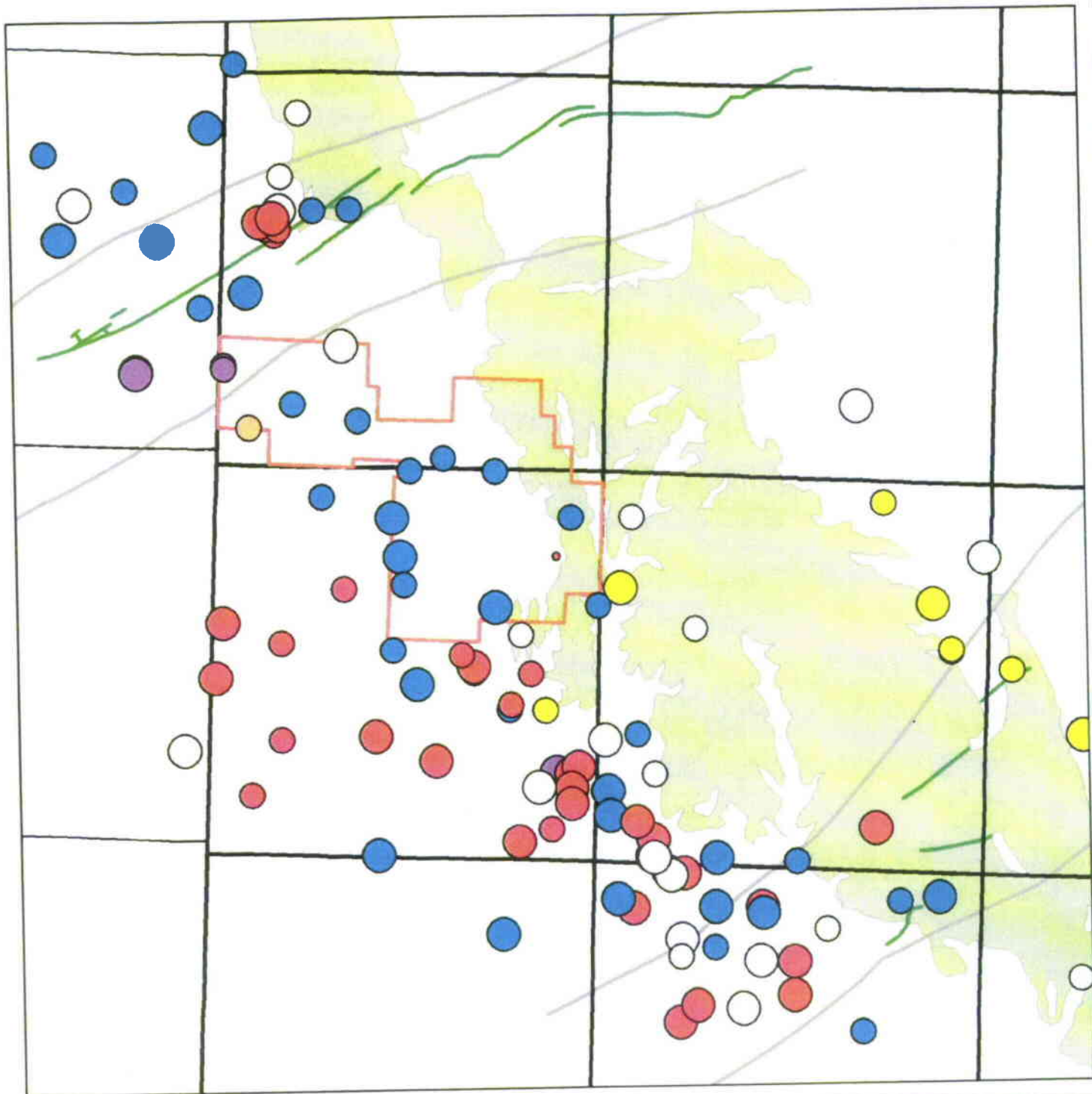
Created By:	C.M. Hocking
Date:	8/30/07
Map File:	PT_Lakota





## **GEOCHEMISTRY MAPS**





### Legend

- |           |                |                |
|-----------|----------------|----------------|
|           | Unconsolidated | <b>Aquifer</b> |
|           | Panel Boundary |                |
| <b>pH</b> |                |                |
|           | 5.2 - 6.0      |                |
|           | 6.1 - 7.0      |                |
|           | 7.1 - 8.0      |                |
|           | 8.1 - 9.0      |                |
|           |                |                |
|           |                |                |

0 0.5 1 2 3 4 Miles



Created By: C. M. Hocking

Date: 8/30/07

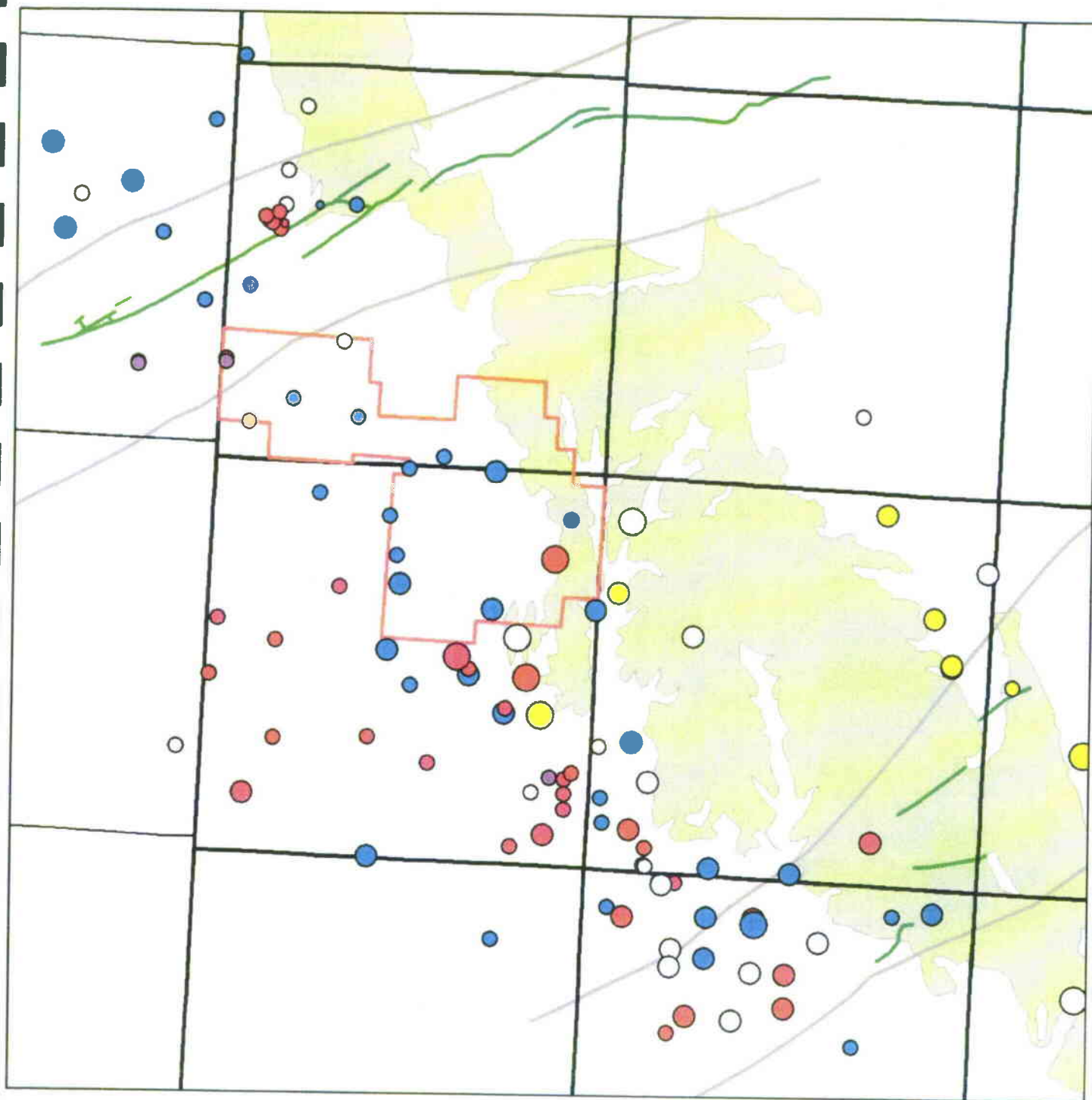
Map File: pH

## Dewey Burdock Historical Ground Water Quality

Median pH







### Legend

Township Range

Parcel Boundary

#### Conductivity (umhoms)

Median

500 - 1000

1000 - 1500

1500 - 2000

2000 - 2500

#### Aquifer

Alluvium

Fort River

Horse Chase

Lumber

Dryden Rock

Sundance

Madison

Steamboat

0 0.5 1 2 3 4 Miles



Created By: C M. Hocking

Date: 8/30/07

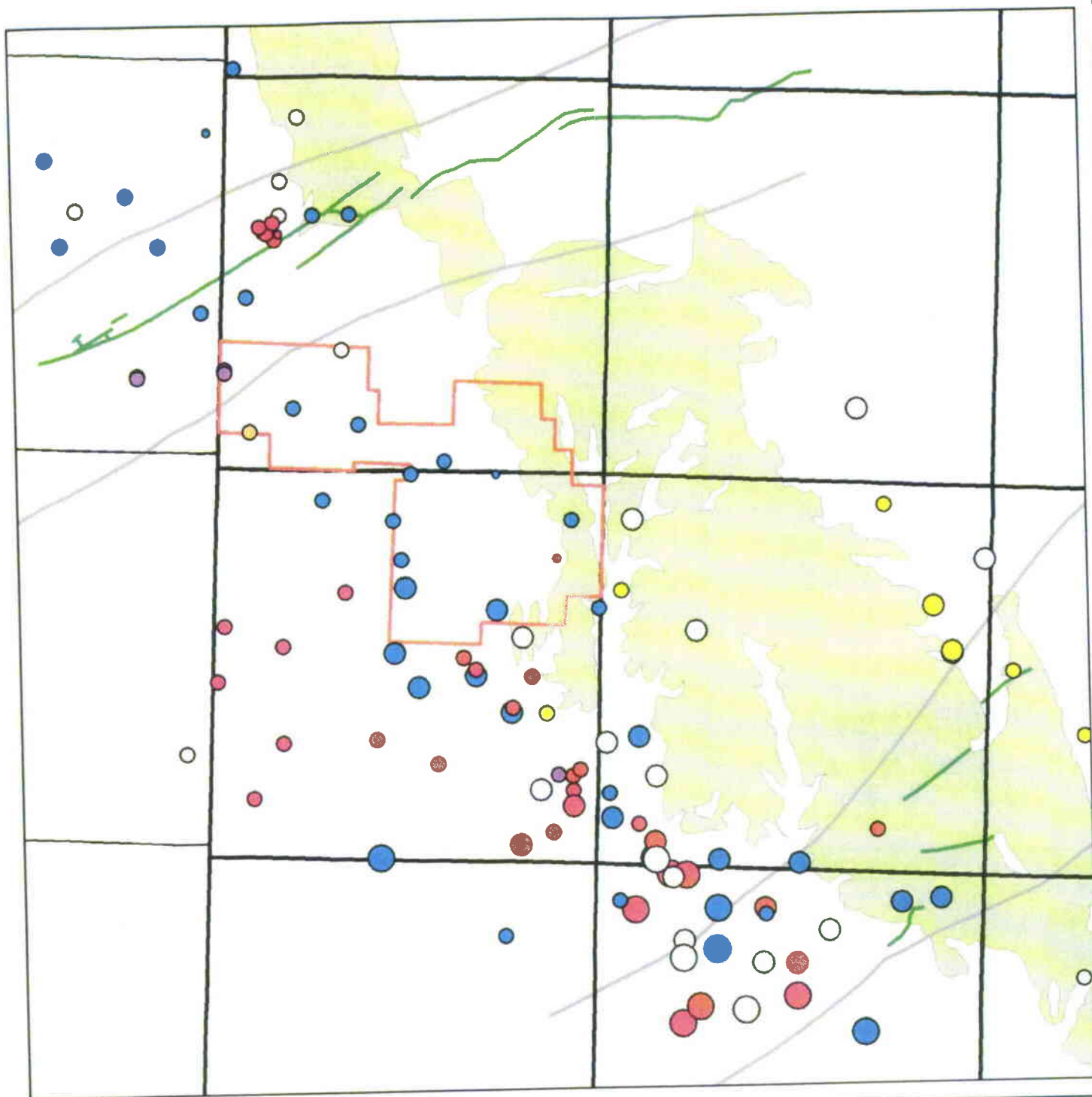
Map File: Conductivity

## Dewey Burdock Historical Ground Water Quality

Median Conductivity







### Legend

Township Range

Boundary

**Alkalinity (mg/L)**

**Median**

0-100

101-200

201-400

401-1000

### Aquifer

Alluvium

Oak River

Fossil Sand

Lignite

Gravel Bank

Sandstone

Mudstone

Unconsolidated

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Alkalinity

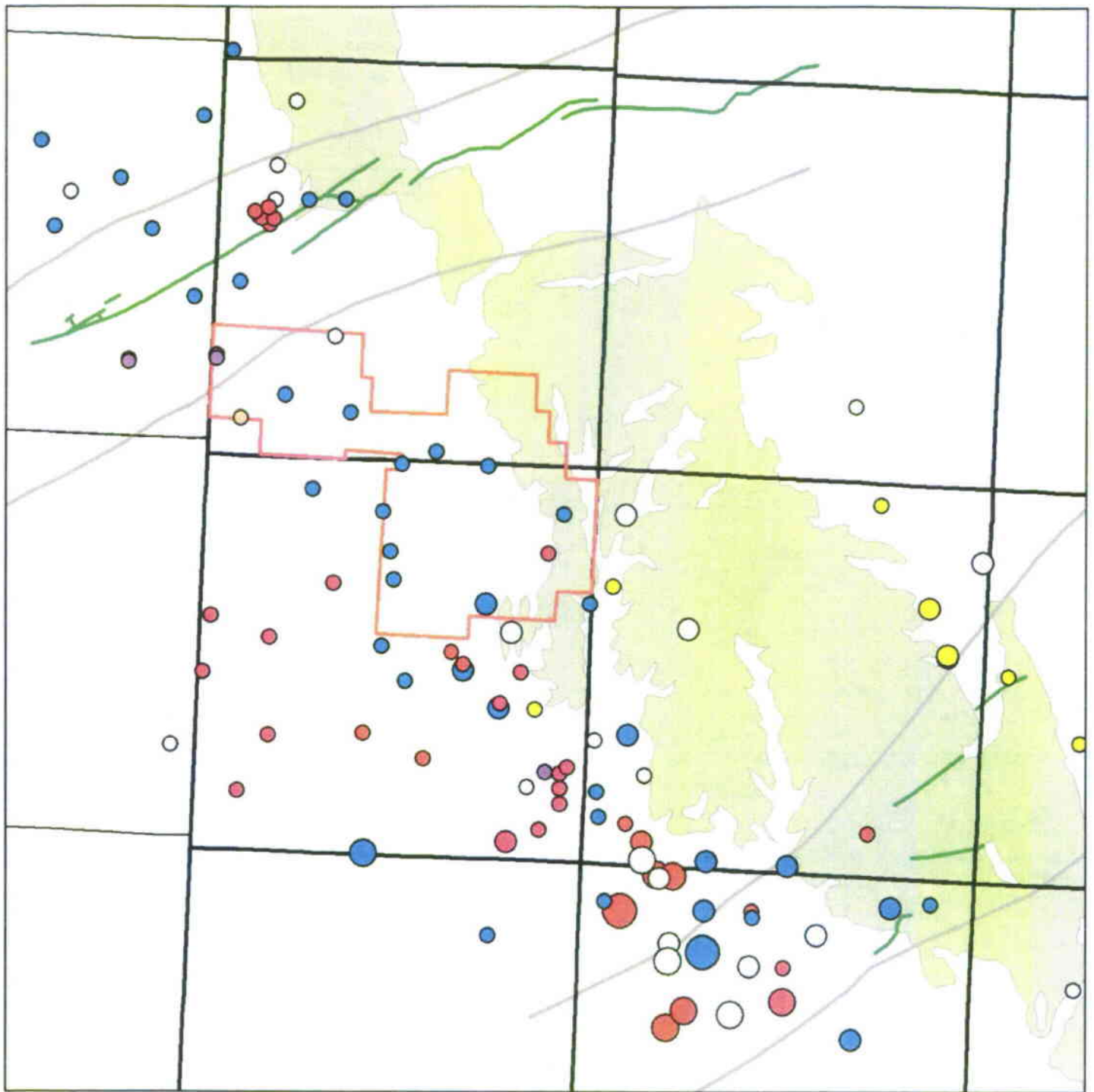
Created By: C M. Hocking

Date: 8/30/07

Map File: Alkalinity







### Legend

Township Range

Parcel Boundary

**Bicarbonate (mg/L)**

Median

0 - 250

251 - 500

501 - 750

751 - 1000

### Aquifer

Alluvium

Fall River

Florio (Shale)

Limestone

Sandstone

Sandstone

Sandstone

Unknown

0 0.5 1 2 3 4 Miles



Created By: C.M. Hocking

Date: 8/30/07

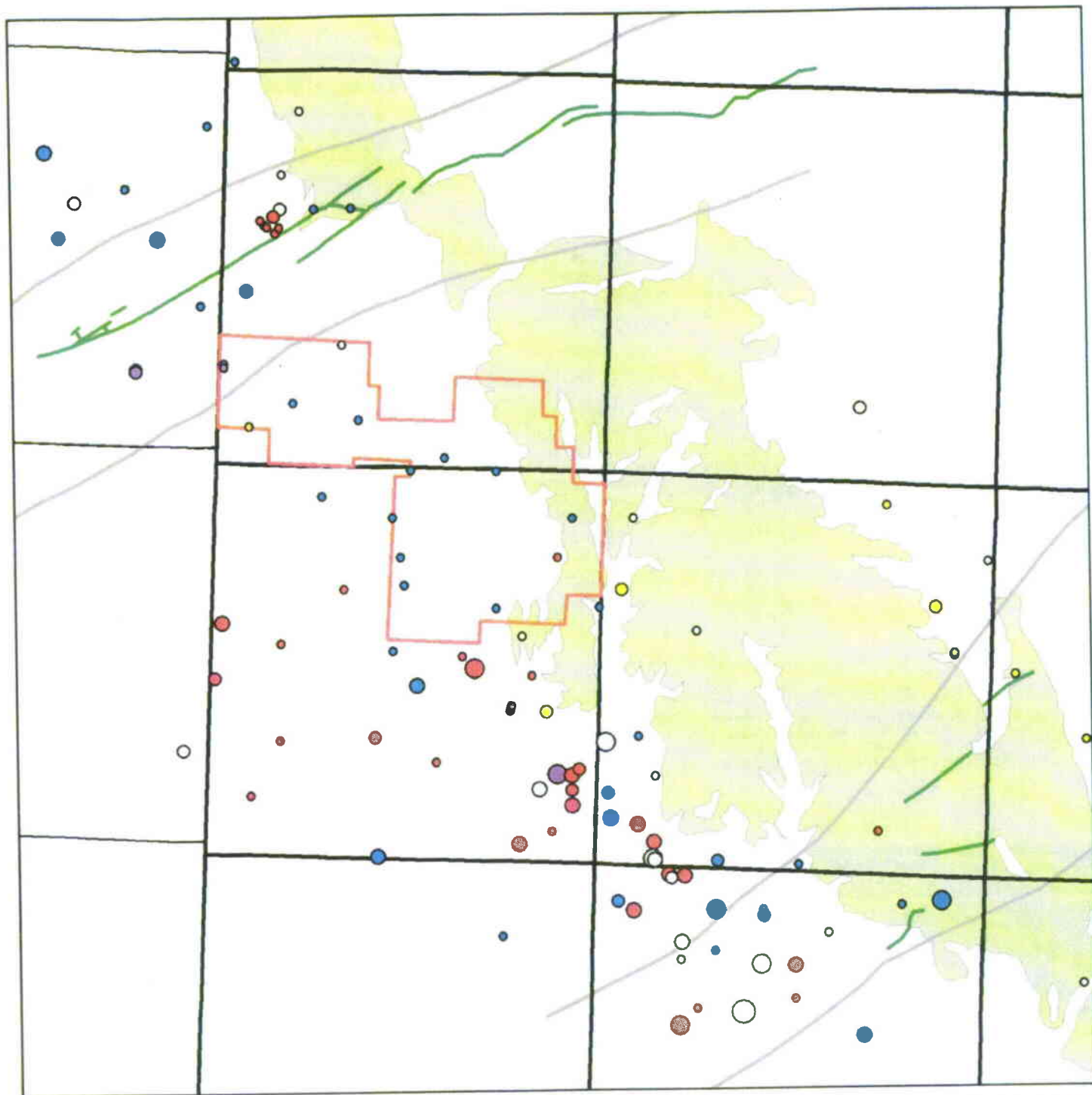
Map File: Bicarbonate

## Dewey Burdock Historical Ground Water Quality

Median Bicarbonate







### Legend



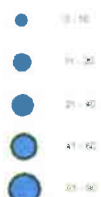
Overhaulage



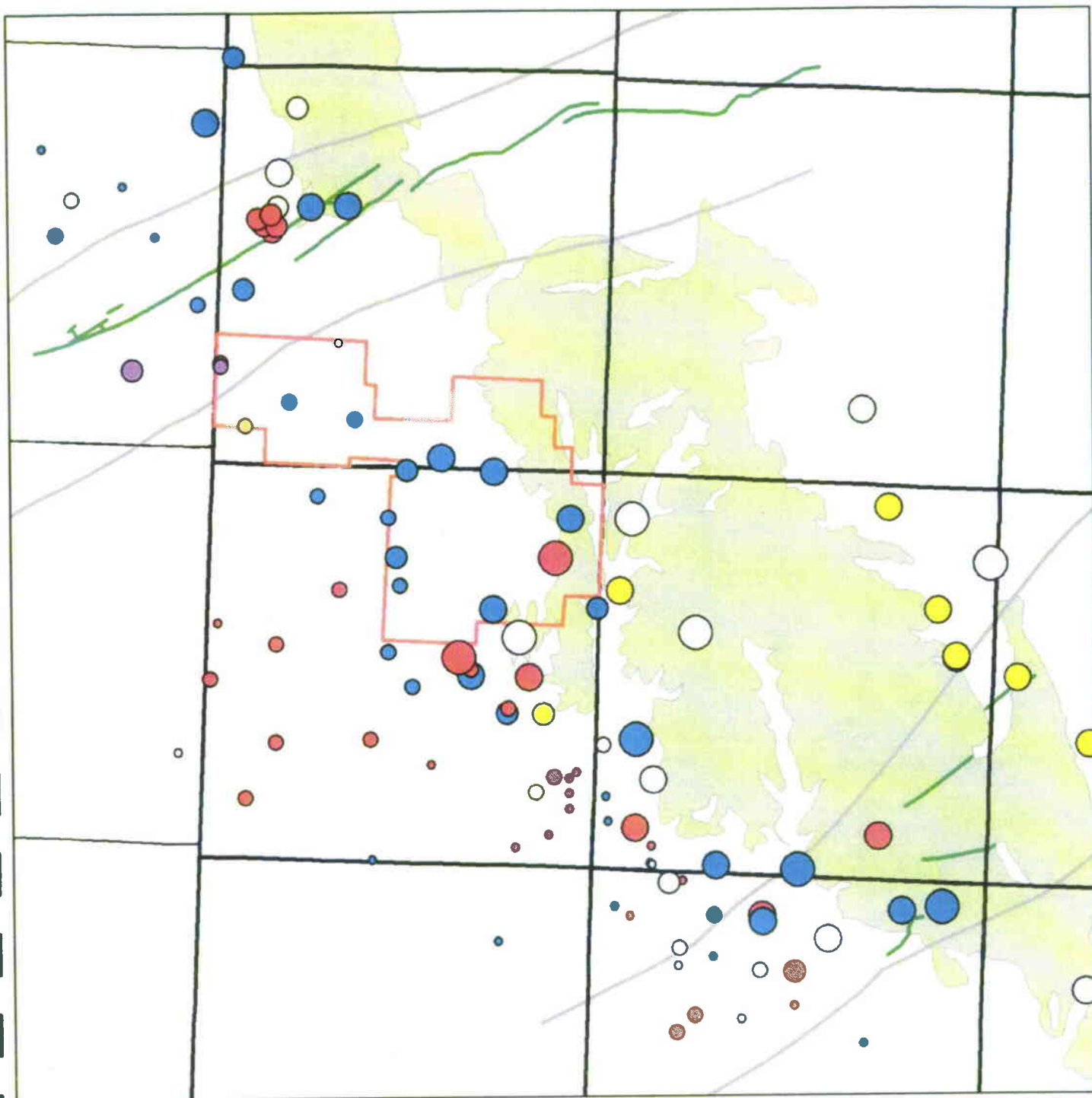
Permit Boundary

Carbonate (mg/L)

Median







### Legend

Township Range

Parcel Boundary

**Hardness (mg/L)**

Median

0 - 100

100 - 250

250 - 500

500 - 1000

1000 - 2000

### Aquifer

Alluvium

Big River

Riparian Shale

Limestone

Shale Rock

Sandstone

Medium

Unknown

0 0.5 1 2 3 4 Miles



Created By: C.M. Hocking

Date: 8/30/07

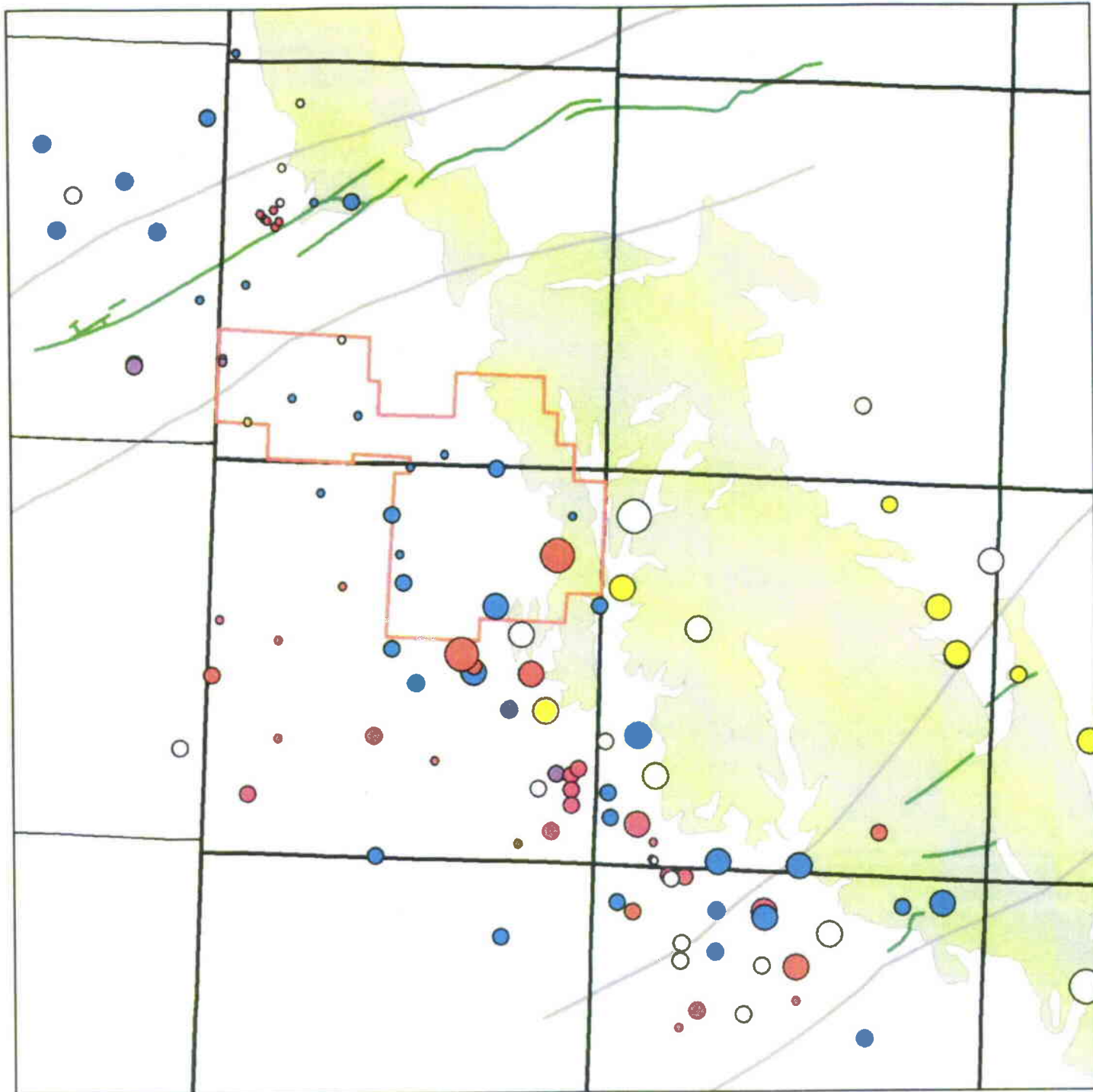
Map File: Hardness

## Dewey Burdock Historical Ground Water Quality

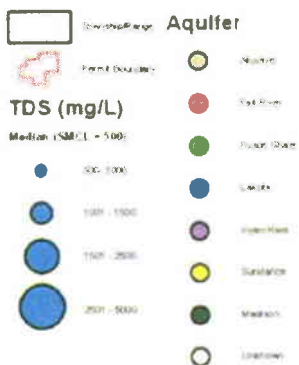
Median Hardness







### Legend



0 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median TDS

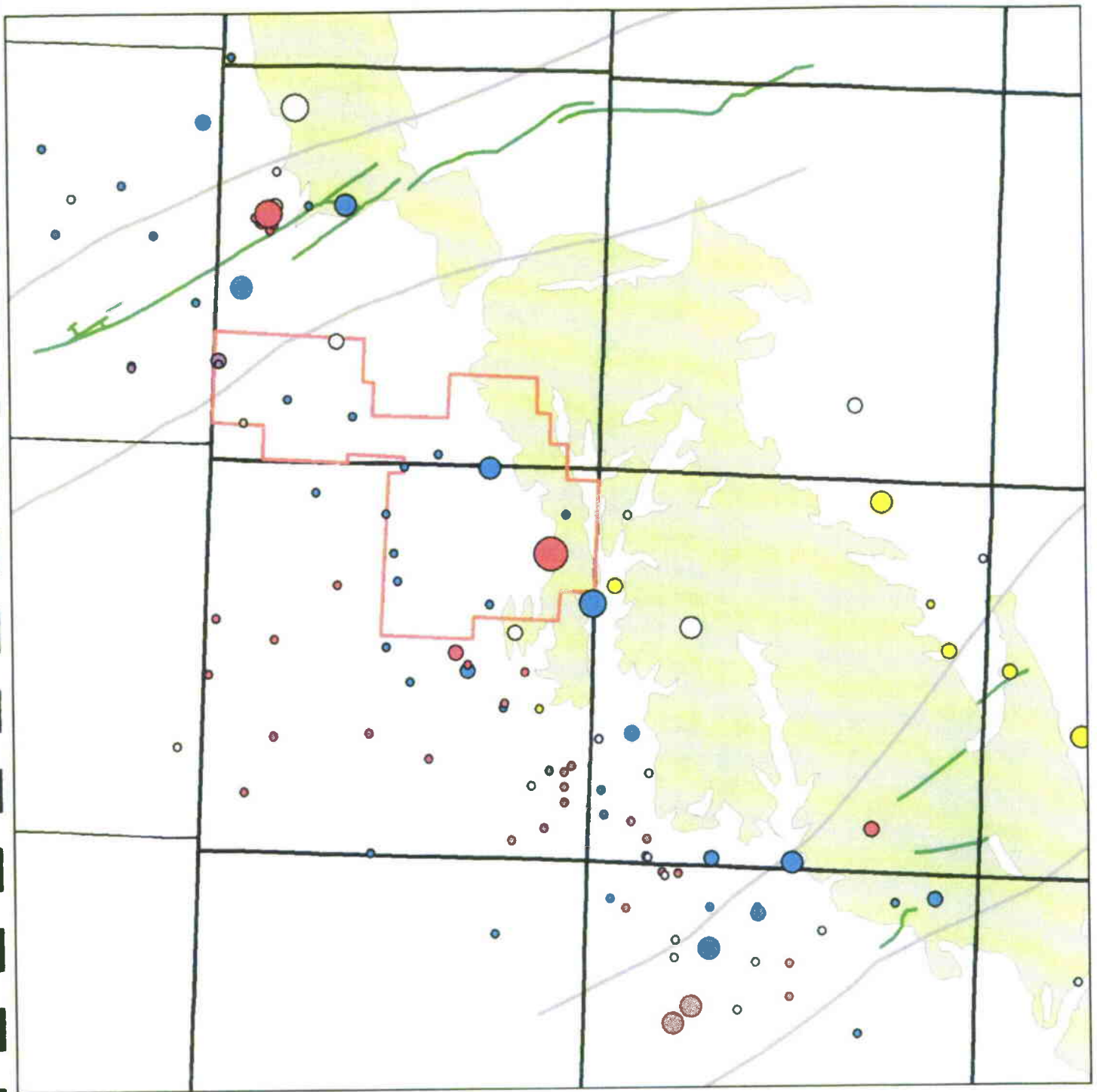


Created By: C M. Hocking

Date: 8/30/07

Map File: TDS





### Legend



0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median TSS

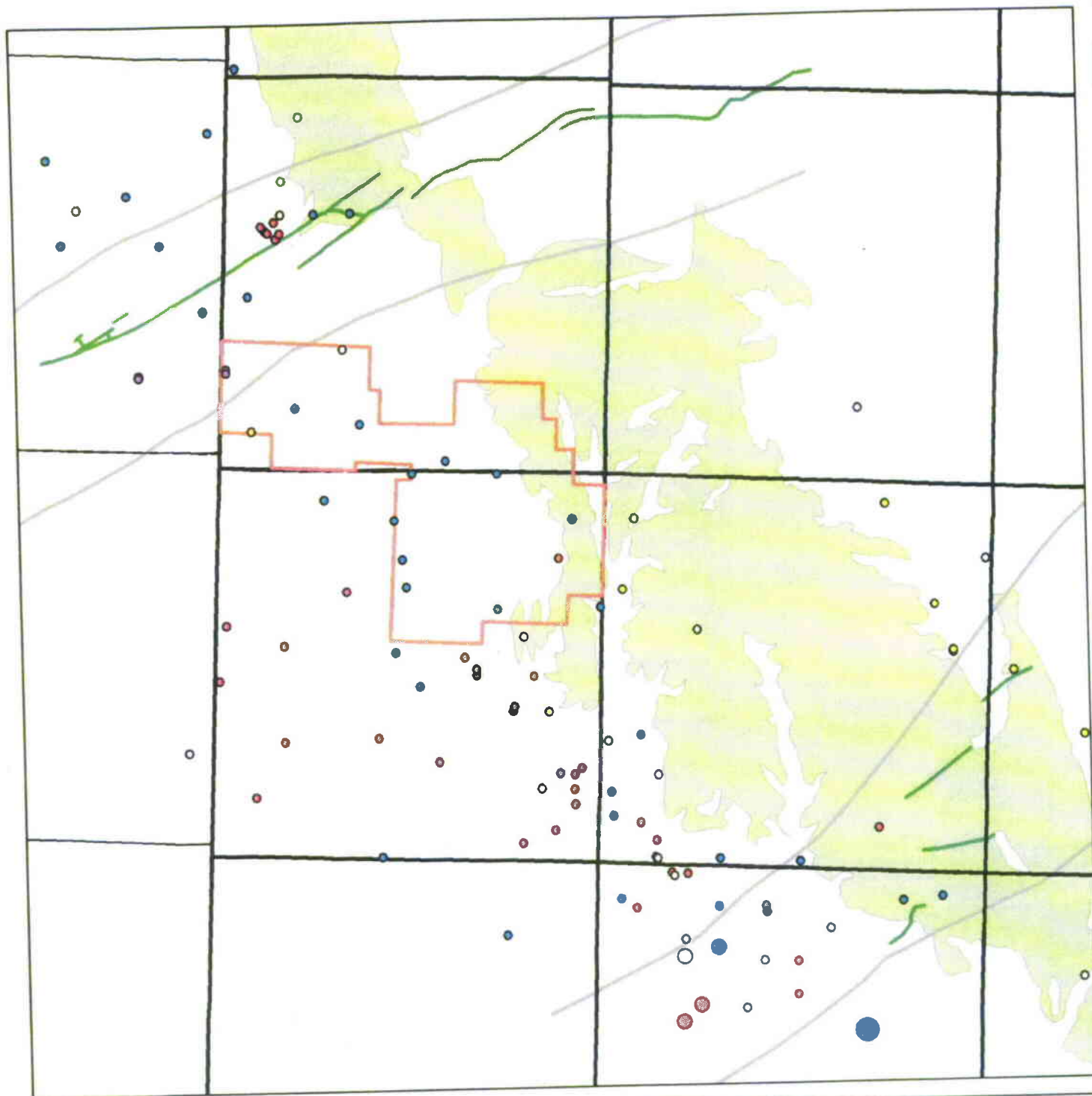
Created By: C.M. Hocking

Date: 8/30/07

Map File: TSS







### Legend

- |                      |                |  |            |
|----------------------|----------------|--|------------|
|                      | Township/Range |  | Aquifer    |
|                      | Range Boundary |  | Albion     |
| <b>As (mg/L)</b>     |                |  | East View  |
| Median (MCL = 0.050) |                |  | Flintstone |
|                      | 0 - 0.025      |  | Lewiston   |
|                      | 0.026 - 0.050  |  | North Star |
|                      | 0.051 - 0.075  |  | Burdock    |
|                      |                |  | Marathon   |
|                      |                |  | Unknown    |

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Arsenic

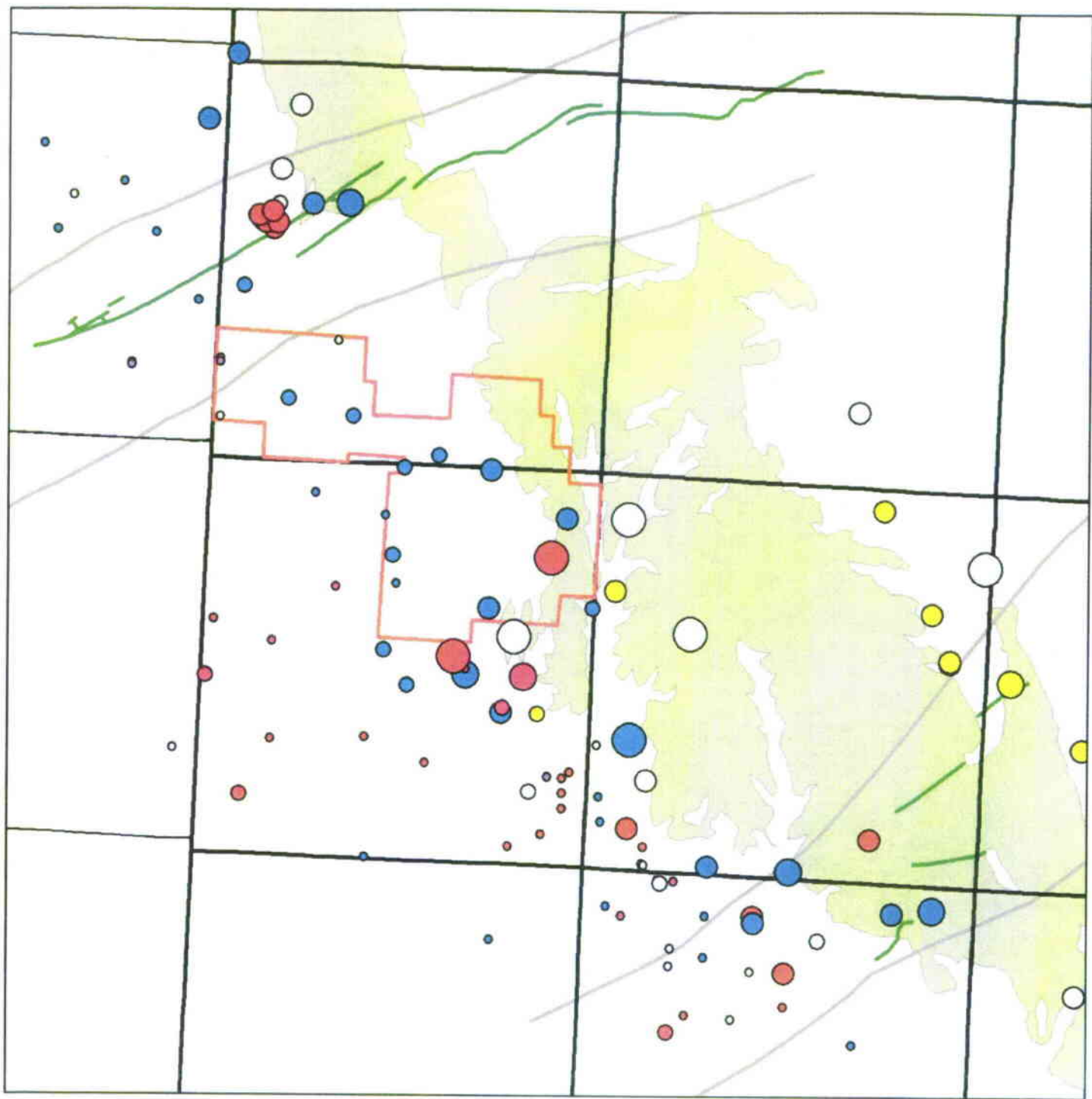
Created By: C.M. Hocking

Date: 8/30/07

Map File: As







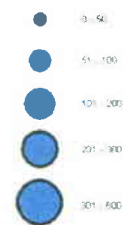
### Legend

Township Range

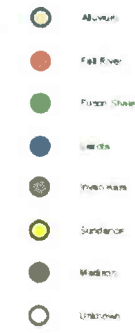
Permit Boundary

Ca (mg/L)

Median



Aquifer



0 0.5 1 2 3 4 Miles



Created By: C.M. Hocking

Date: 8/30/07

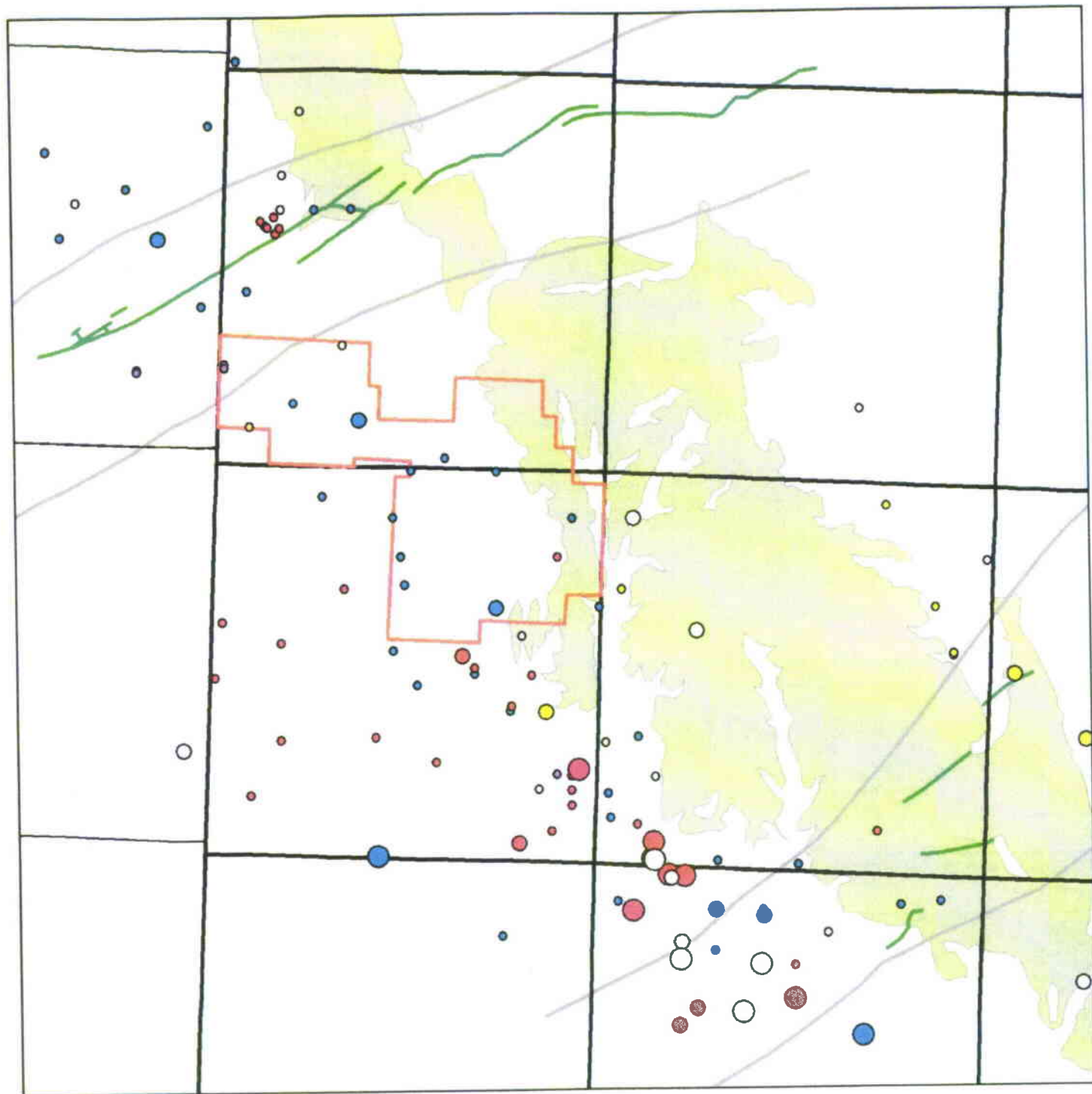
Map File: Ca

## Dewey Burdock Historical Ground Water Quality

Median Calcium







### Legend



0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Chlorine

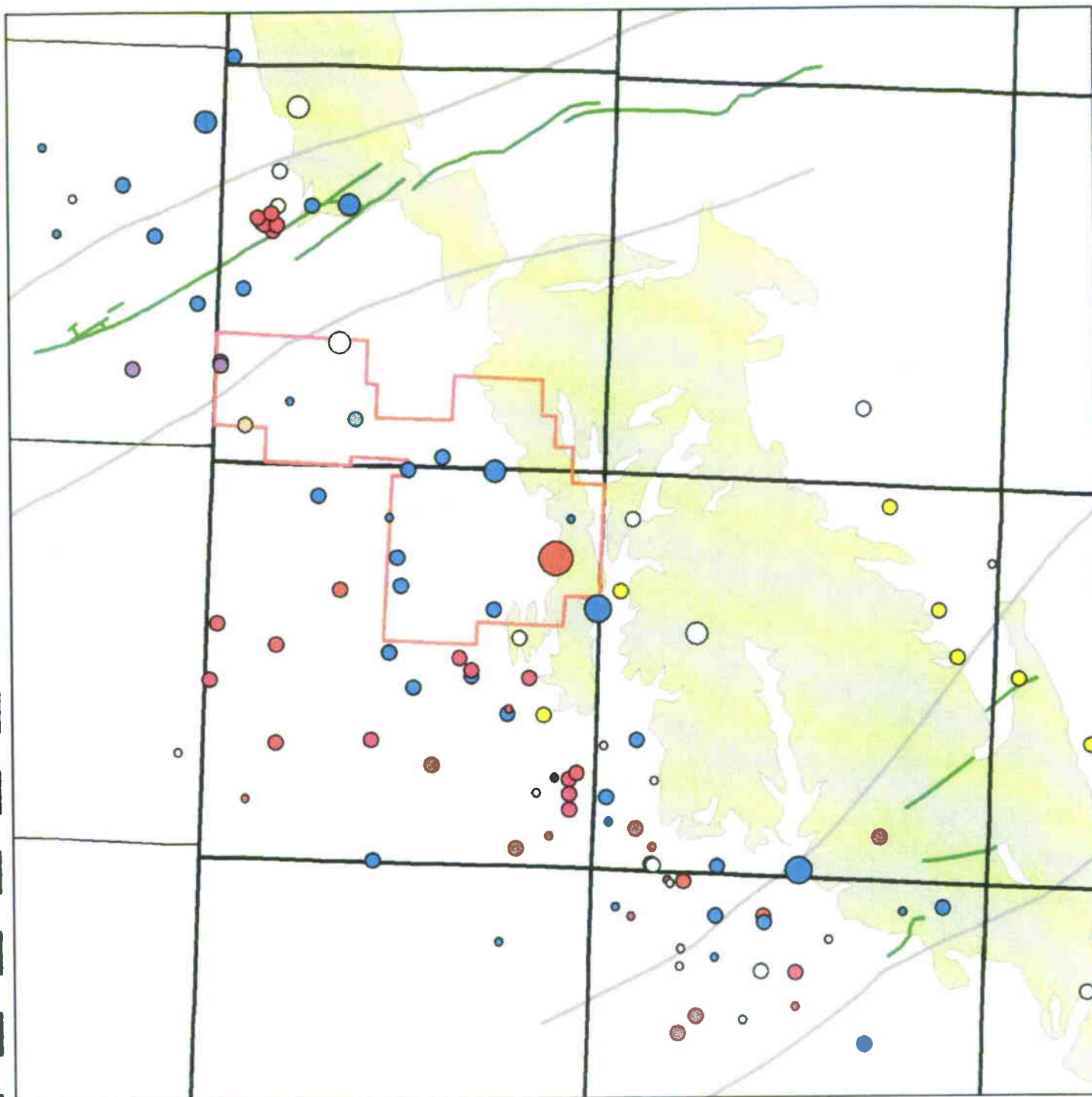
Created By: C.M. Hocking

Date: 8/30/07

Map File: Cl







### Legend



## Dewey Burdock Historical Ground Water Quality

Median Iron

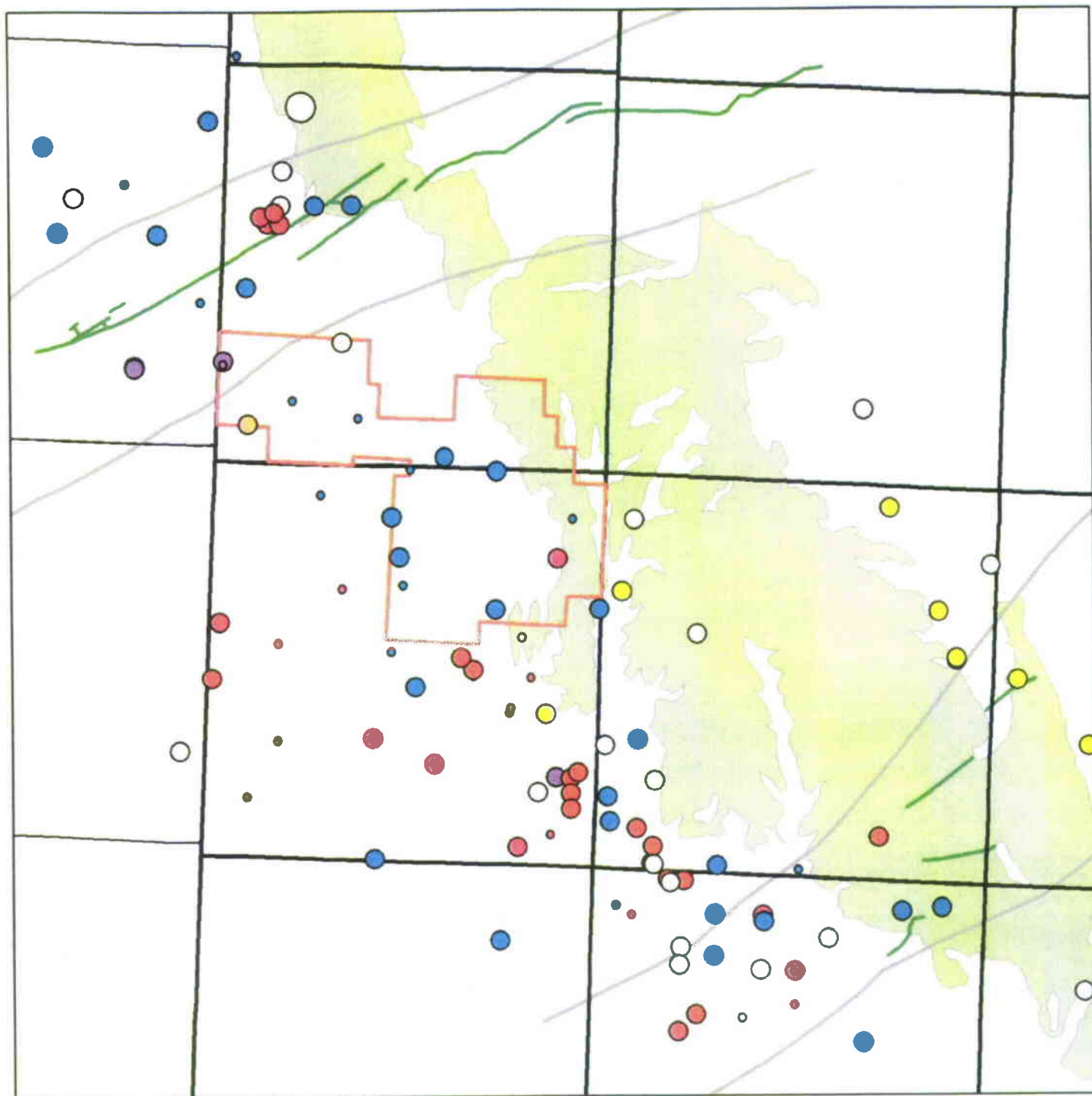


Created By: C.M. Hocking

Date: 8/30/07

Map File: Fe





### Legend

- |                      |                 |                |                |
|----------------------|-----------------|----------------|----------------|
|                      | Uncontaminated  | <b>Aquifer</b> |                |
|                      | Permit Boundary |                | Mudstone       |
| <b>Pb (mg/L)</b>     |                 |                | Red River      |
| Median (MCL = 0.015) |                 |                | Fort Worth     |
|                      | 0.005           |                | Lavaca         |
|                      | 0.005 - 0.010   |                | Travis         |
|                      | 0.010 - 0.015   |                | Guadalupe      |
|                      |                 |                | Medallion      |
|                      |                 |                | Uncontaminated |

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Lead

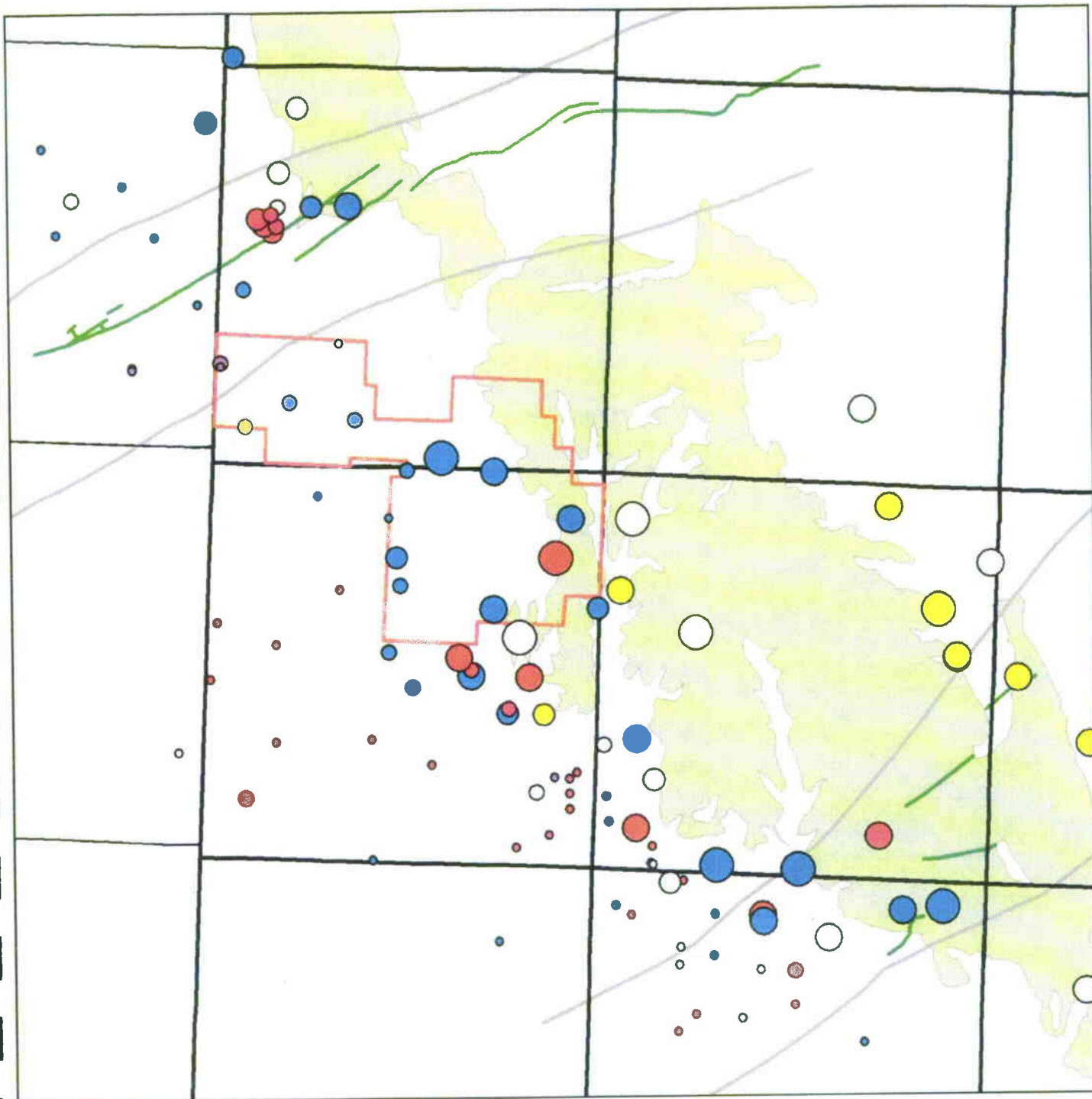


Created By: C.M. Hocking

Date: 8/30/07

Map File: Pb





### Legend

Special Feature: Aquifer

Special Boundary

**Mg (mg/L)**

Median



Alluvium

Oak River

Flood Plain

Lake

Inlet Point

Sandstone

Madison

Unknown

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Magnesium

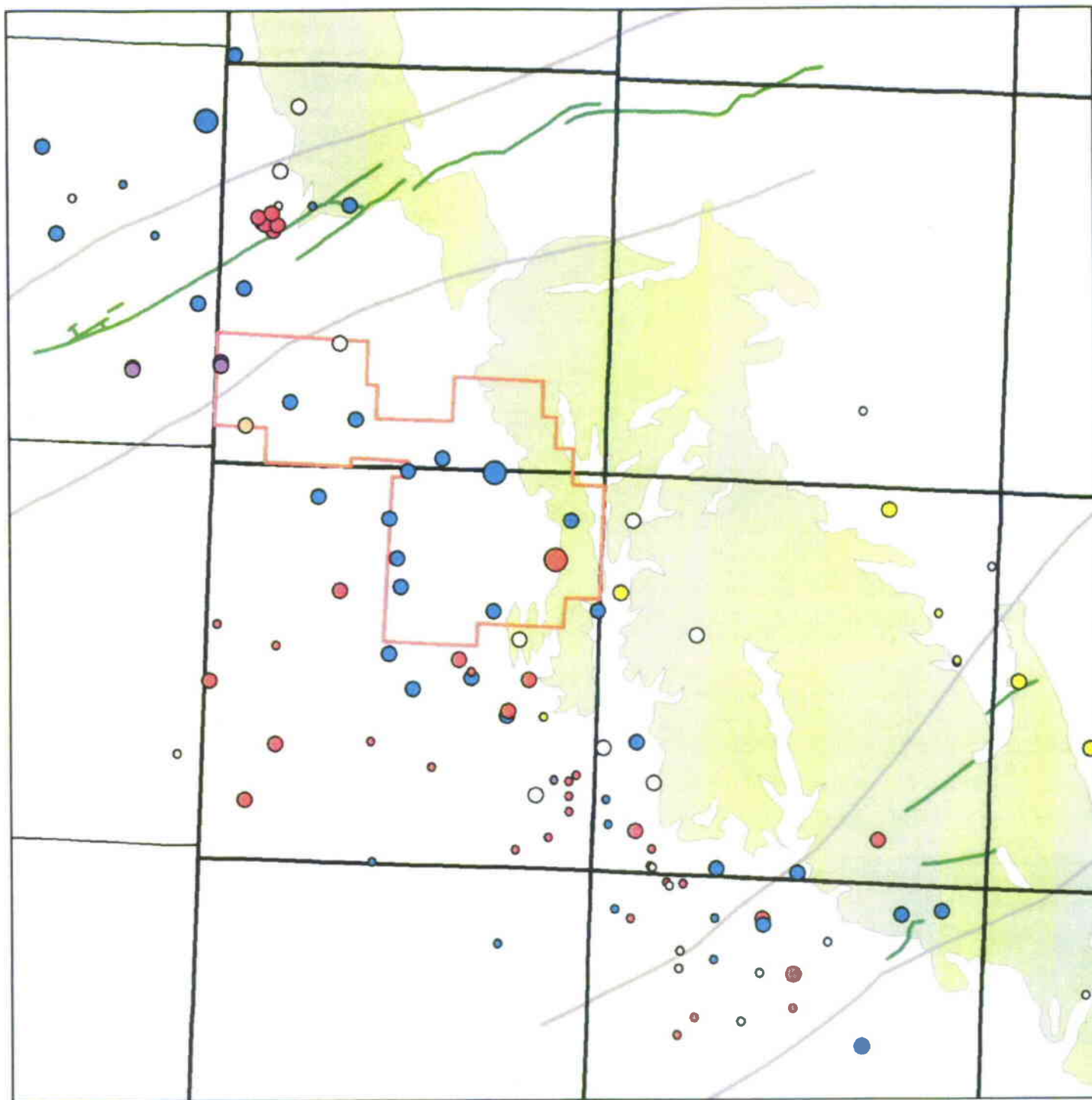
Created By: C.M. Hocking

Date: 8/30/07

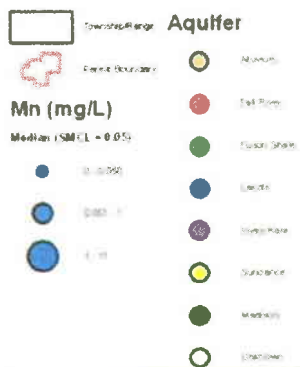
Map File: Mg







### Legend



## Dewey Burdock Historical Ground Water Quality

Median Manganese

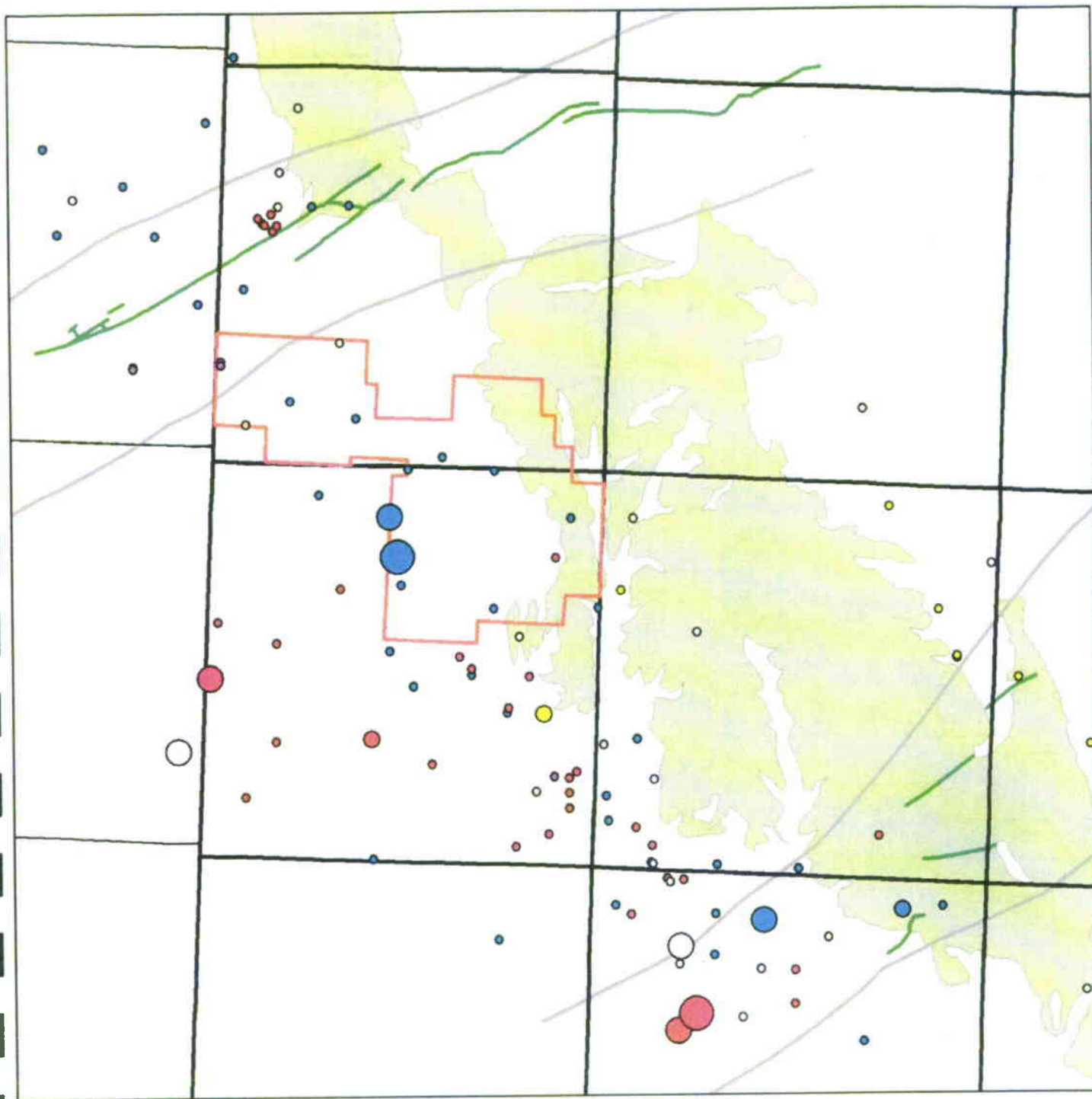


Created By: C.M. Hocking

Date: 8/30/07

Map File: Mn





### Legend

Township Range

Range Boundary

**N (Nitrate + Nitrite) (mg/L)**

Median (MGL = 10)

0-2

3-4

5-6

7-8

### Aquifer

Alluvial

Red River

River Bank

Sand

Sandstone

Sandstone

Medium

Unconsolidated

0 0.5 1 2 3 4 Miles



Created By: C.M. Hocking

Date: 8/30/07

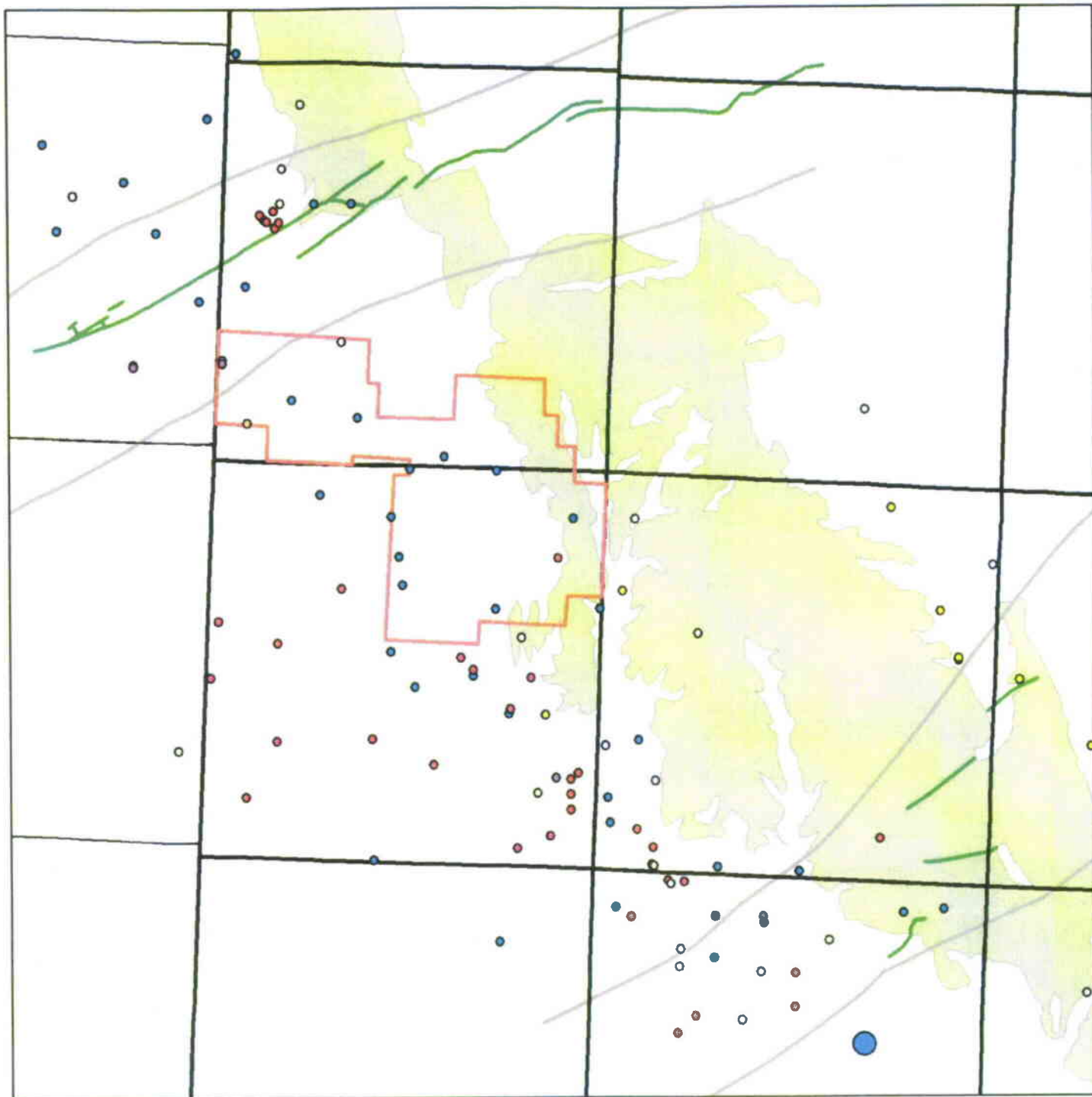
Map File: N

## Dewey Burdock Historical Ground Water Quality

Median Total Nitrogen







### Legend

Township Range

Range Boundary

PO4 (mg/L)

Median

0.00000 - 1.00000

1.00000 - 300.00000

### Aquifer

Alluvium

Red River

Palmer Shale

Lakota

Shinarump

Tuffaceous

Mudstone

Unconsolidated

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Phosphate

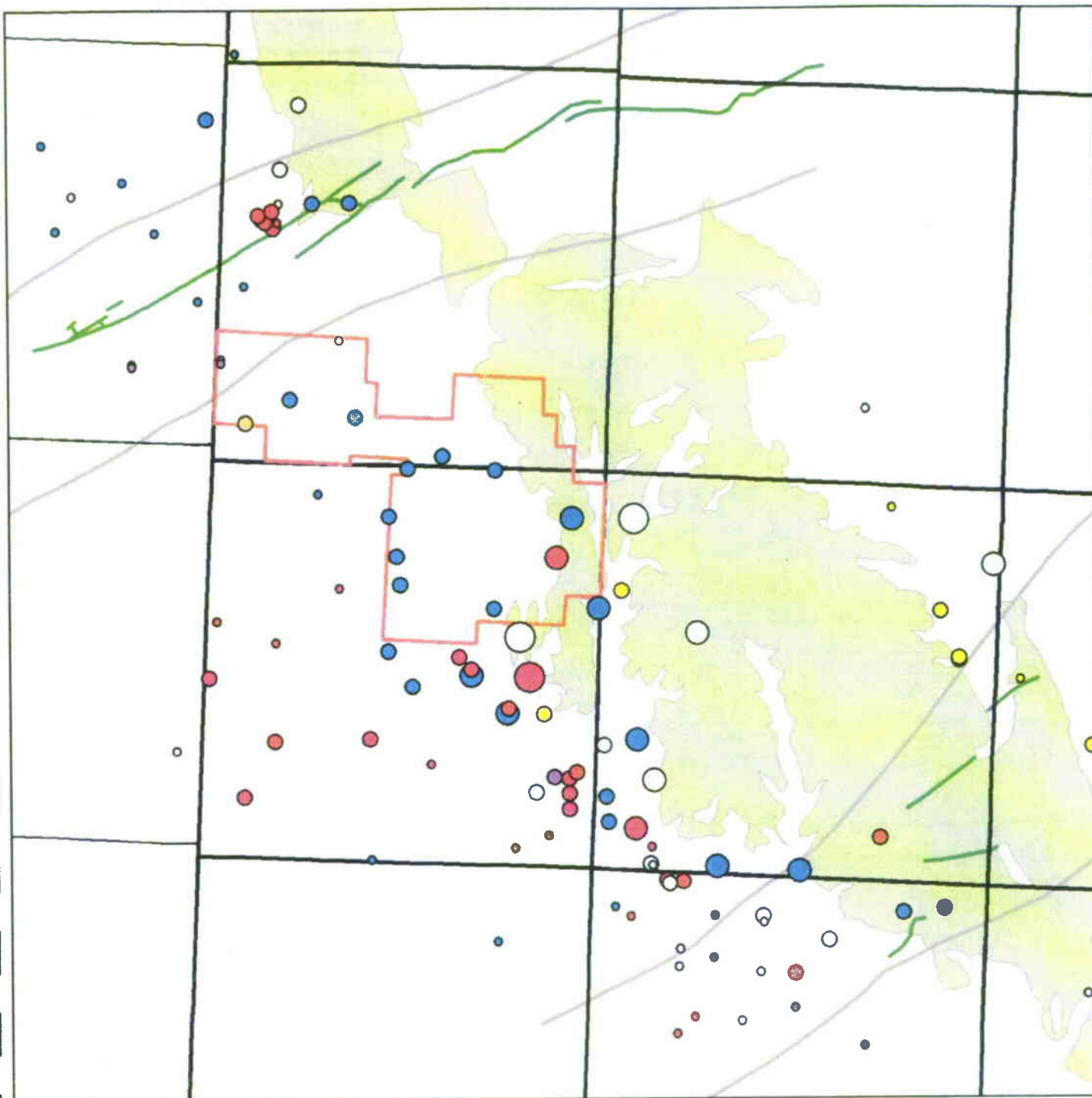


Created By: C.M. Hocking

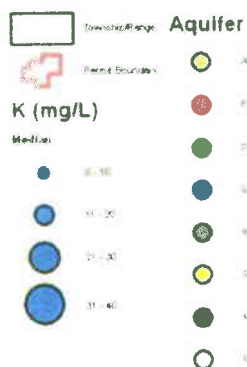
Date: 8/30/07

Map File: PO4





### Legend



## Dewey Burdock Historical Ground Water Quality

Median Potassium

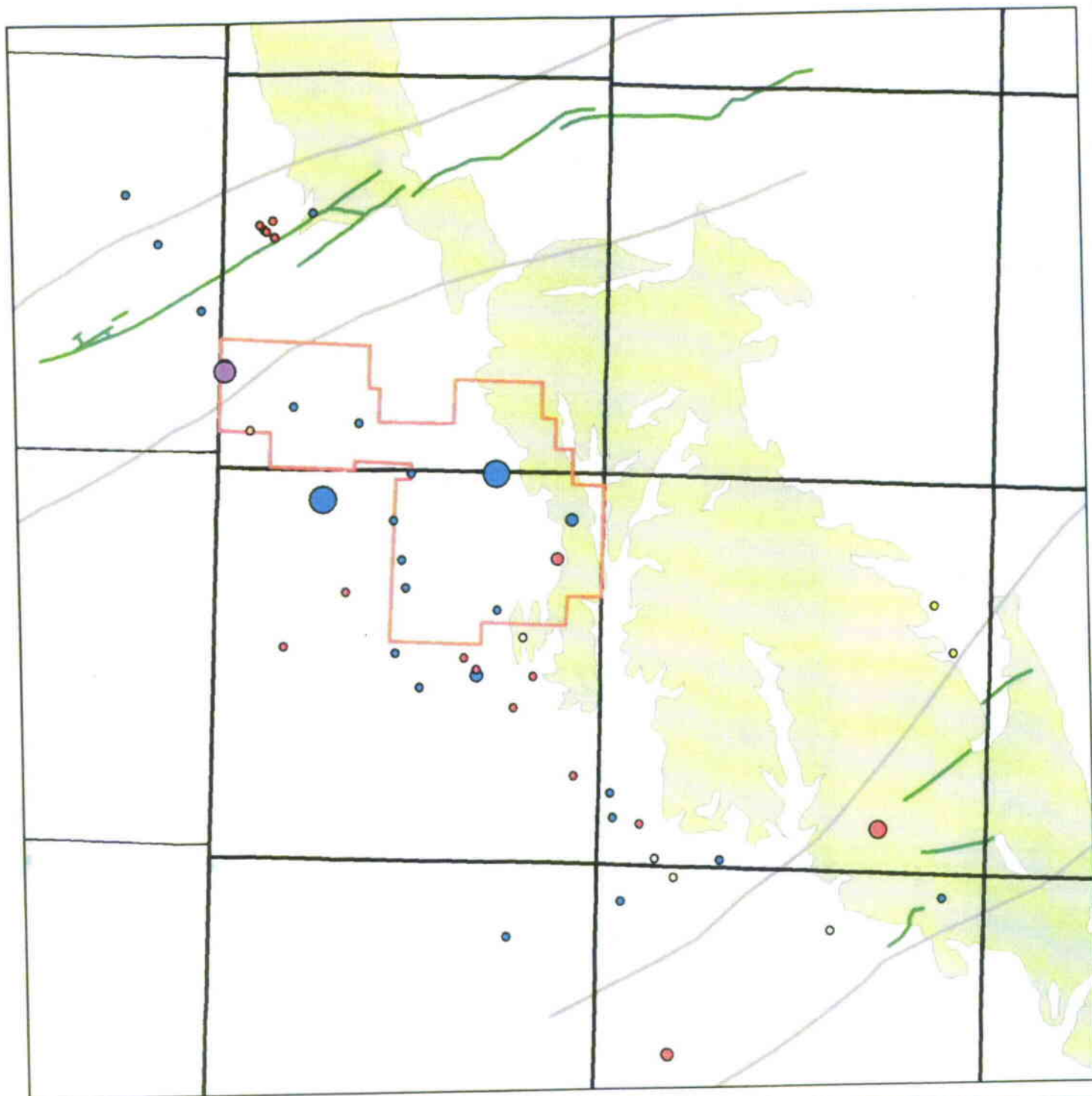


Created By: C.M. Hocking

Date: 8/30/07

Map File: K





### Legend



Township/Range



Field boundary

Radium (pCi/L)

Median (MCL = 5)

0-5

6-10

11-20

21-40

41-80

### Aquifer



Alluvium



Flat Slope



Pebbly Sand



Sand



Sandstone



Shale



Siltstone



Mudstone



Limestone



## Dewey Burdock Historical Ground Water Quality

Median Radium-226

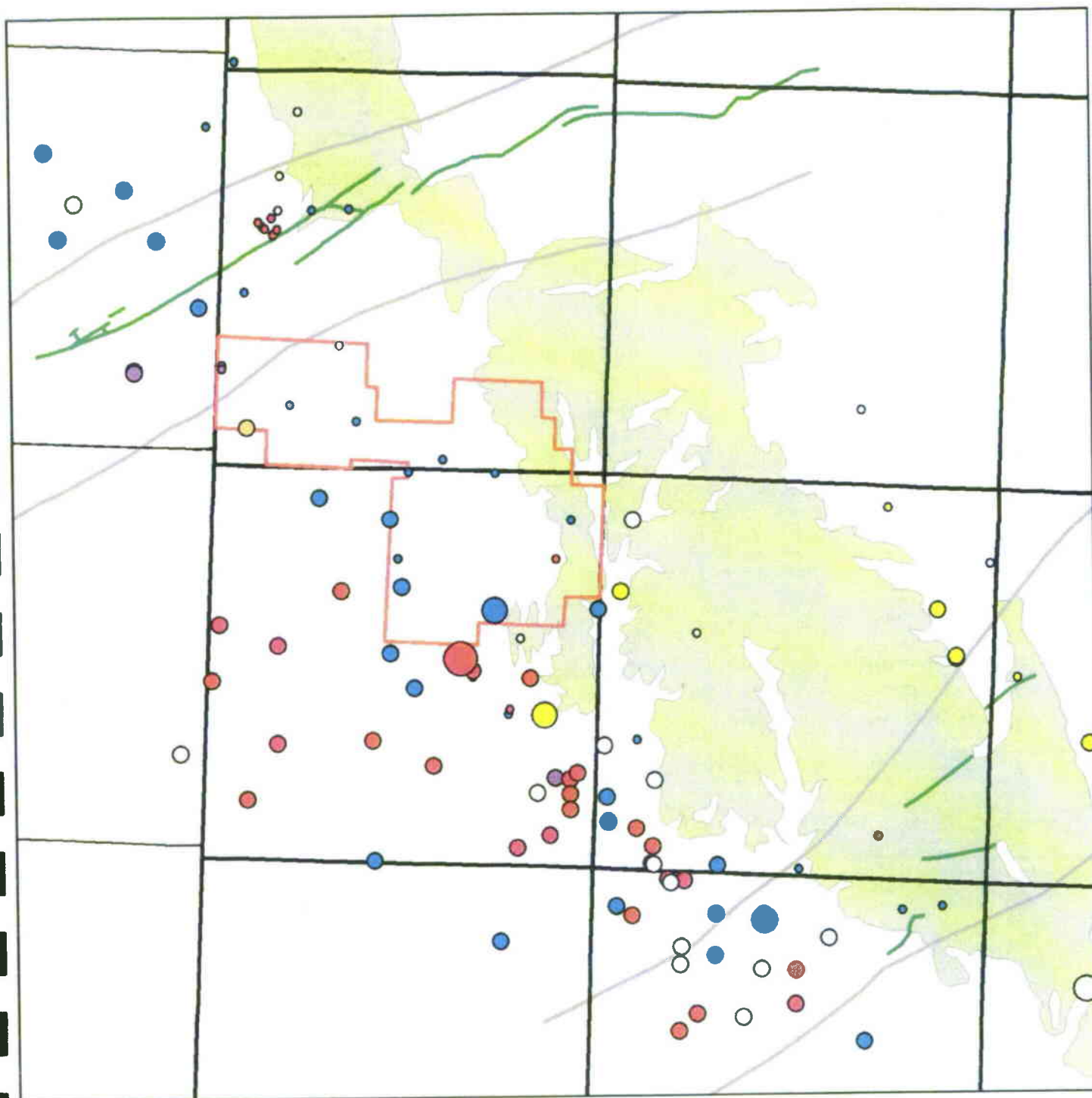
Created By: C.M. Hocking

Date: 8/30/07

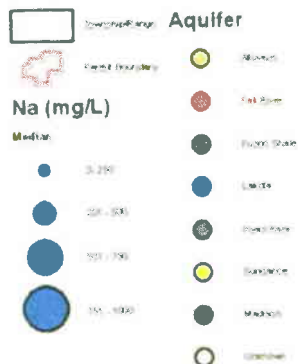
Map File: Ra







### Legend



0 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Sodium

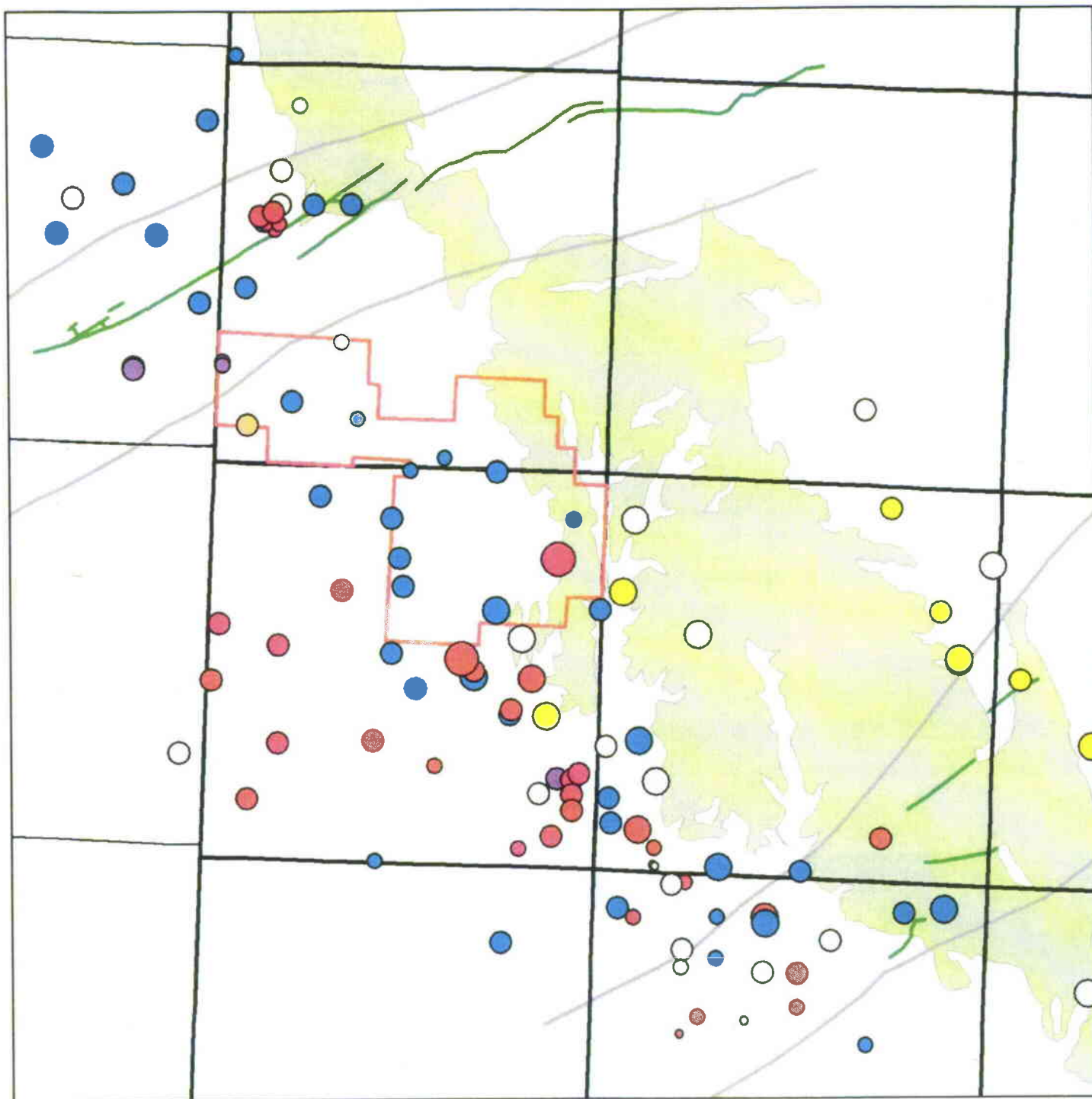


Created By: C.M. Hocking

Date: 8/30/07

Map File: Na





### Legend



0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Sulfate

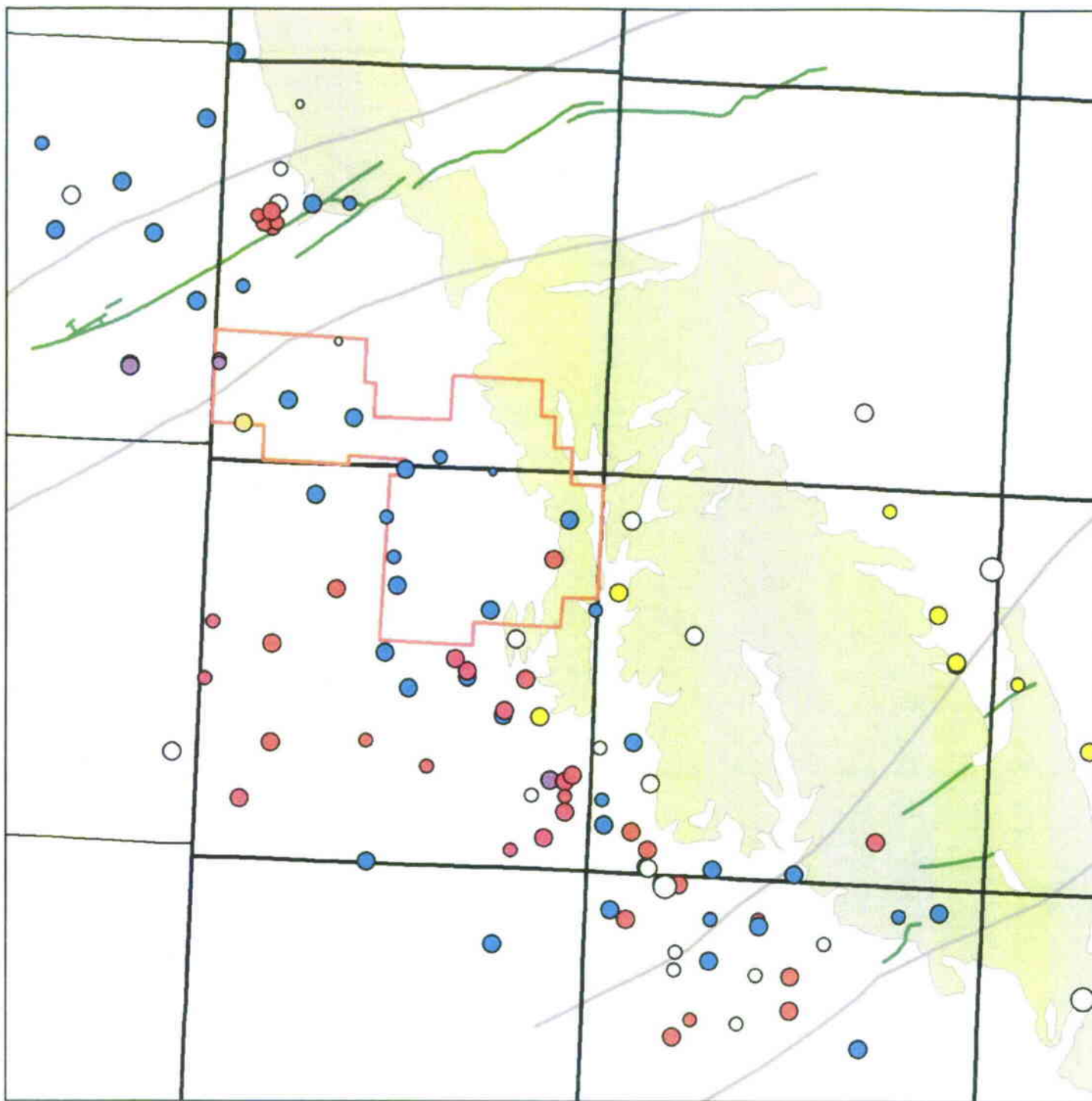


Created By: C.M. Hocking

Date: 8/30/07

Map File: SO4





### Legend



Township Range



Period Boundary

SiO<sub>2</sub> (mg/L)

Median

1-3

4-5

6-9

10-12

Aquifer

Alluvium

Fall River

Fox River

Lakeville

Iron River

Sandstone

Madison

Unknown

0 0.5 1 2 3 4 Miles



Created By: C.M. Hocking

Date: 8/30/07

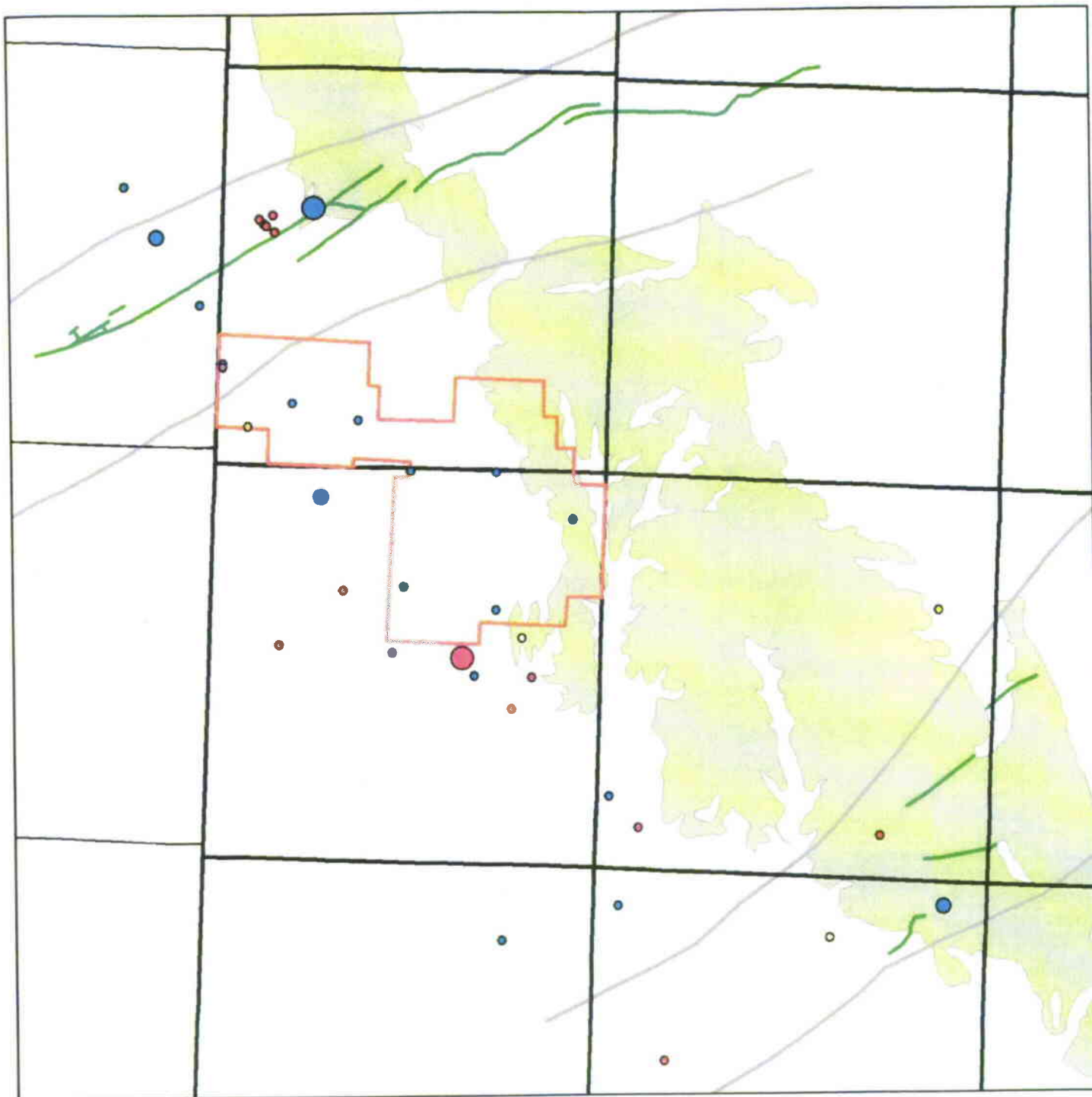
Map File: SiO<sub>2</sub>

## Dewey Burdock Historical Ground Water Quality

Median Silicon



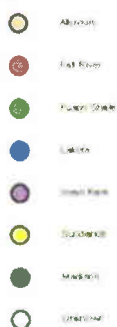




### Legend



### Aquifer



## Dewey Burdock Historical Ground Water Quality

Median Uranium

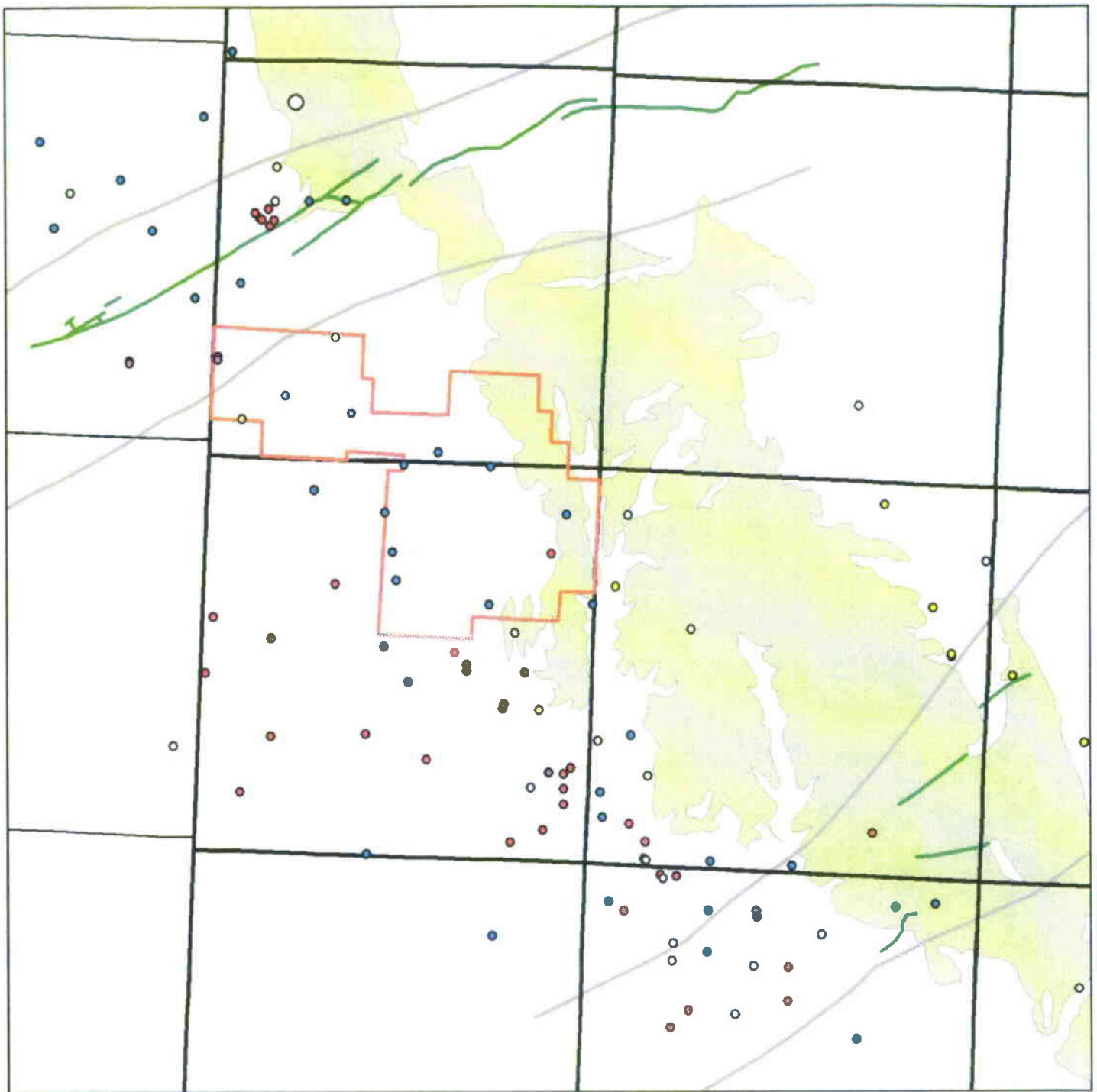


Created By: C.M. Hocking

Date: 8/30/07

Map File: U





### Legend

Township Boundary

Parcel Boundary

Zn (mg/L)

Median (SMCL = 5)

0-5

6-10

### Aquifer

Albany

Fall River

Tuscarora

Lodi

Tuscarora

Seneca

Seneca

Unknown

0 0.5 1 2 3 4 Miles



## Dewey Burdock Historical Ground Water Quality

Median Zinc



Created By: C M. Hocking

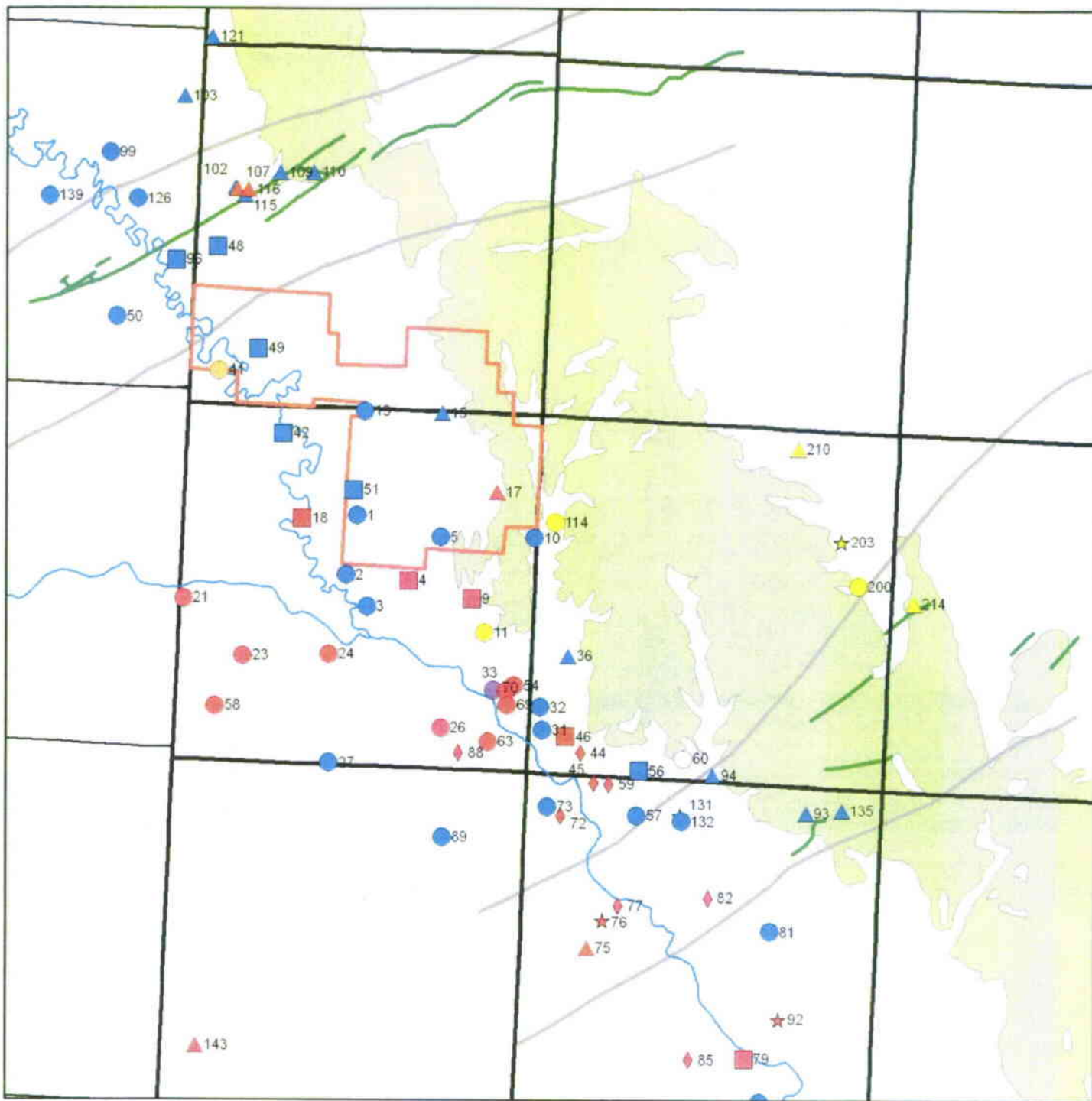
Date: 8/30/07

Map File: Zn



## **PIPER and STIFF DIAGRAMS**





### Legend

- Township Range
- Parish Boundary
- Stream
- Chemistry Type**
- Na SO<sub>4</sub>
- Na Cl SO<sub>4</sub>
- Ca Mg Na SO<sub>4</sub>
- Na HCO<sub>3</sub> SO<sub>4</sub>
- Na Ca Mg HCO<sub>3</sub> SO<sub>4</sub>

### Aquifer

- Alluvium
- Paleogene
- Paleozoic
- Limestone
- Shale
- Sandstone
- Madison
- Unconsolidated



## Dewey Burdock Ground Water Chemistry

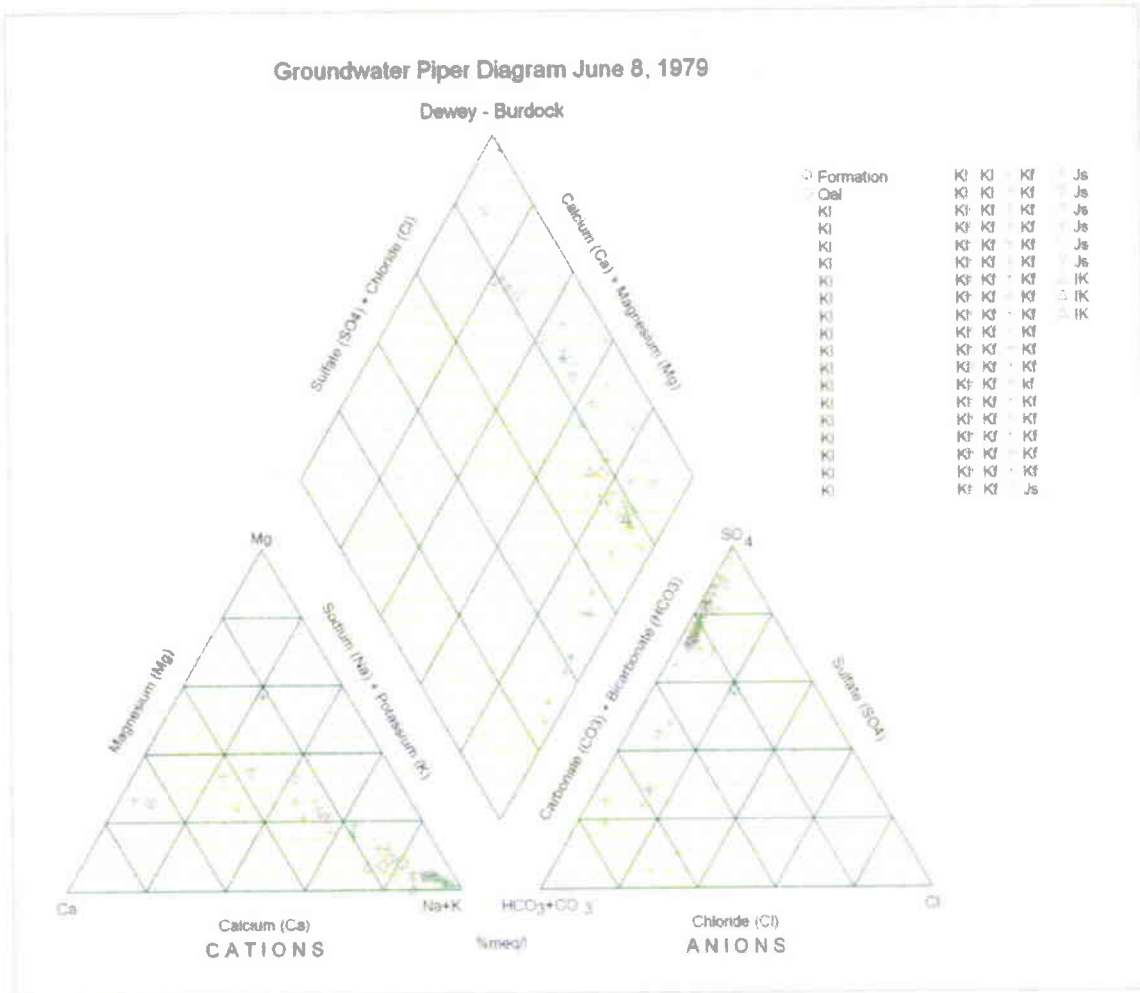


Created By:	C. M. Hocking
Date:	8/29/07
Map File:	Well Piper Chemistry



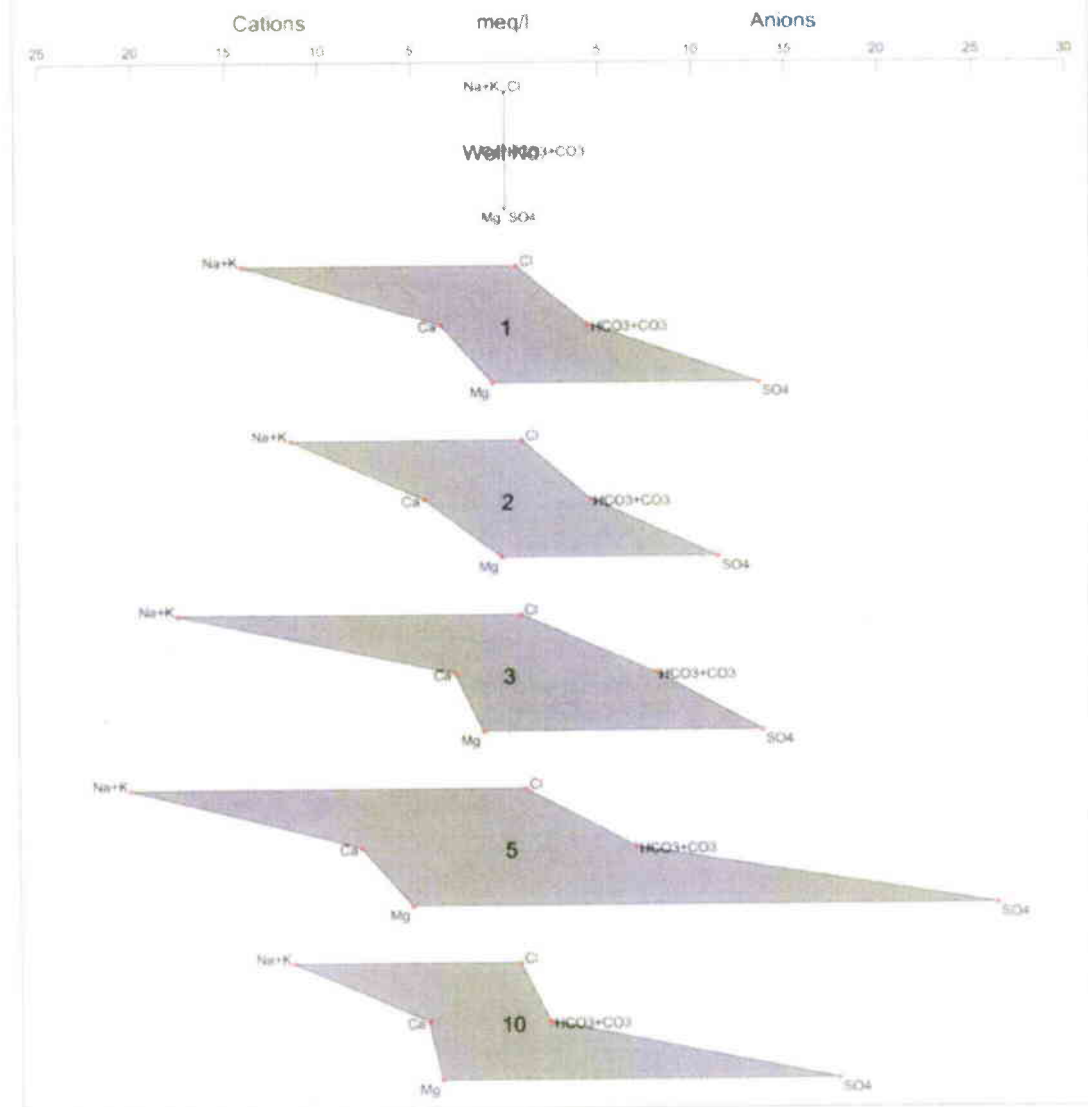
# Groundwater Piper Diagram June 8, 1979

Dewey - Burdock



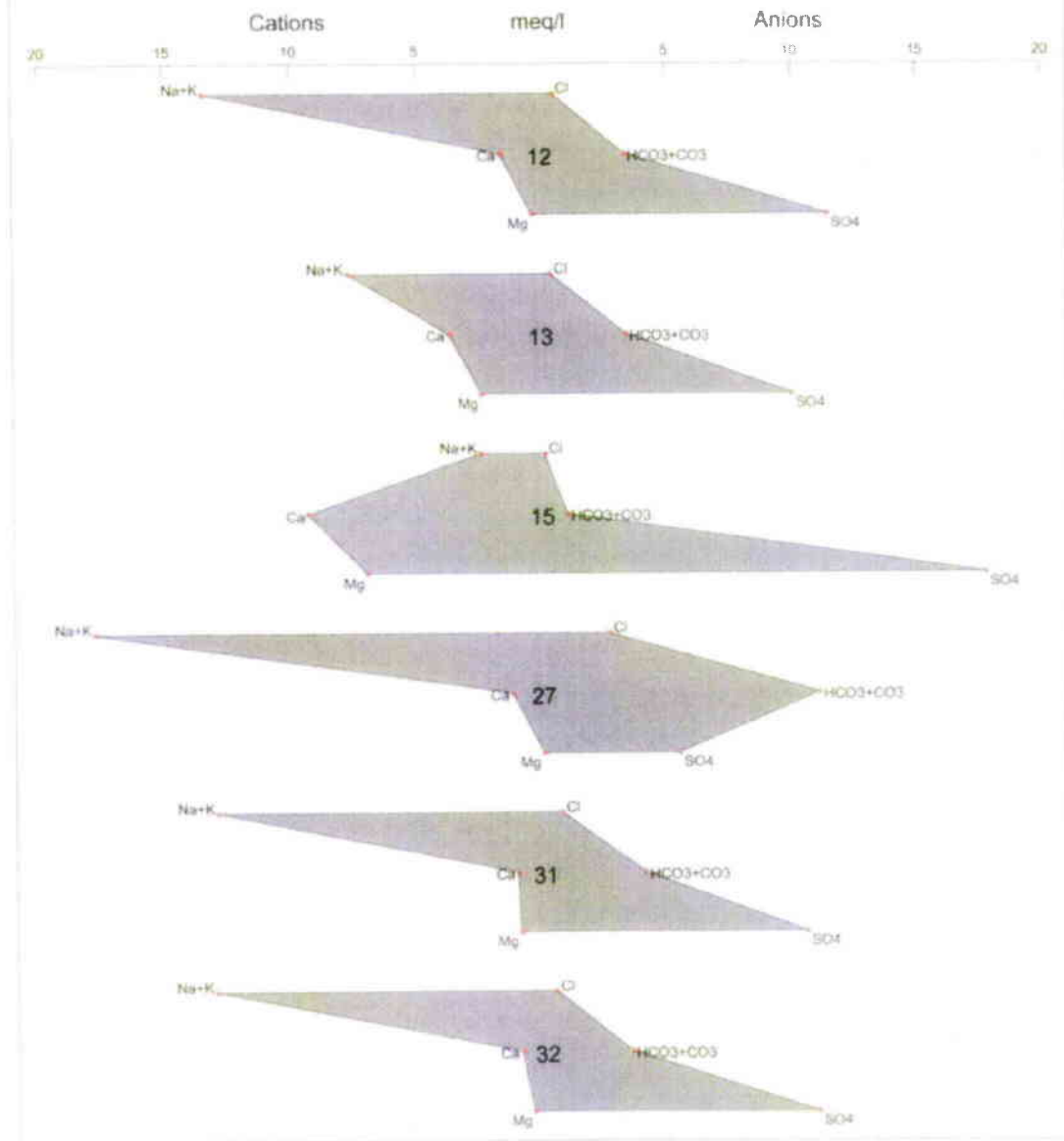


# Stiff Diagrams September 1979 Dewey - Burdock



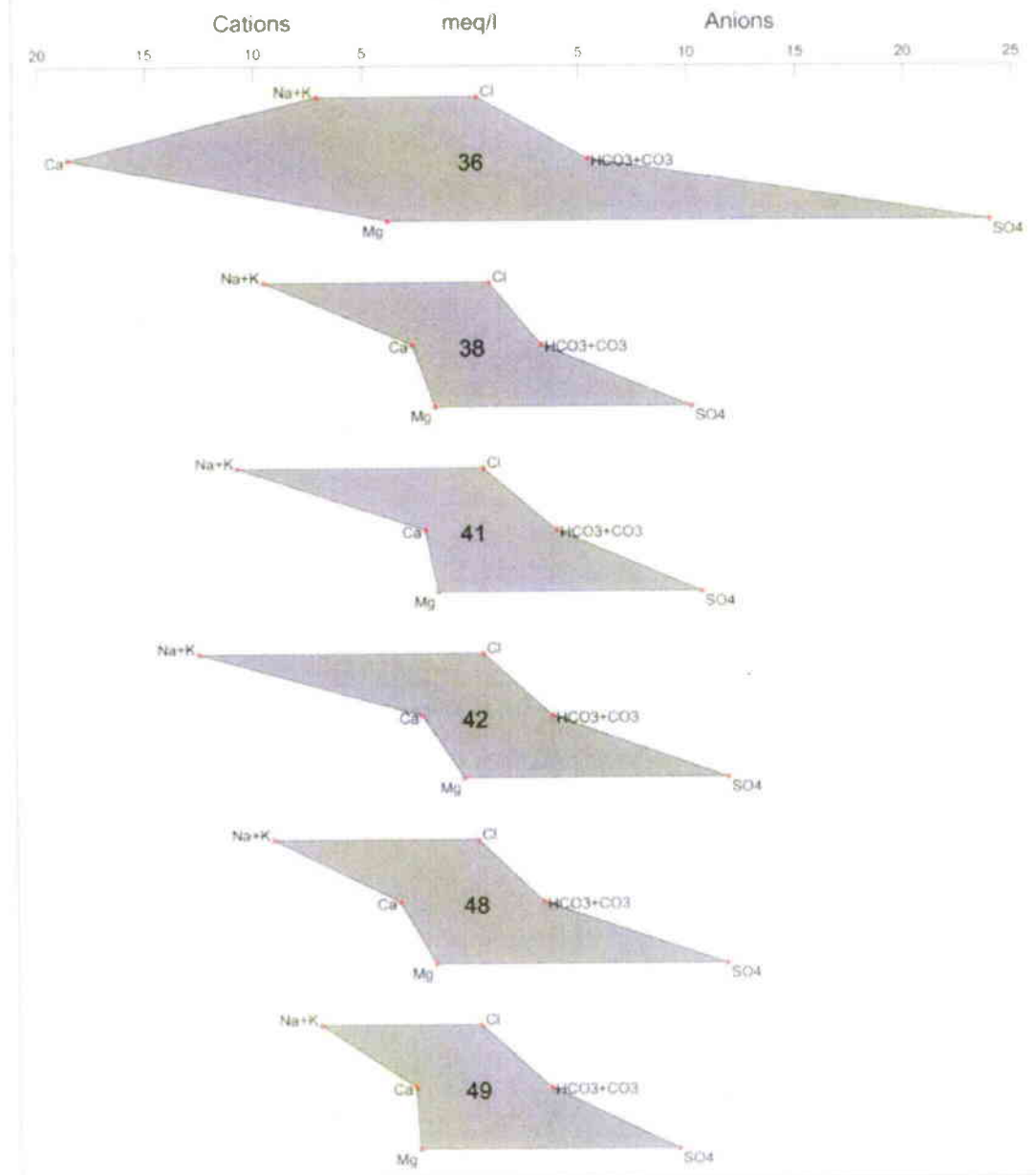


# Stiff Diagrams September 1979 Dewey - Burdock



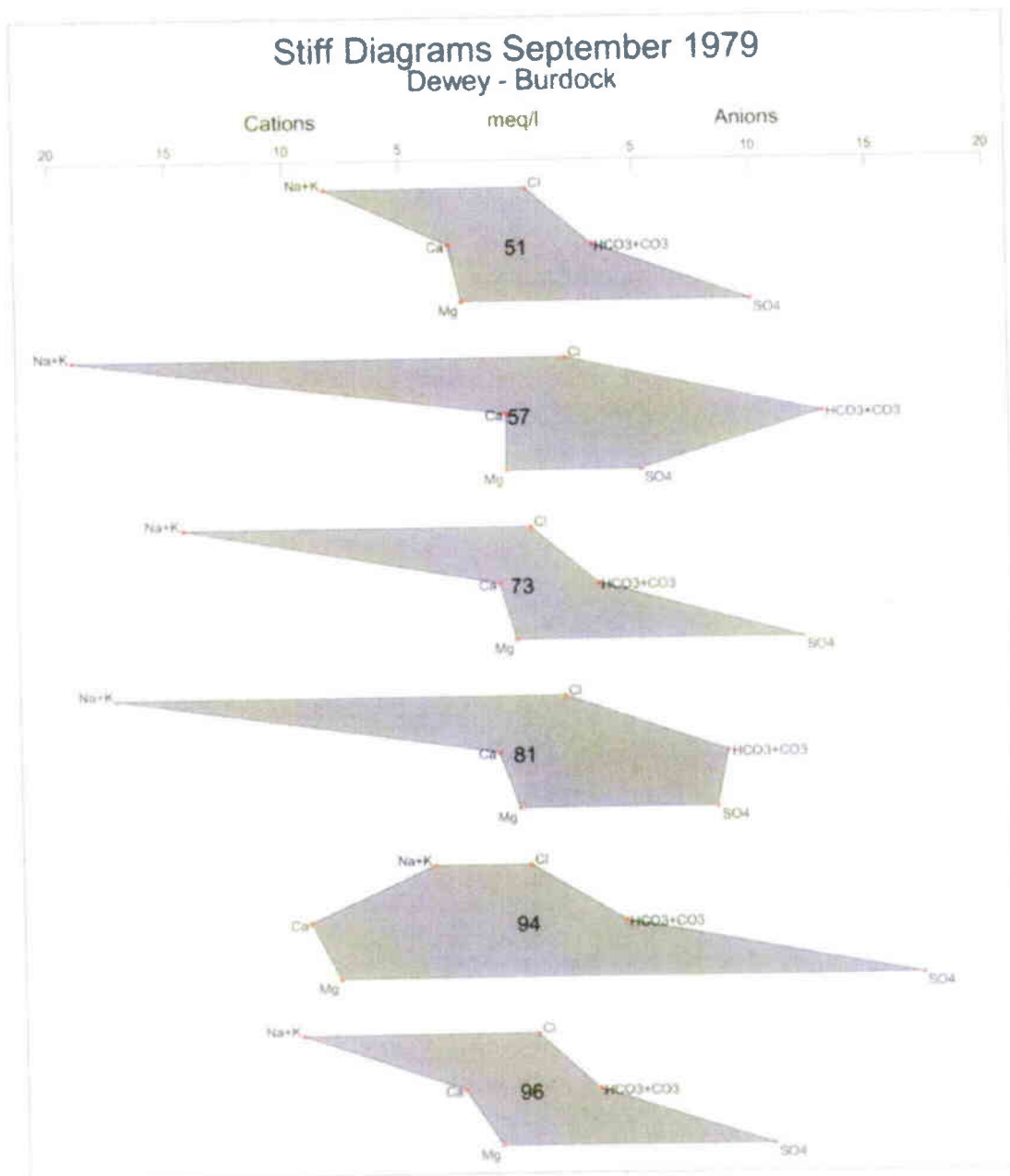


# Stiff Diagrams September 1979 Dewey - Burdock



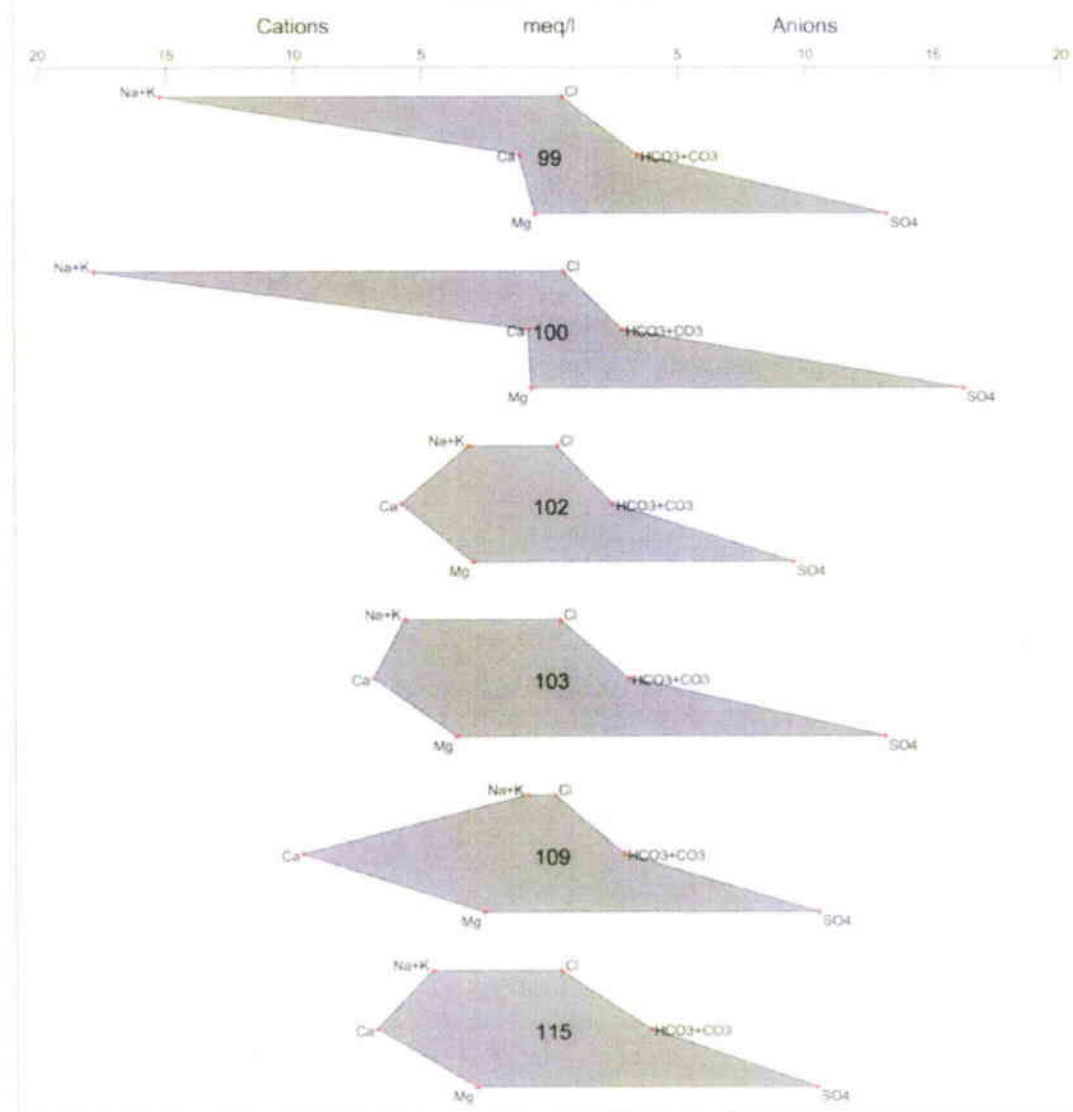


# Stiff Diagrams September 1979 Dewey - Burdock



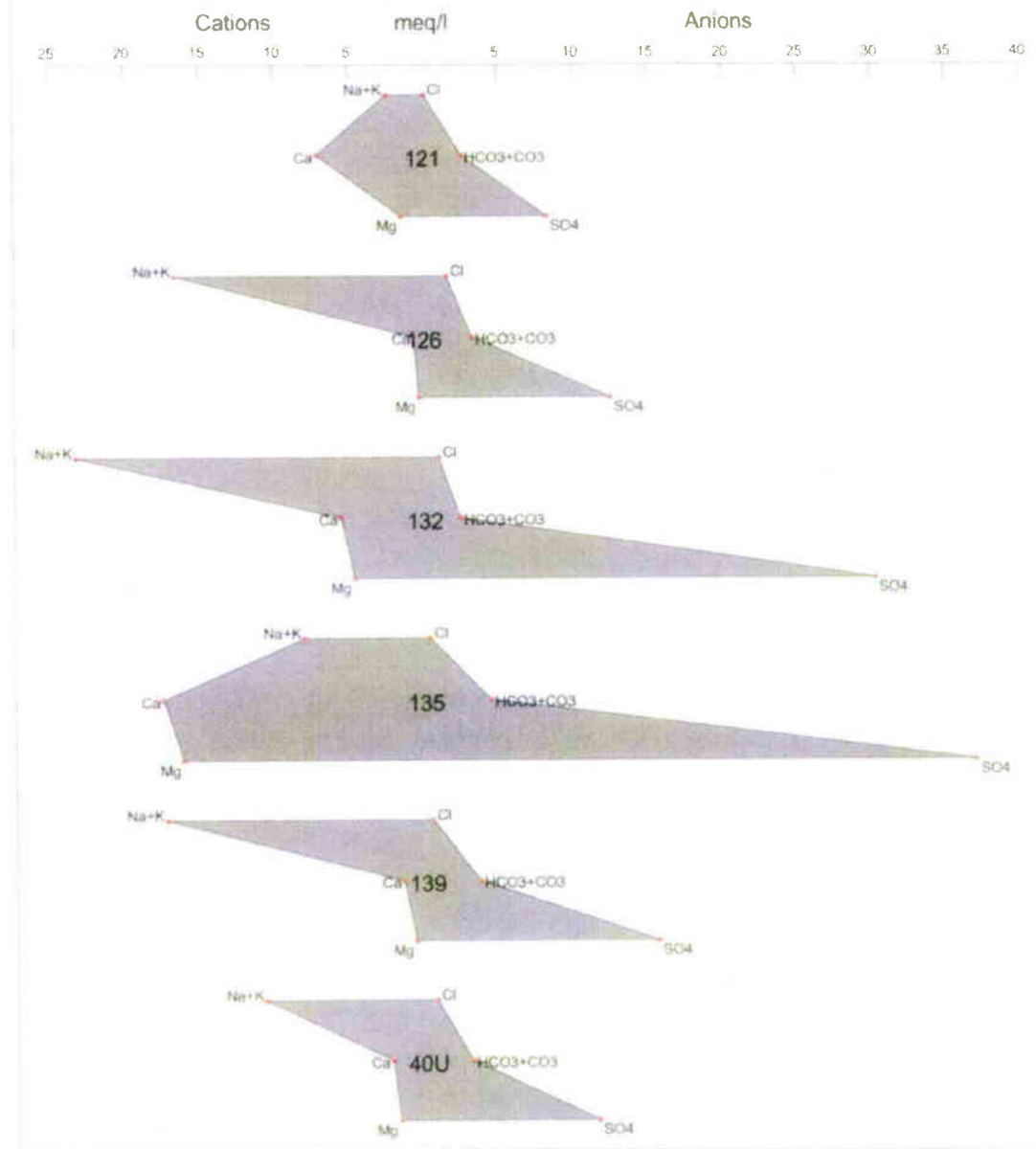


# Stiff Diagrams September 1979 Dewey - Burdock



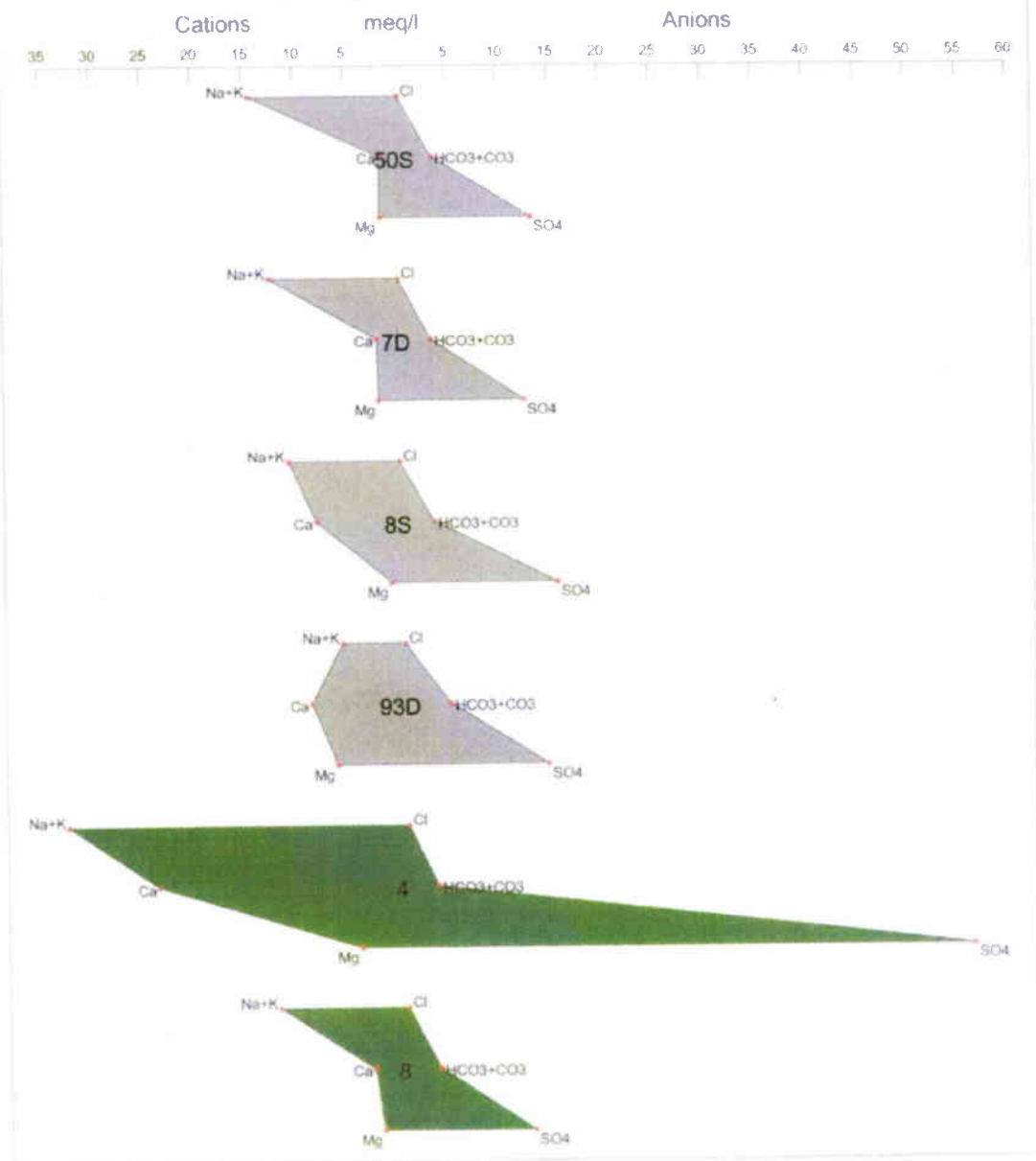


# Stiff Diagrams September 1979 Dewey - Burdock



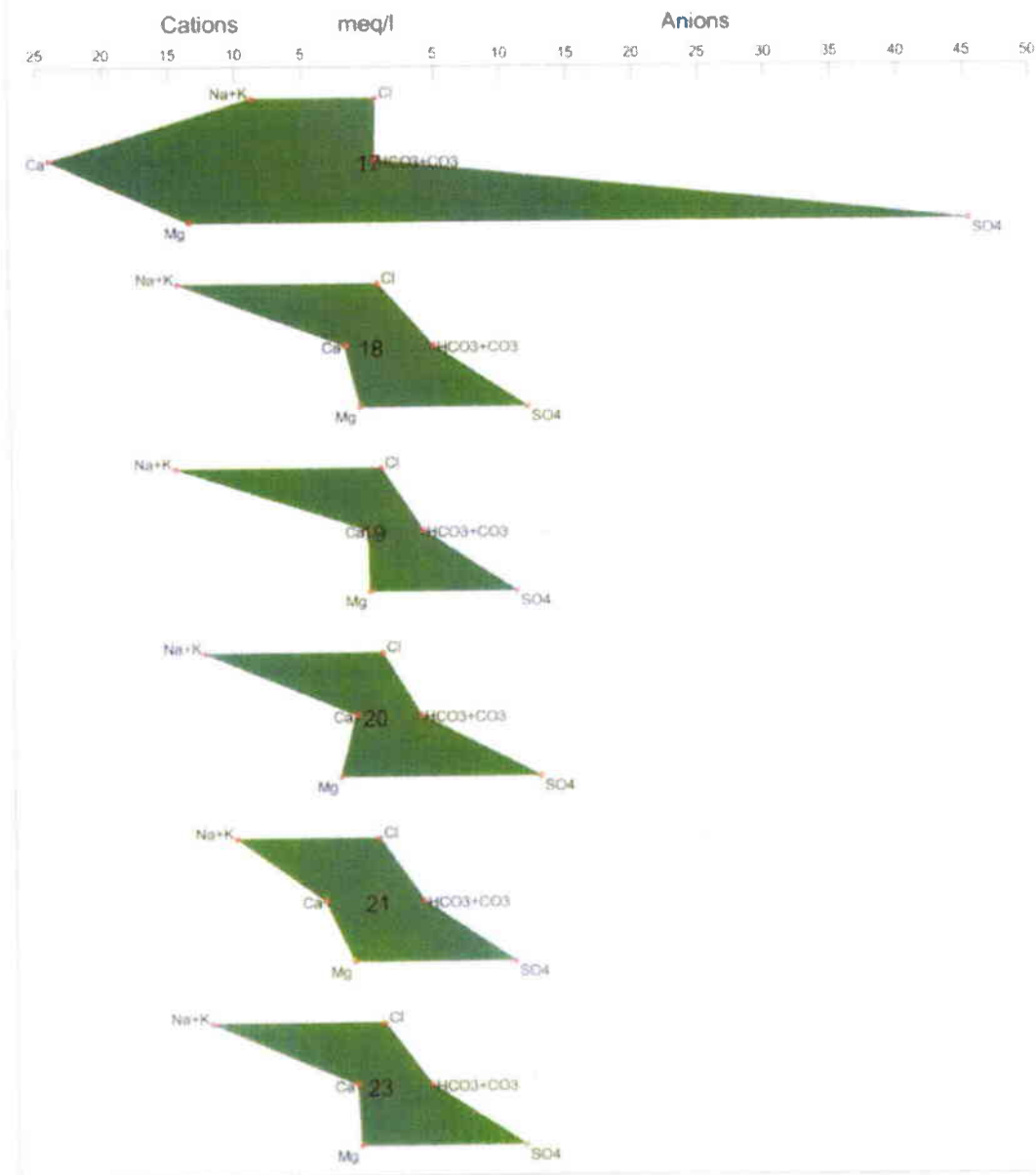


# Stiff Diagrams September 1979 Dewey - Burdock



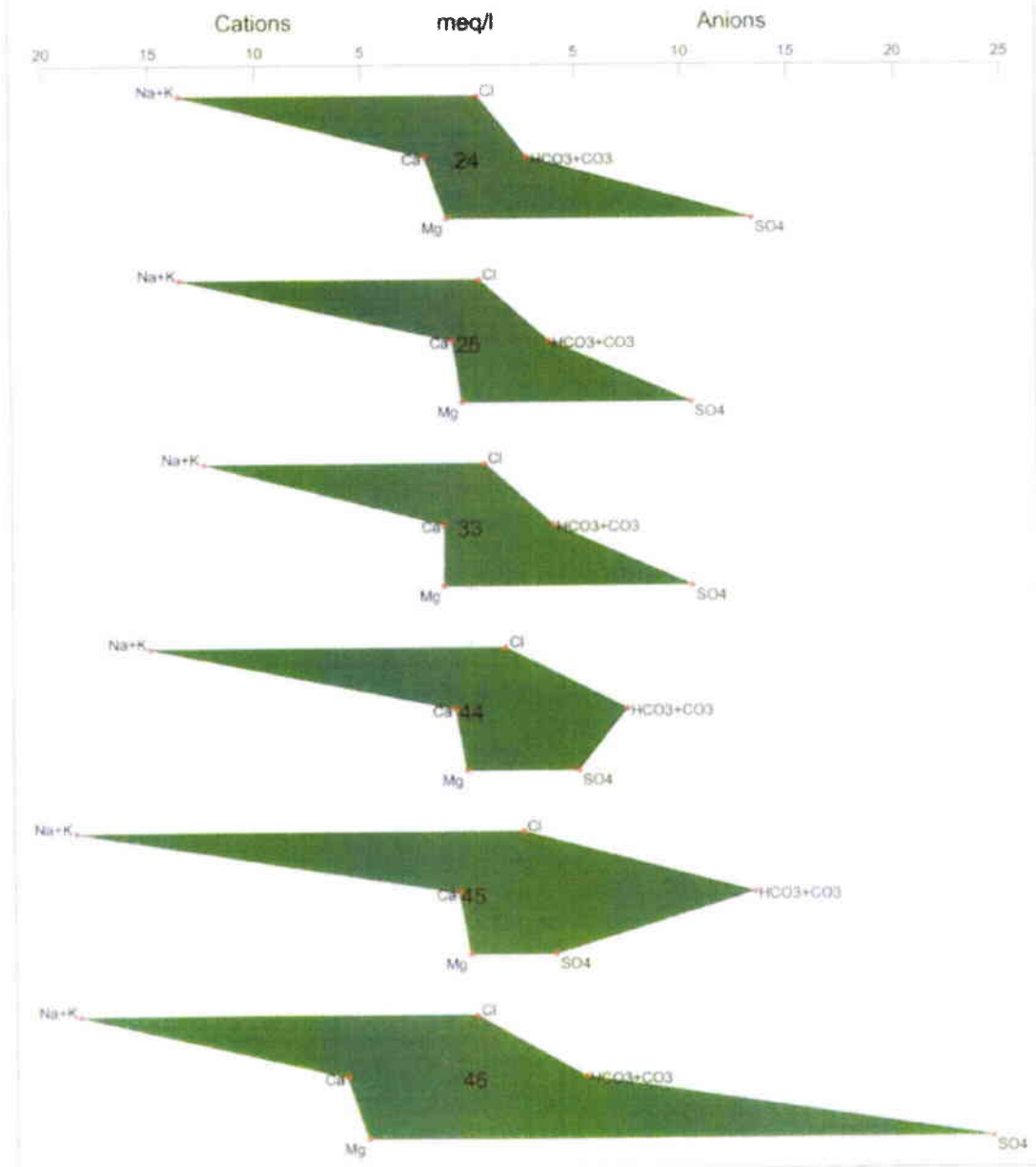


# Stiff Diagrams September 1979 Dewey - Burdock



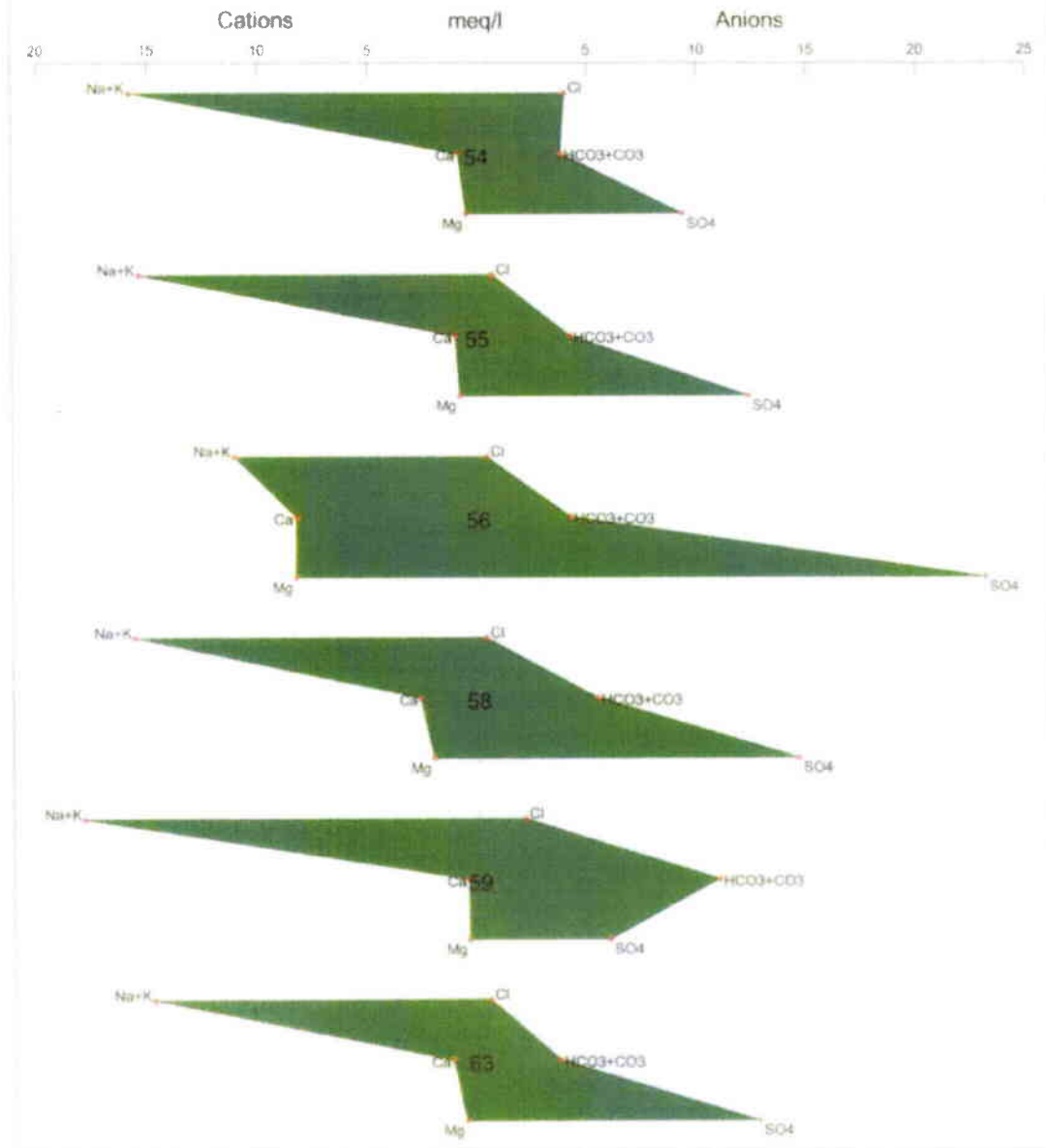


# Stiff Diagrams September 1979 Dewey - Burdock



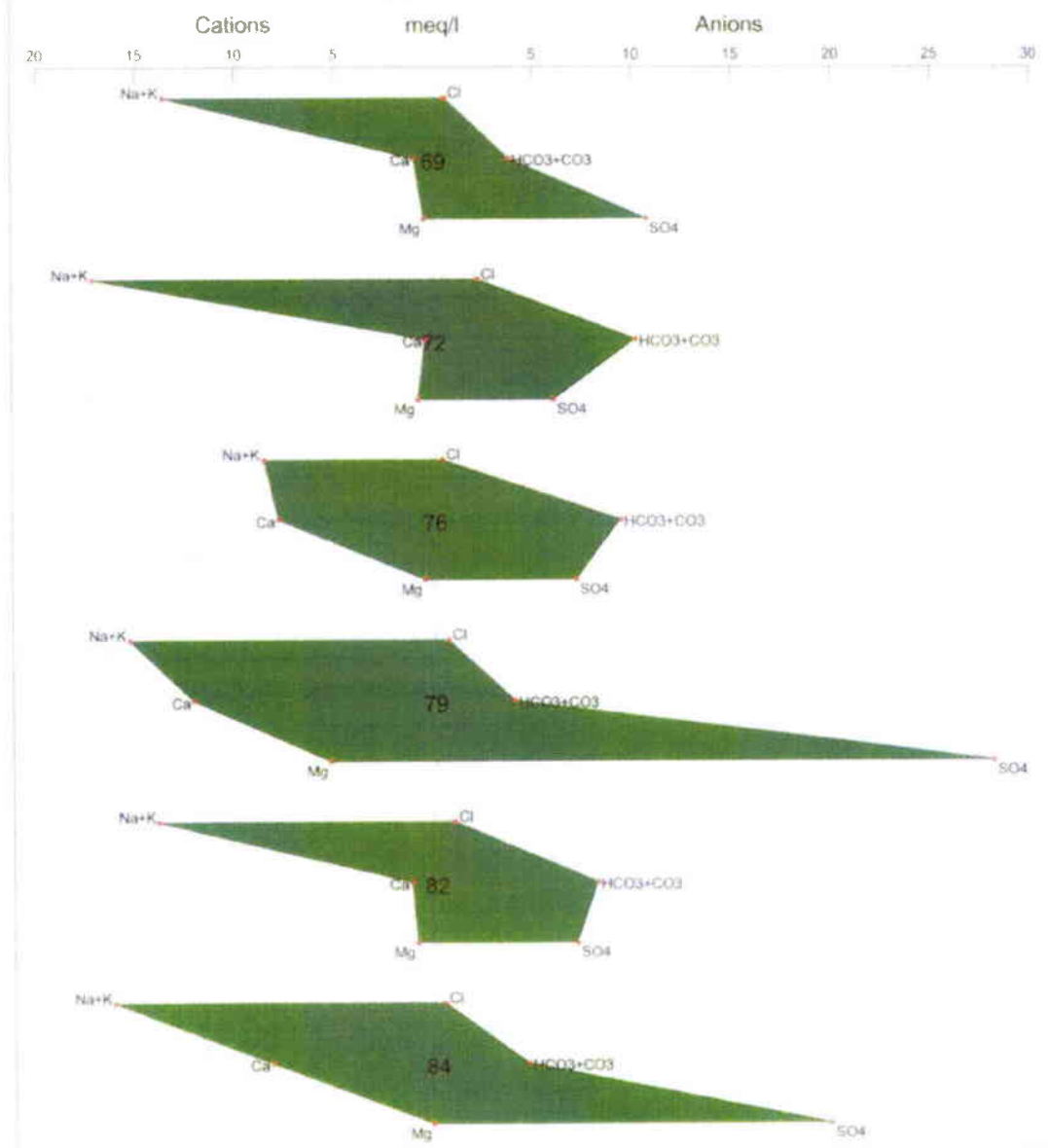


# Stiff Diagrams September 1979 Dewey - Burdock



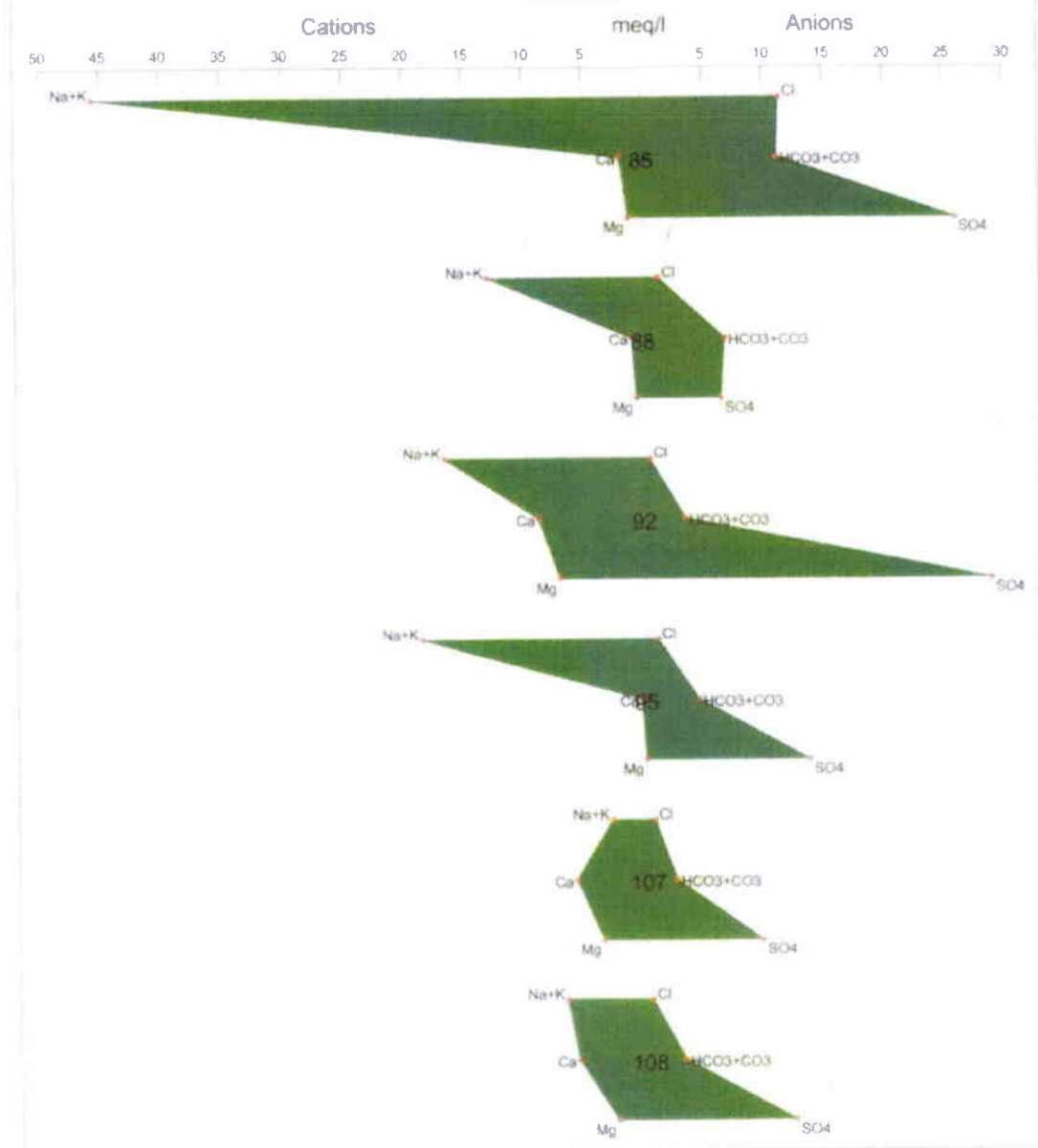


# Stiff Diagrams September 1979 Dewey - Burdock



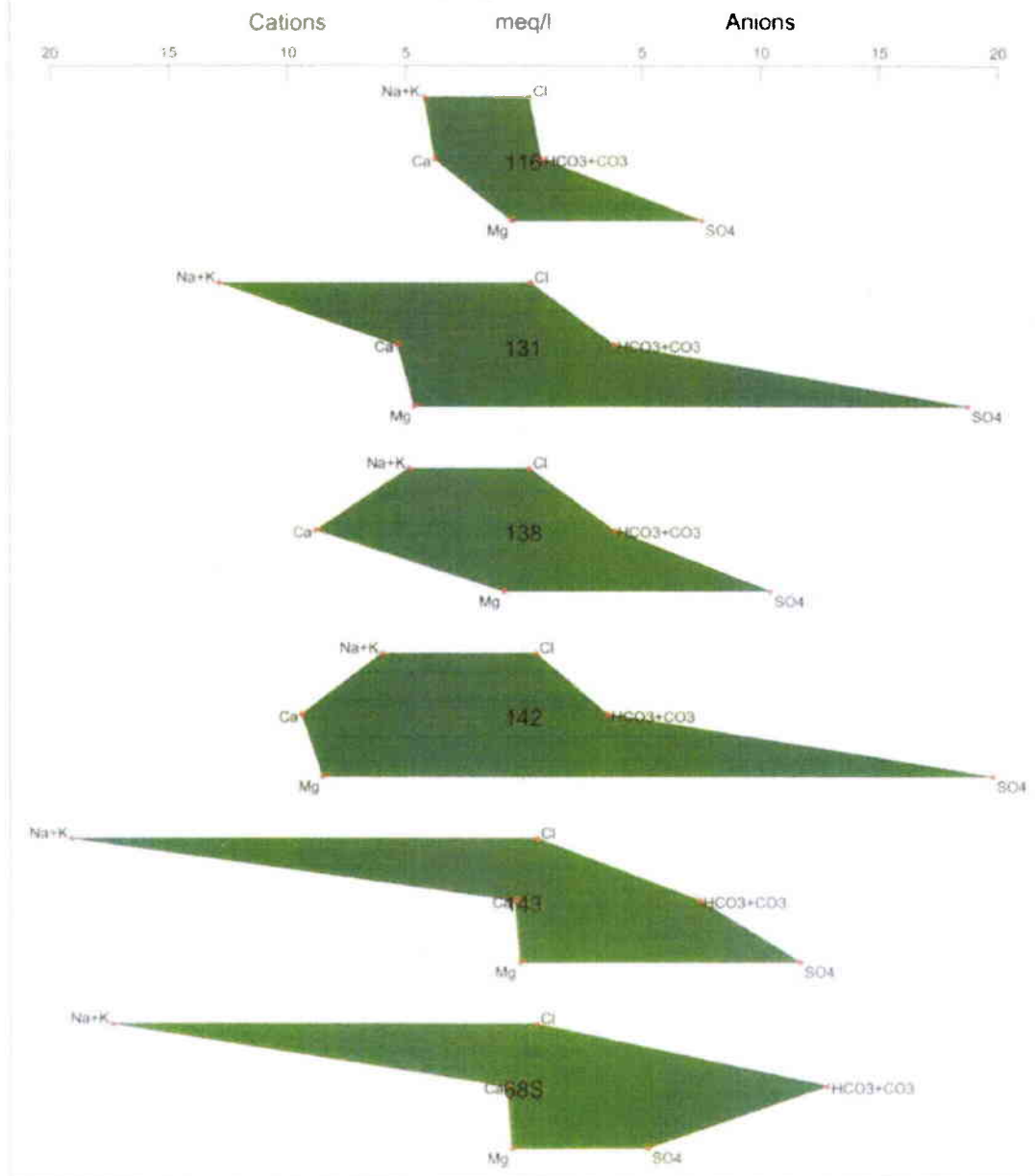


# Stiff Diagrams September 1979 Dewey - Burdock



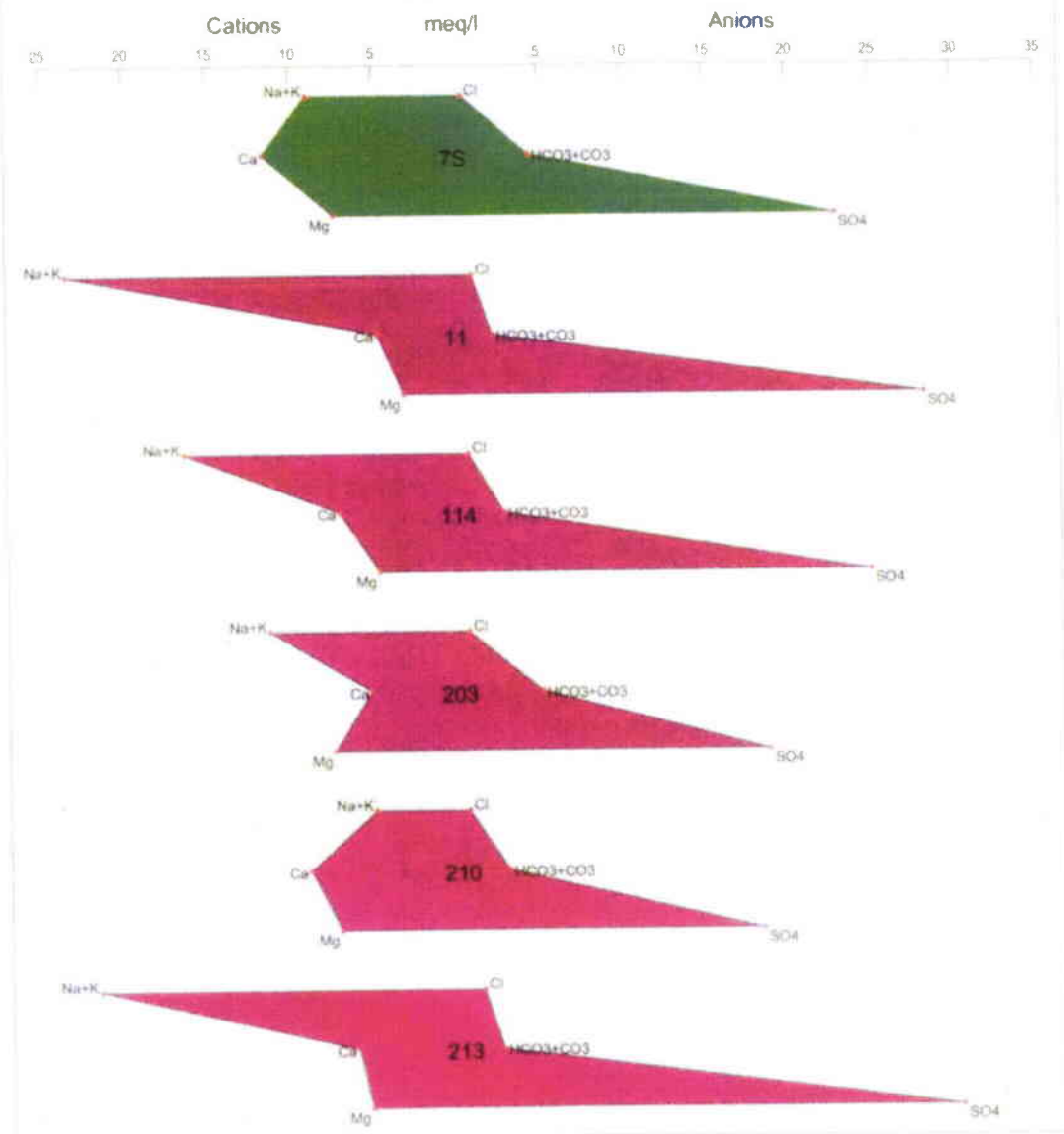


# Stiff Diagrams September 1979 Dewey - Burdock



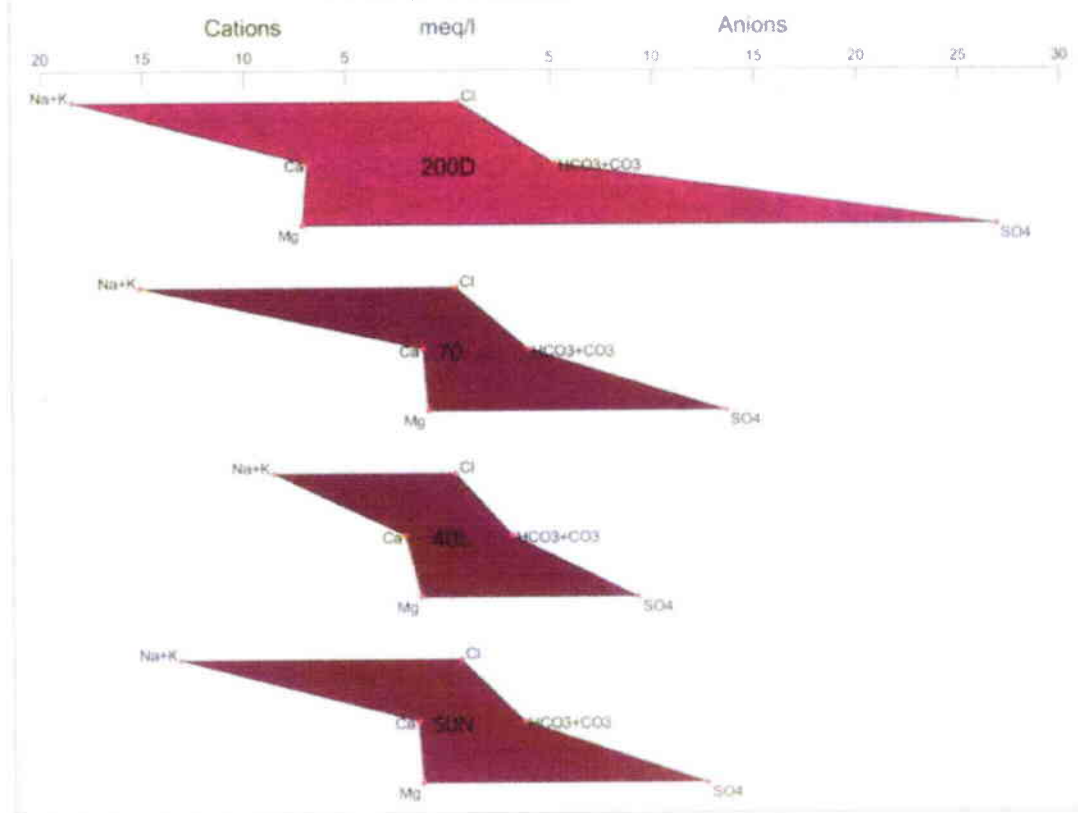


# Stiff Diagrams September 1979 Dewey - Burdock





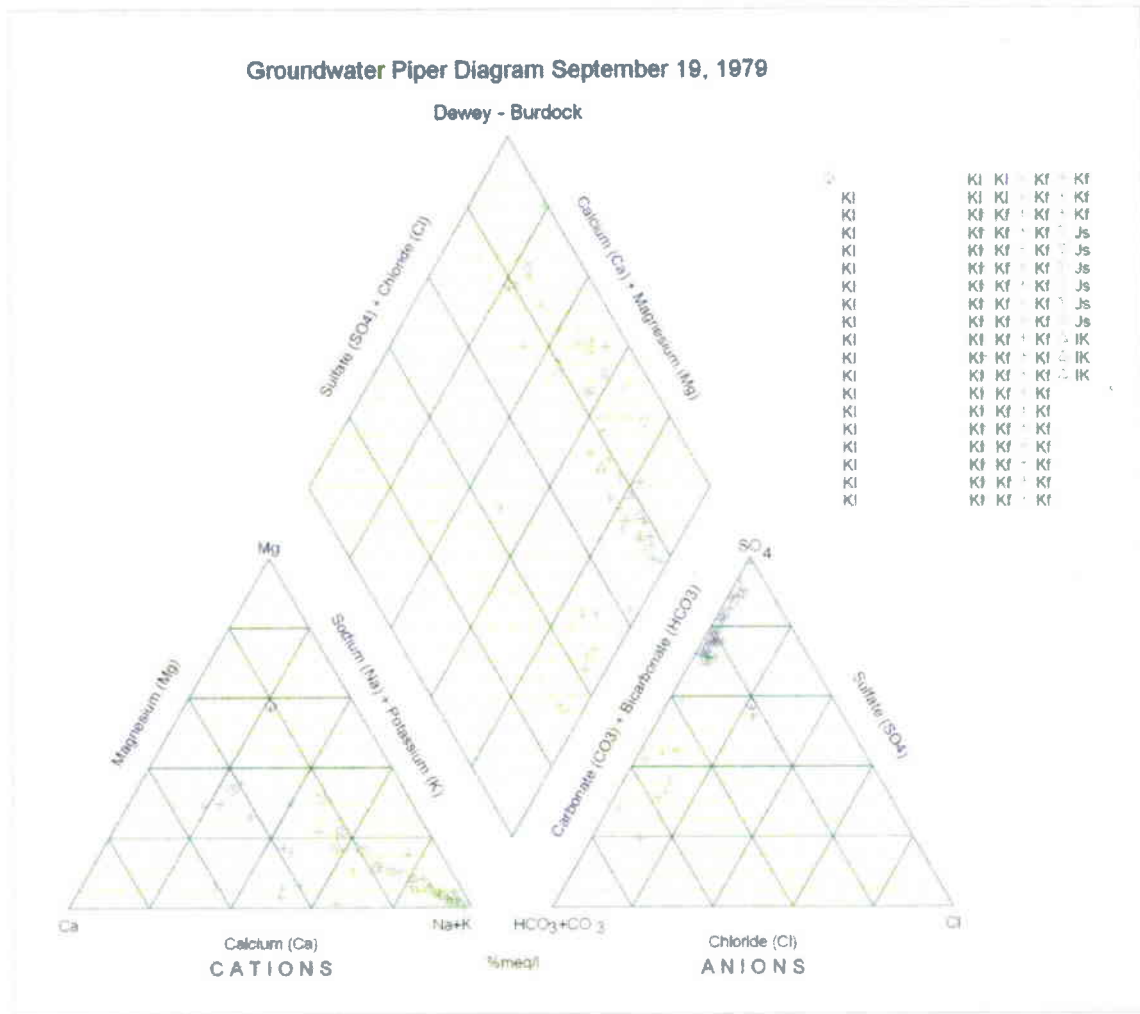
# Stiff Diagrams September 1979 Dewey - Burdock





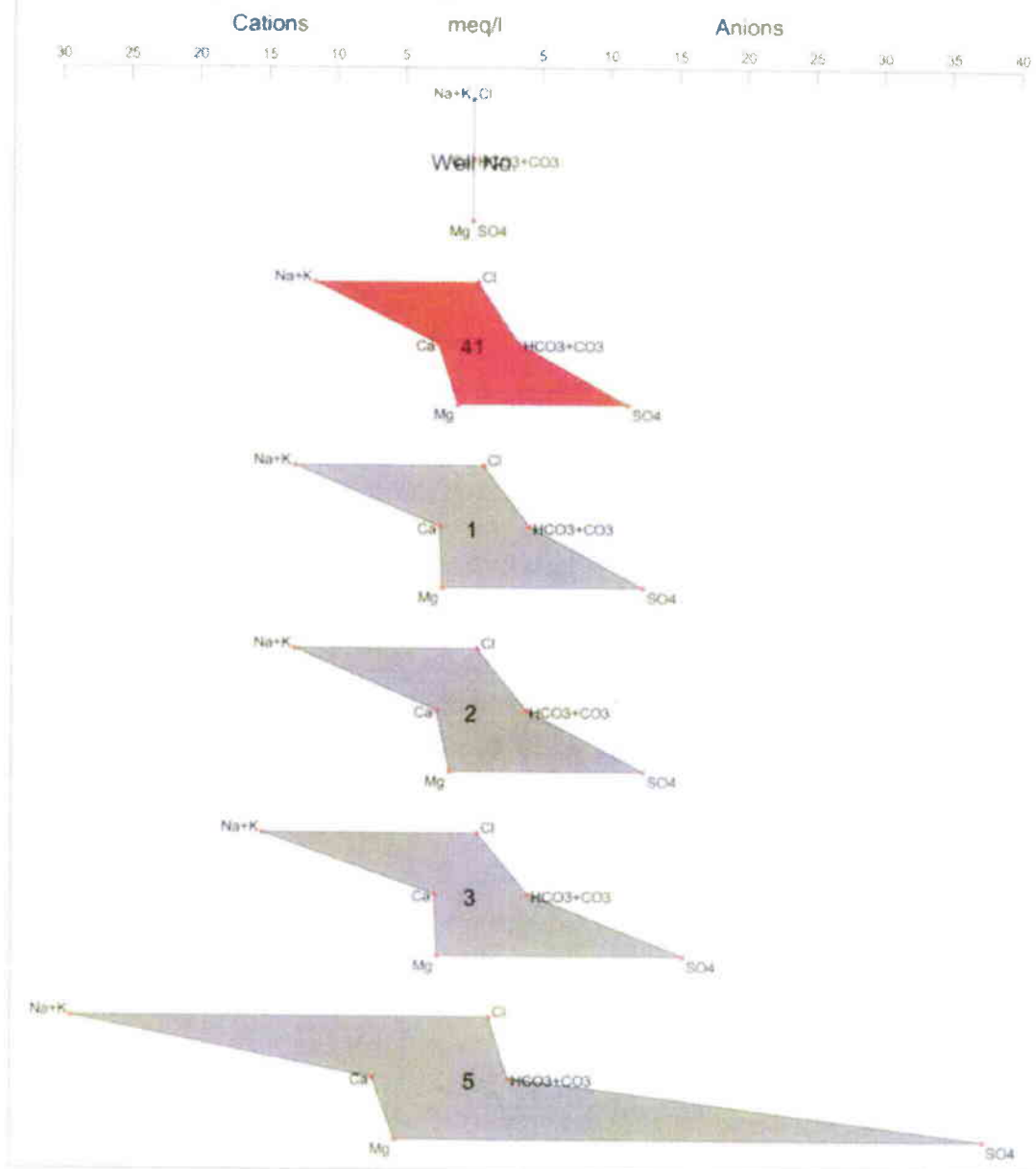
# Groundwater Piper Diagram September 19, 1979

Dewey - Burdock

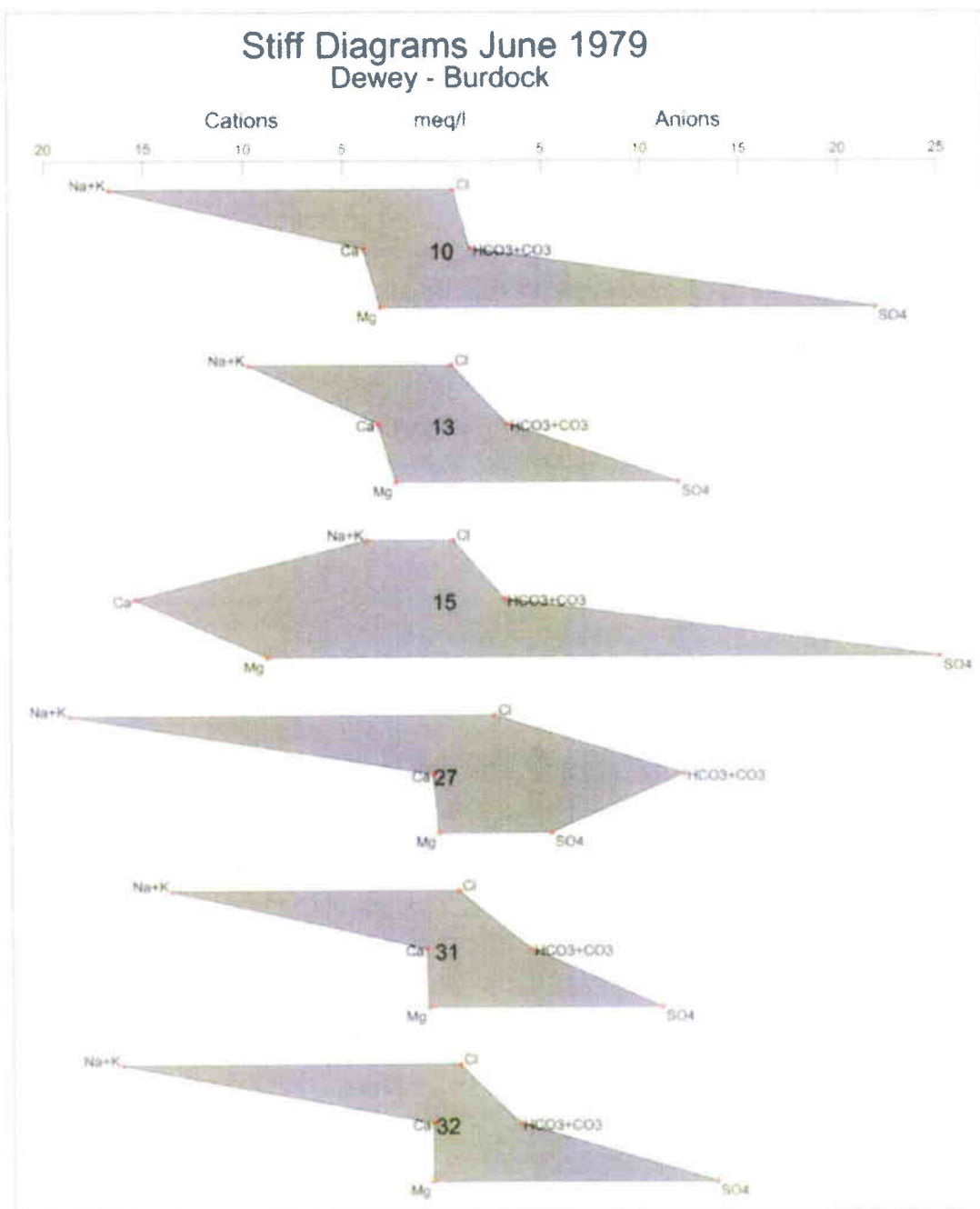




# Stiff Diagrams June 1979 Dewey - Burdock

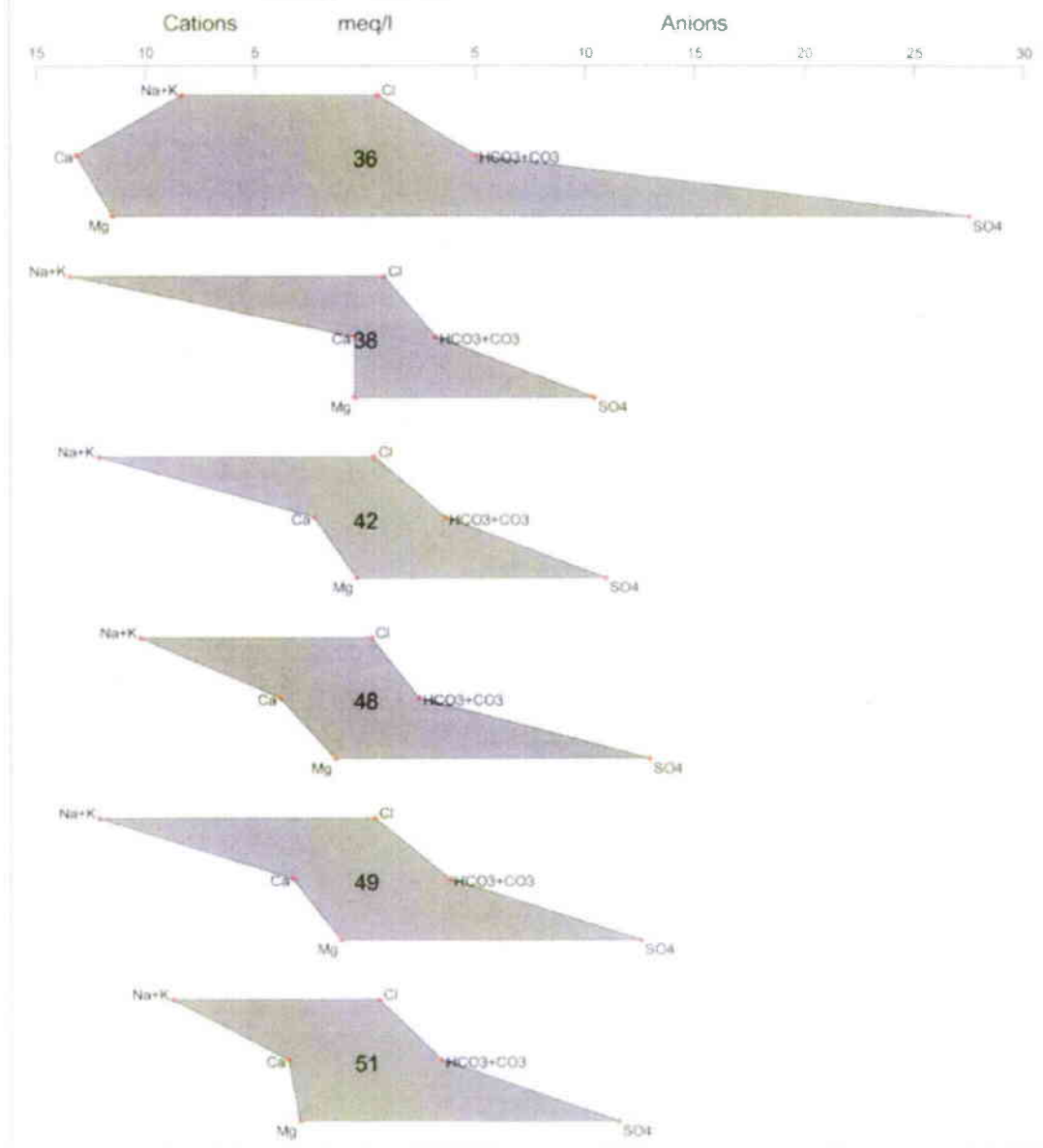




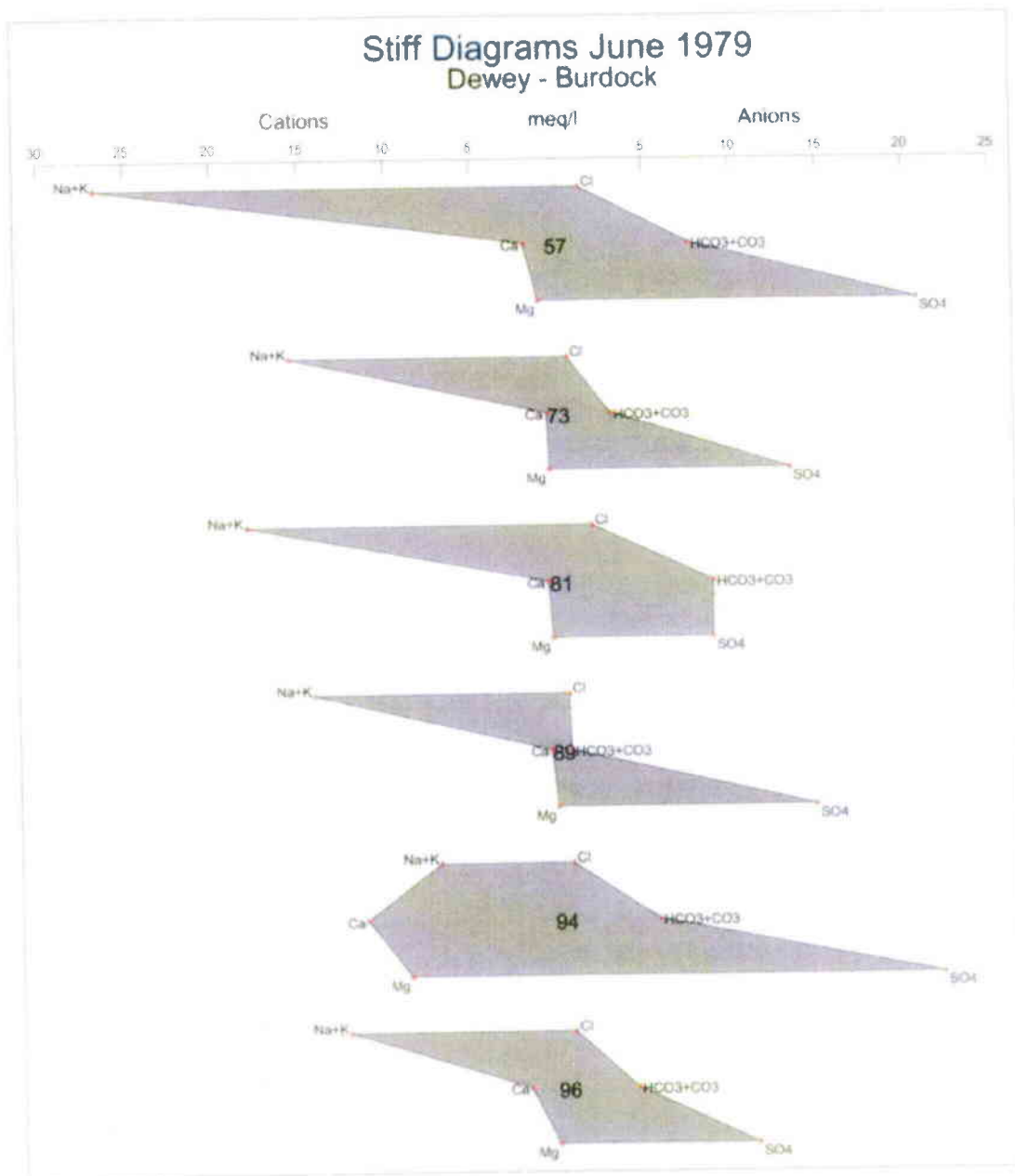




# Stiff Diagrams June 1979 Dewey - Burdock

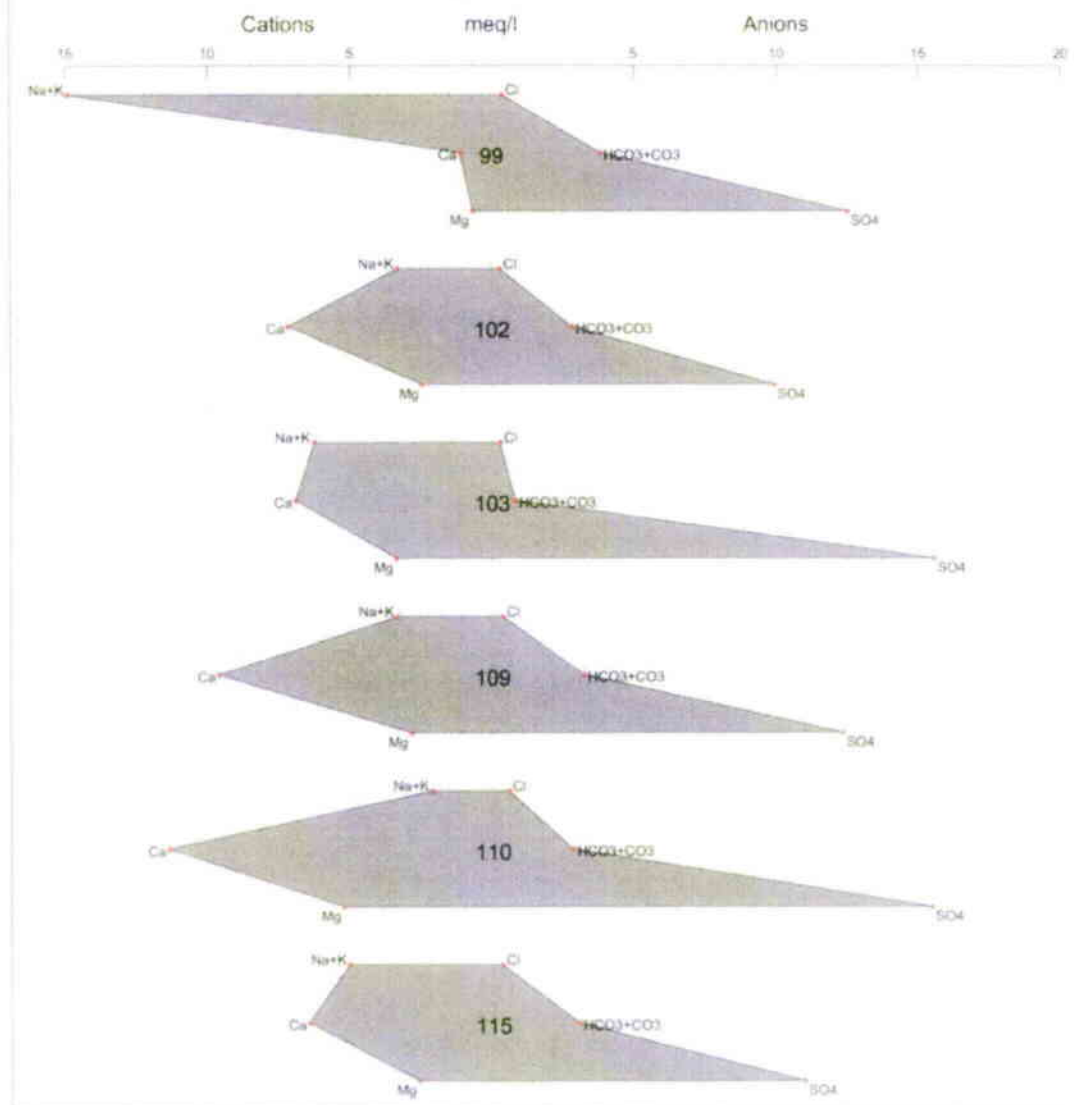






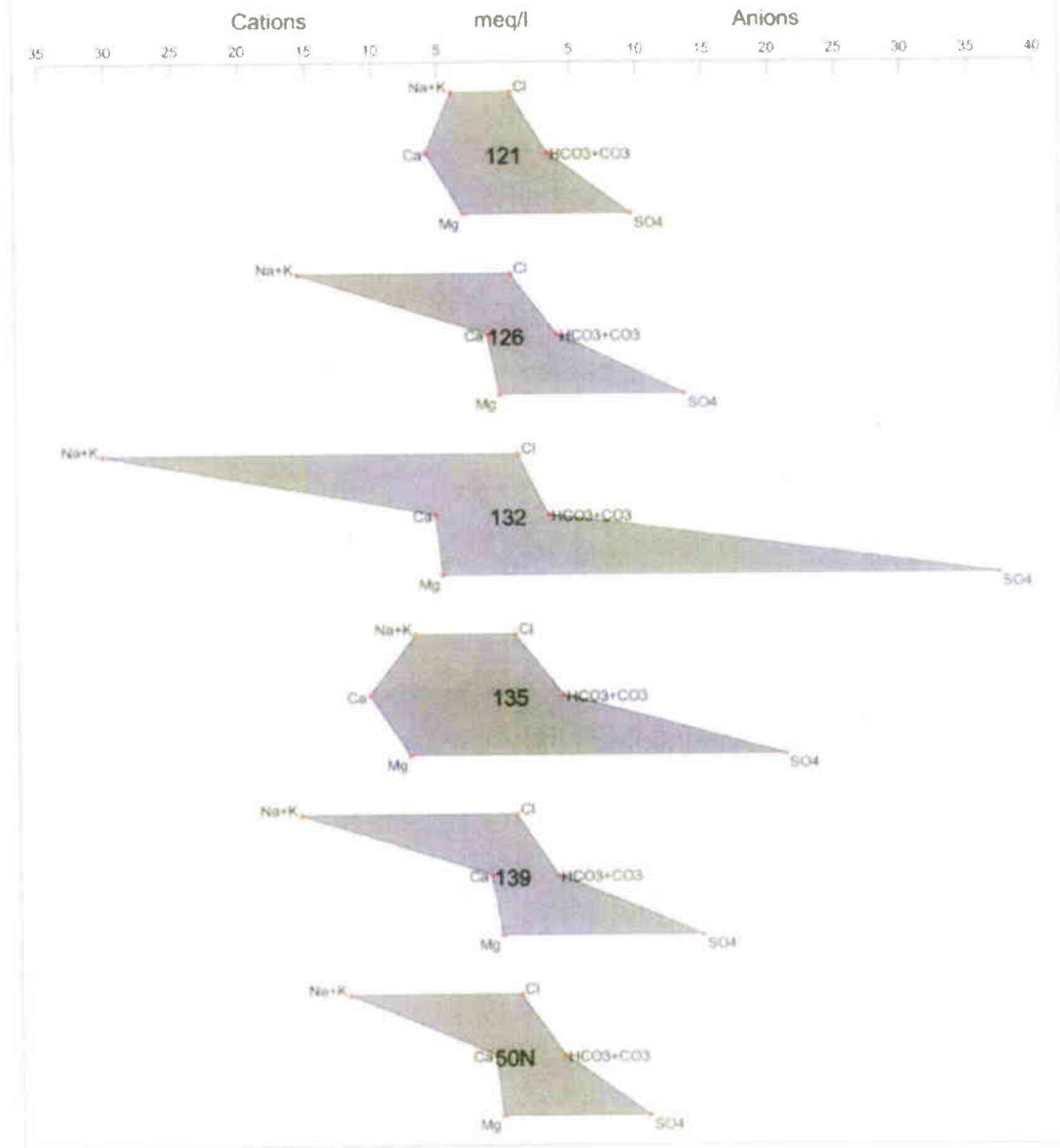


# Stiff Diagrams June 1979 Dewey - Burdock



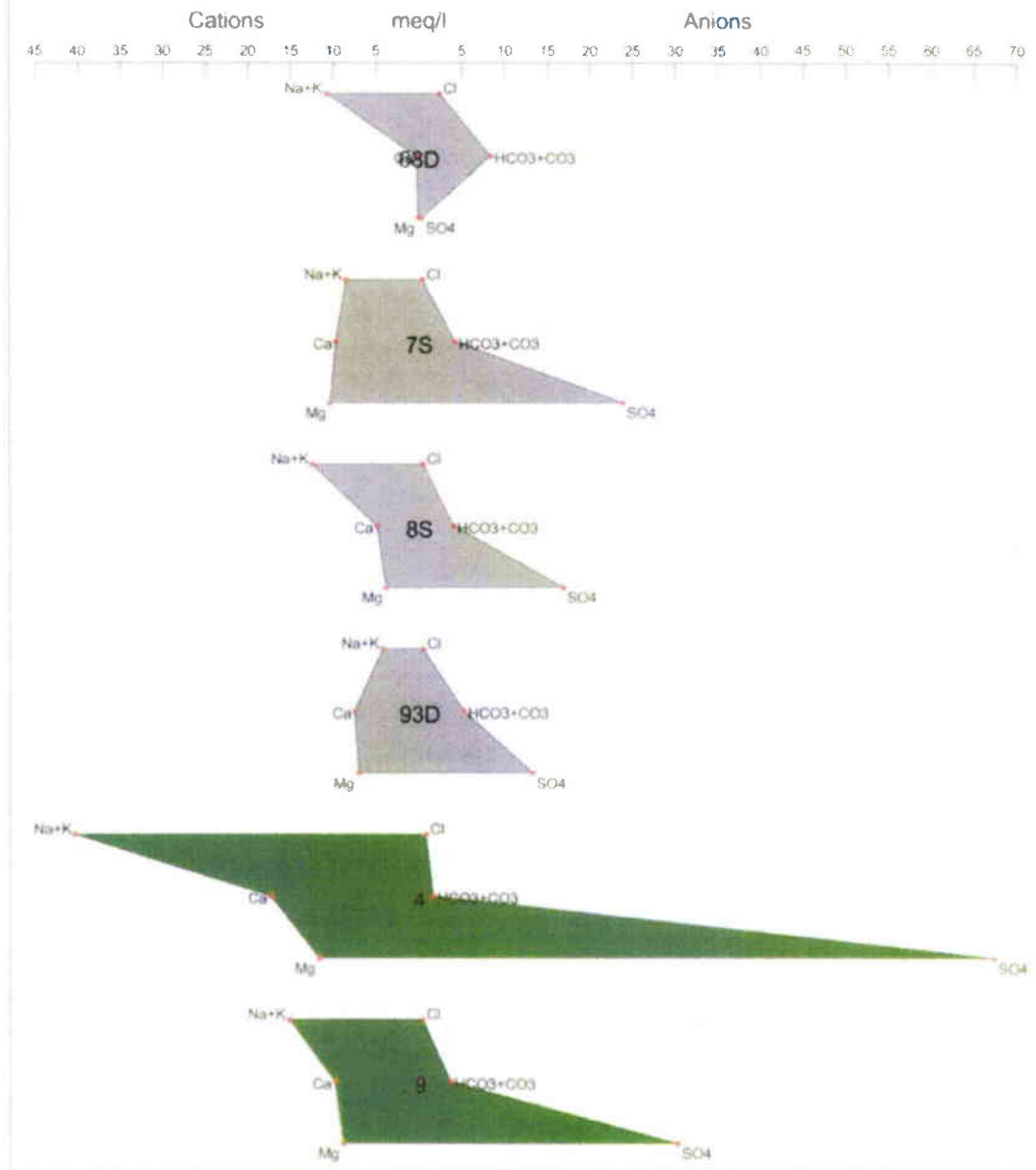


# Stiff Diagrams June 1979 Dewey - Burdock



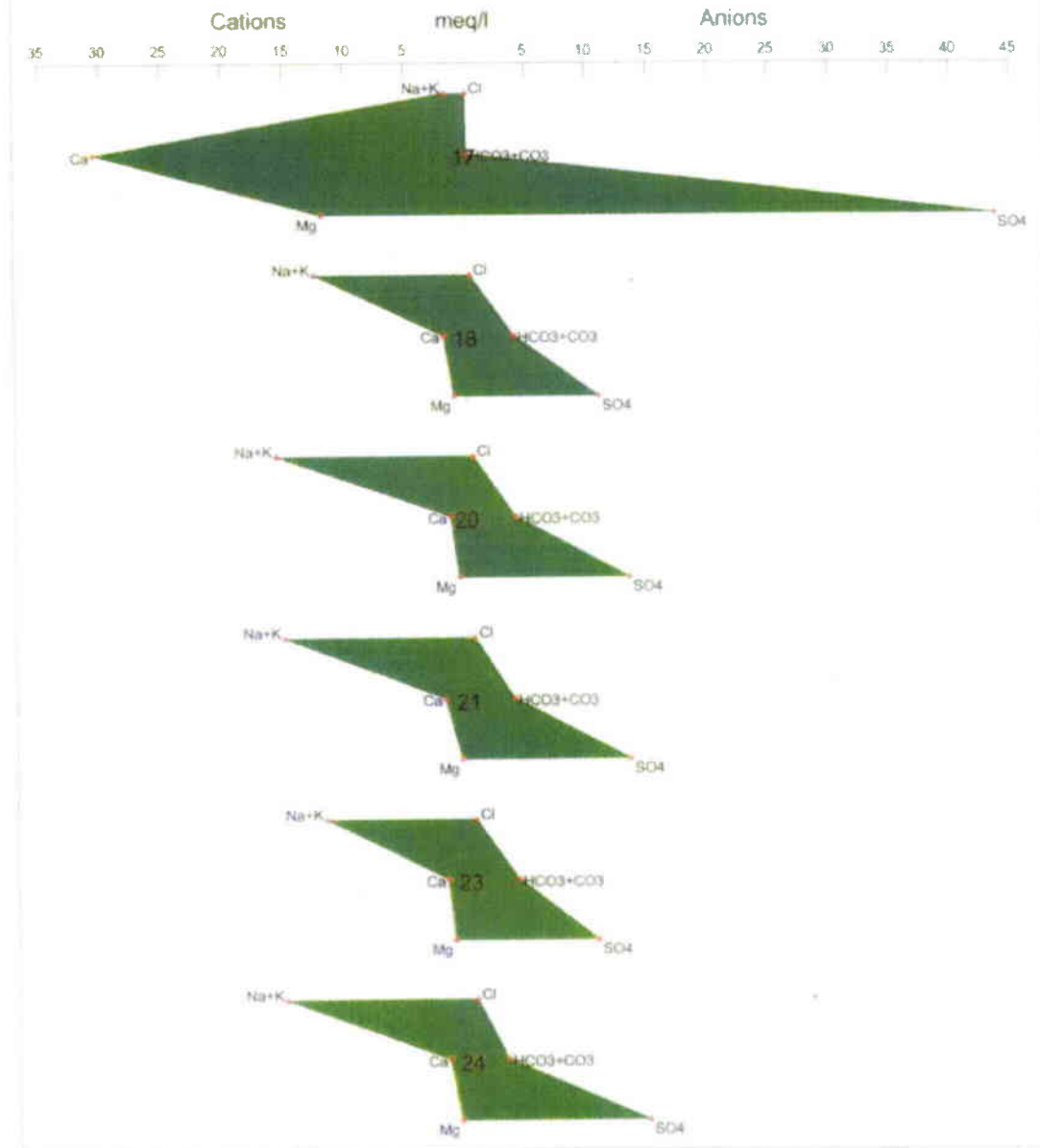


# Stiff Diagrams June 1979 Dewey - Burdock



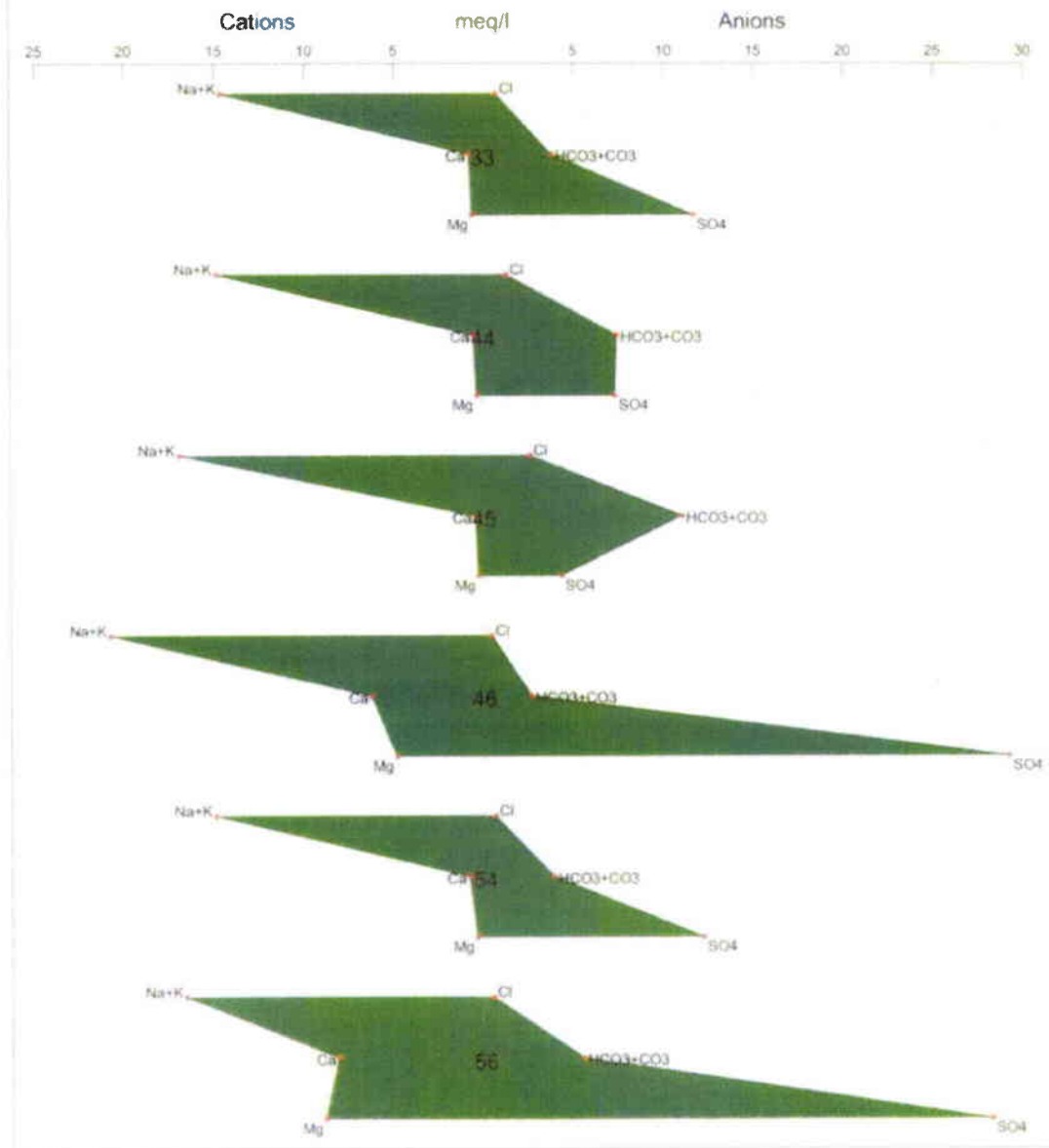


# Stiff Diagrams June 1979 Dewey - Burdock

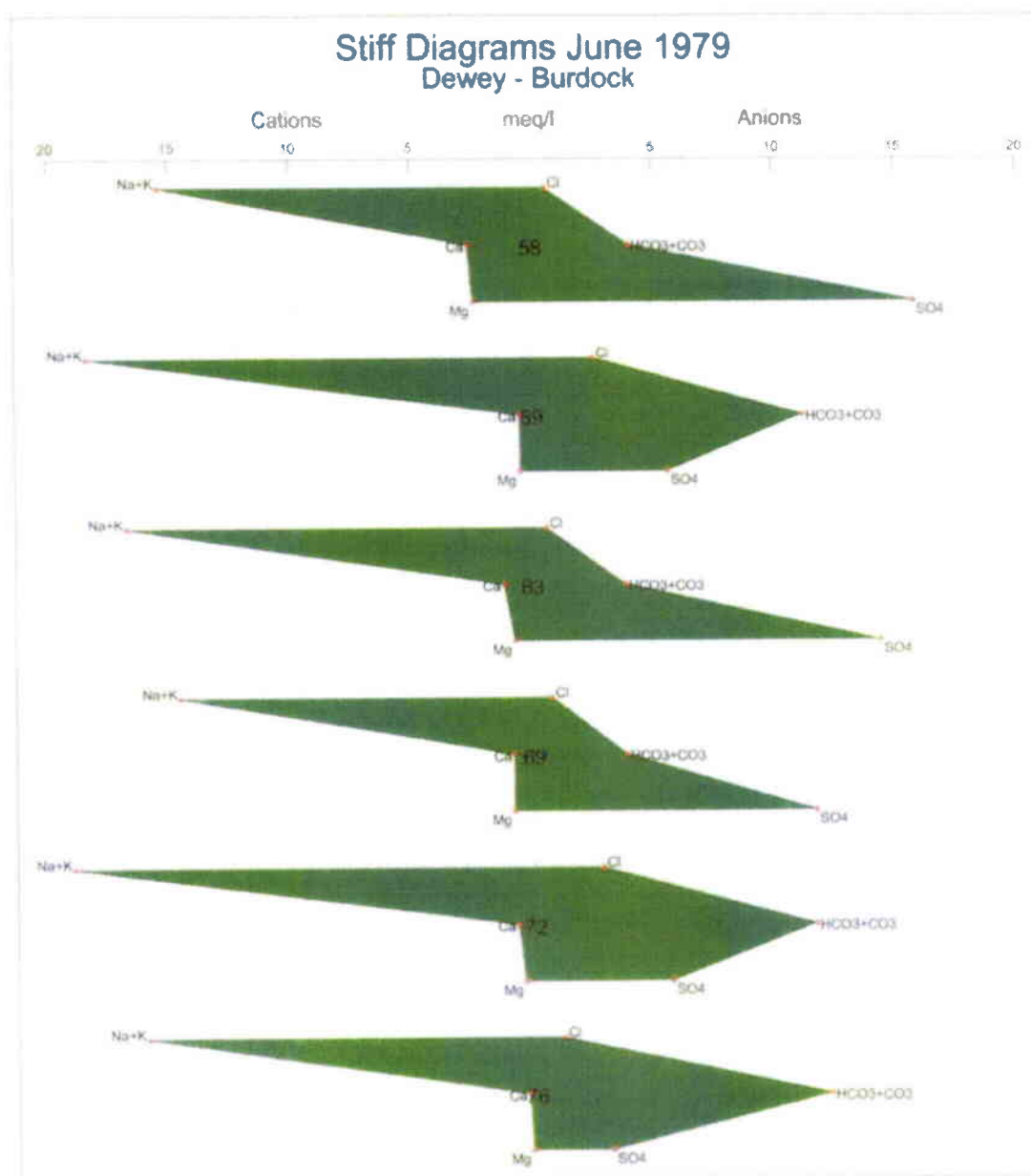




# Stiff Diagrams June 1979 Dewey - Burdock

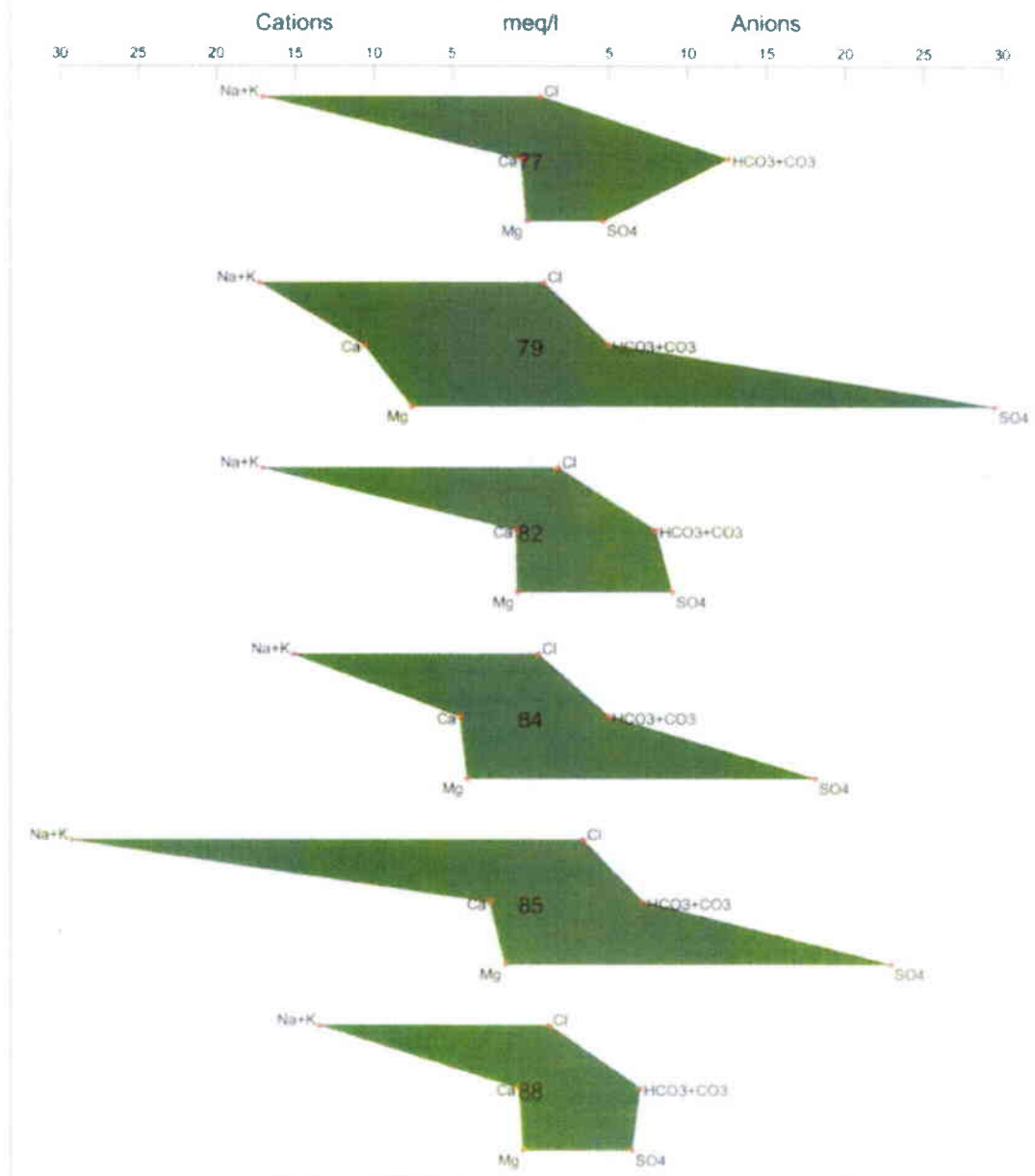






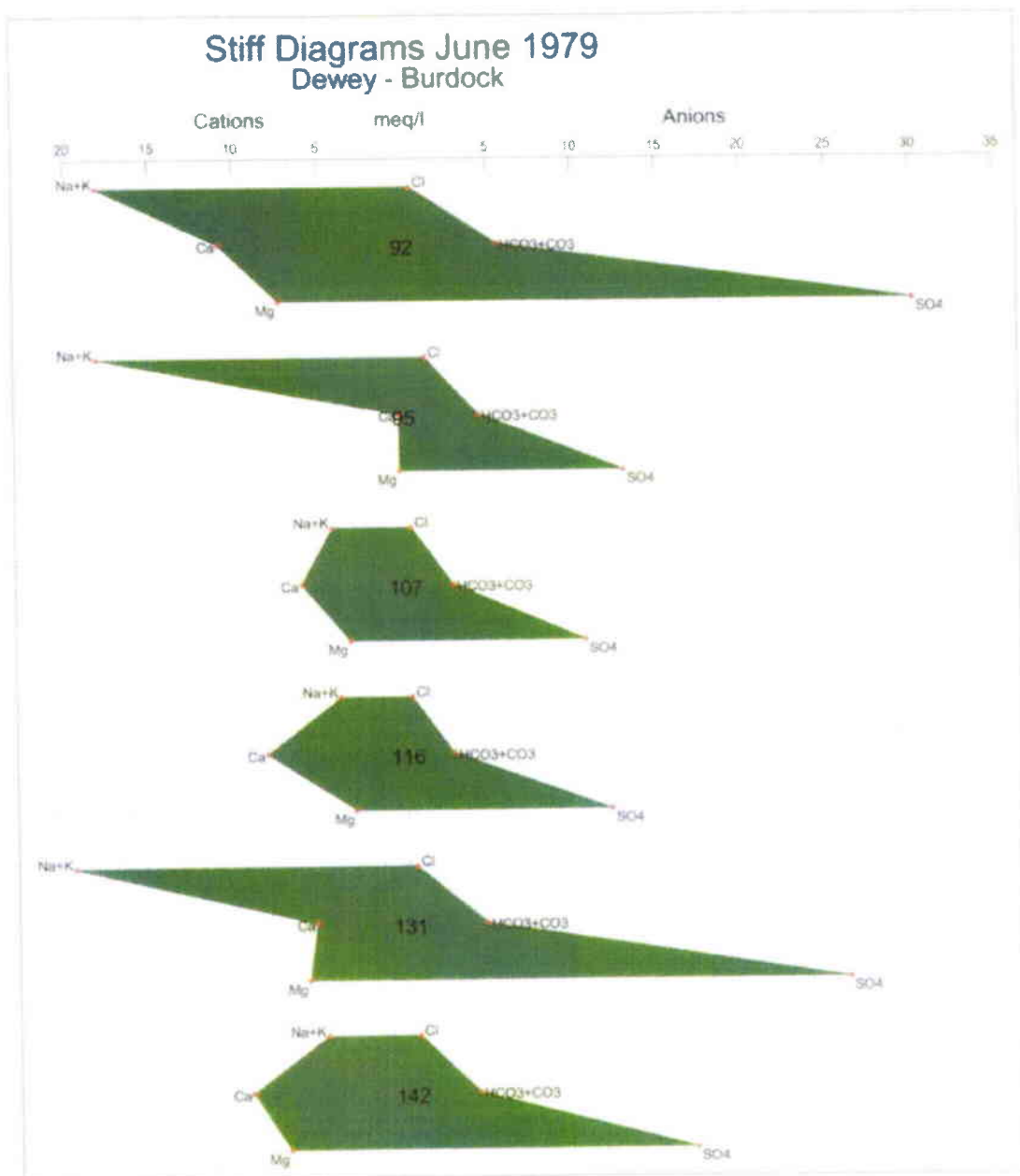


# Stiff Diagrams June 1979 Dewey - Burdock



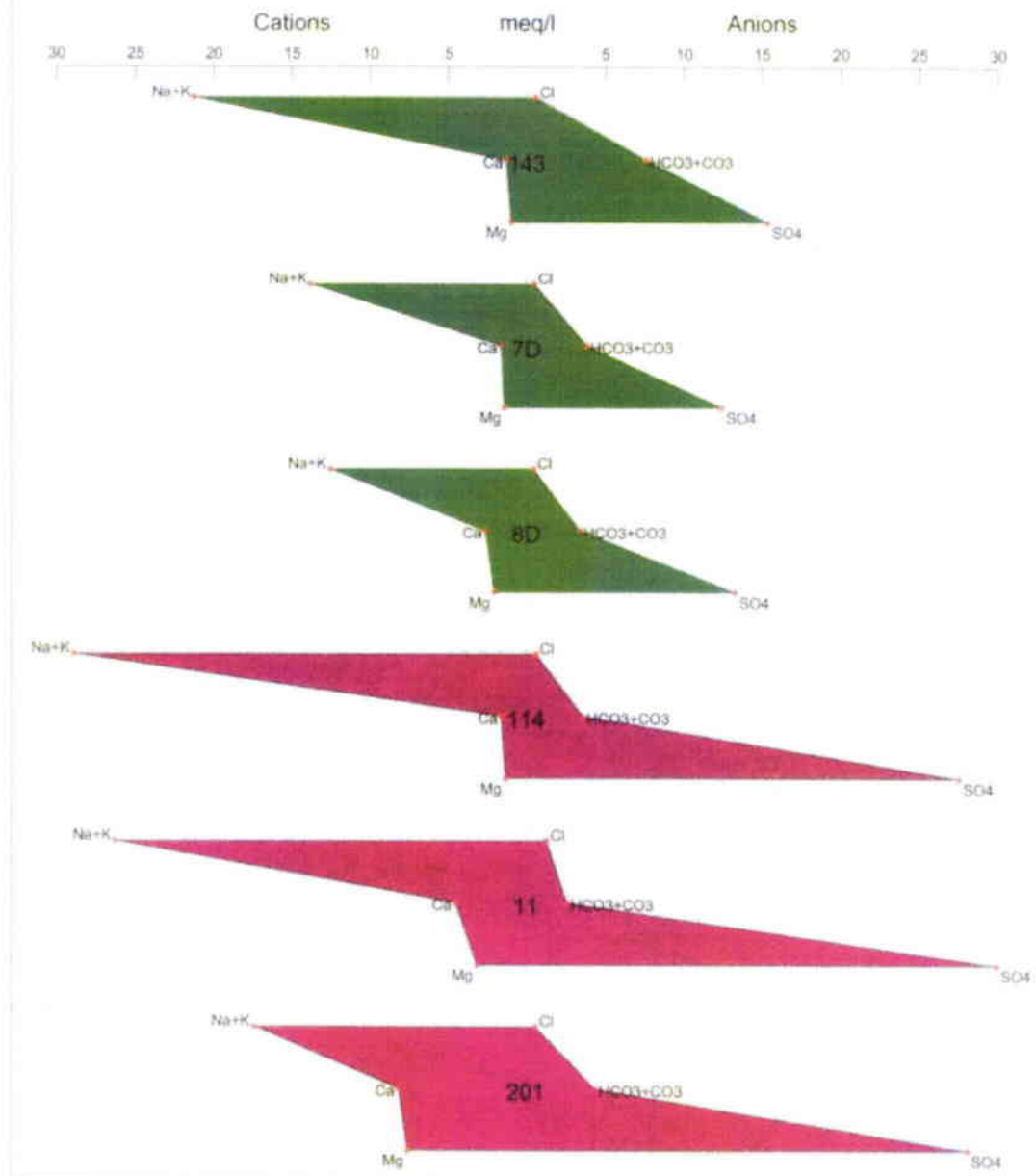


# Stiff Diagrams June 1979 Dewey - Burdock



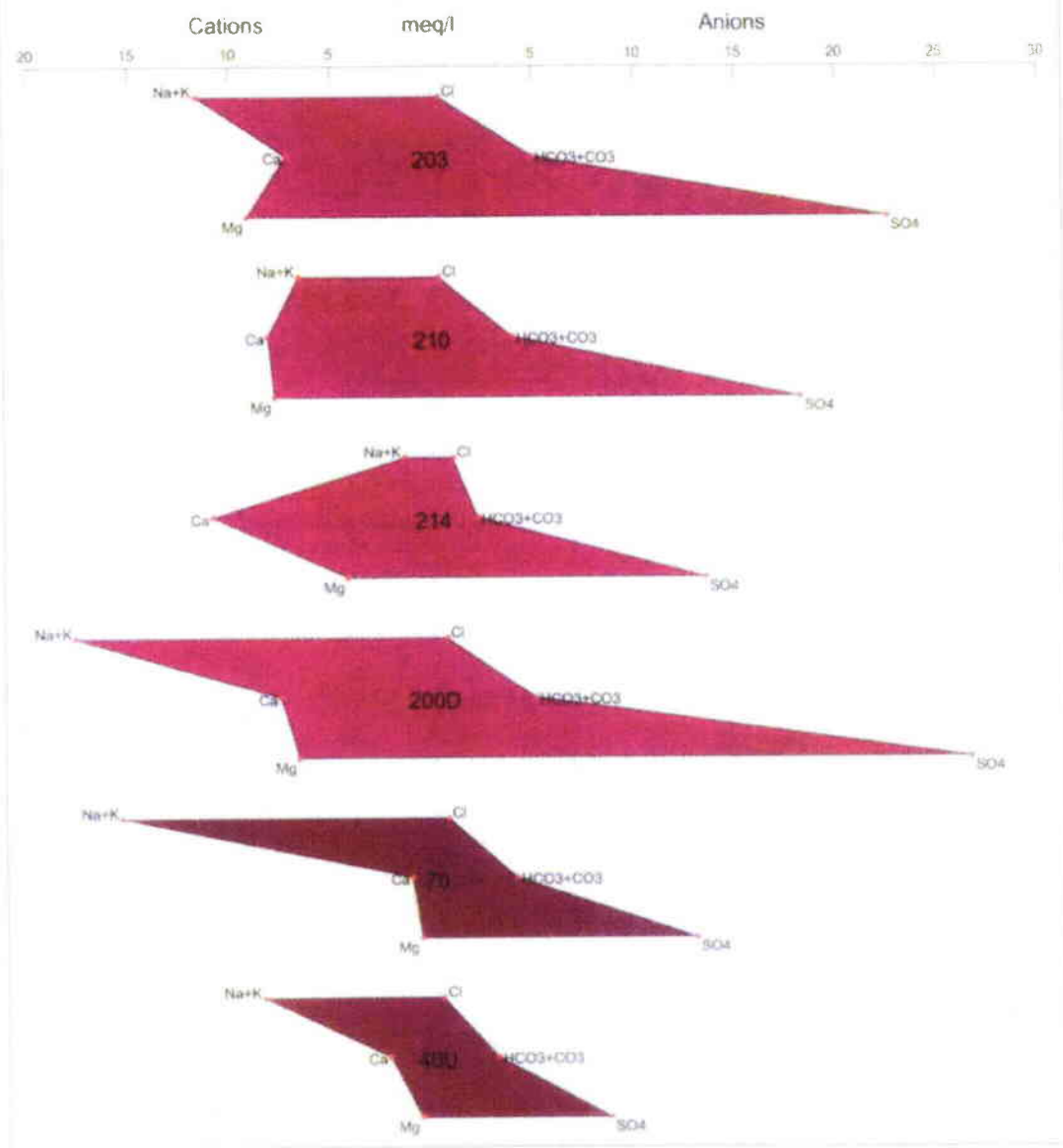


# Stiff Diagrams June 1979 Dewey - Burdock

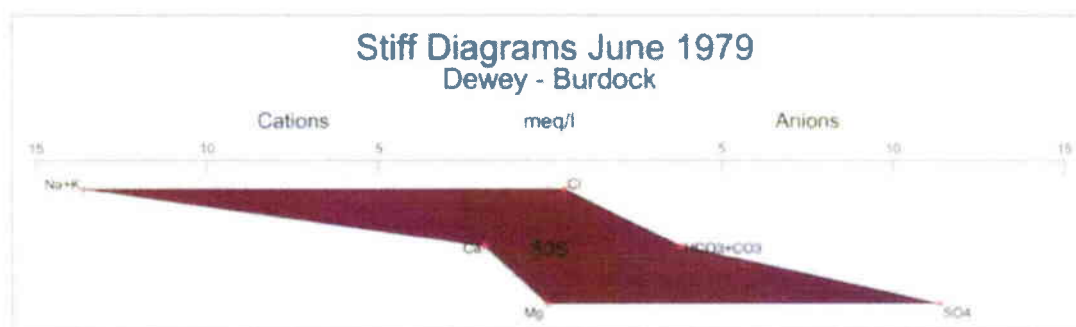




# Stiff Diagrams June 1979 Dewey - Burdock

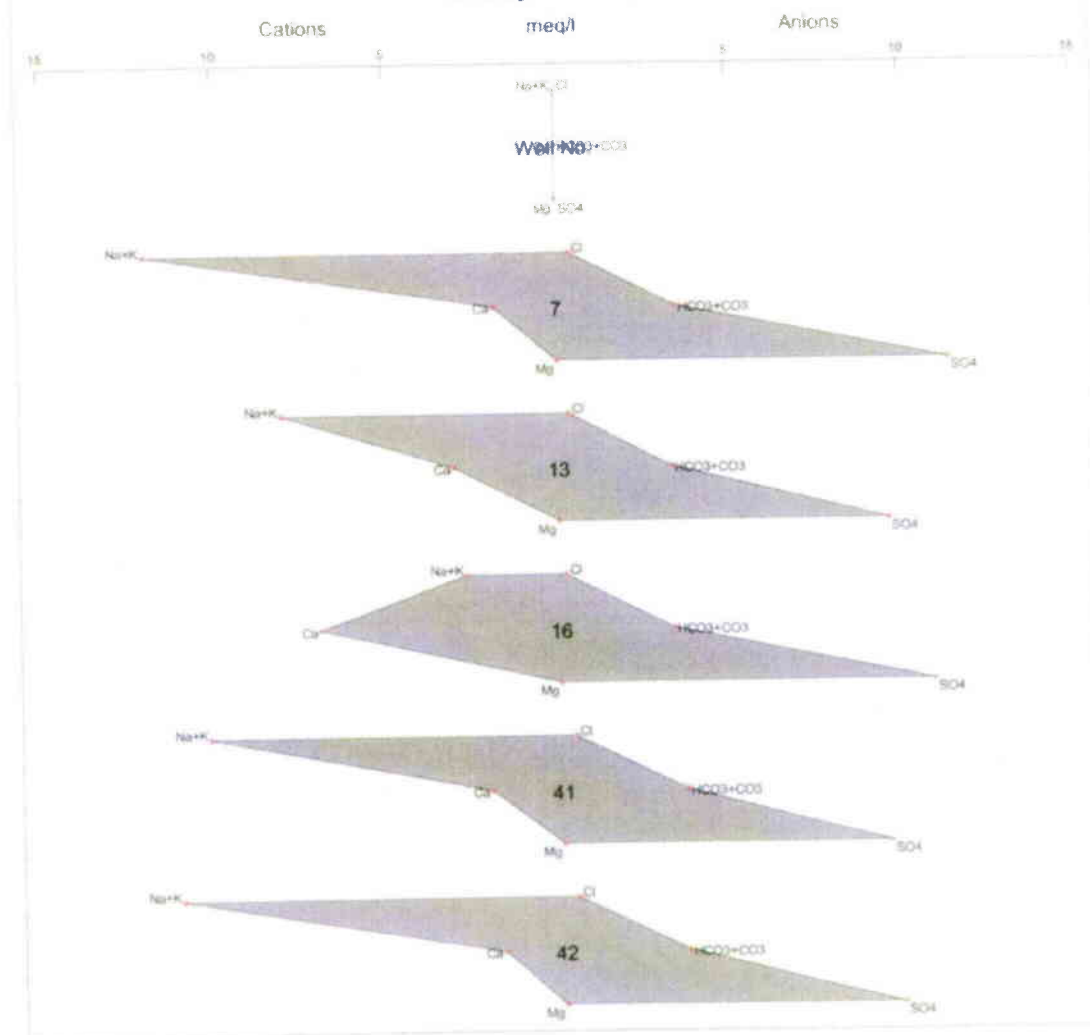




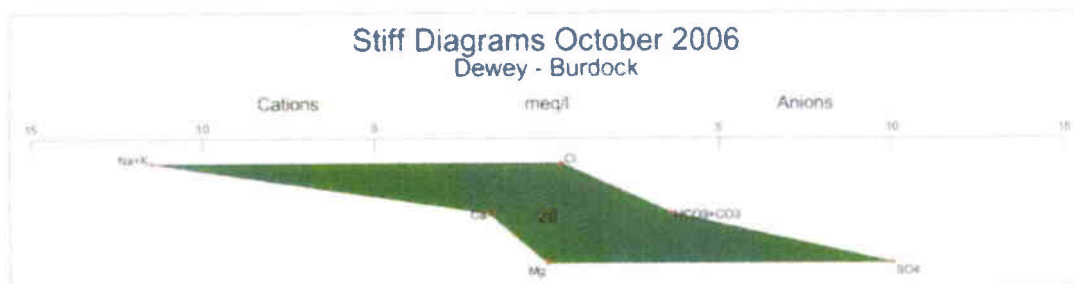




# Stiff Diagrams October 2006 Dewey - Burdock



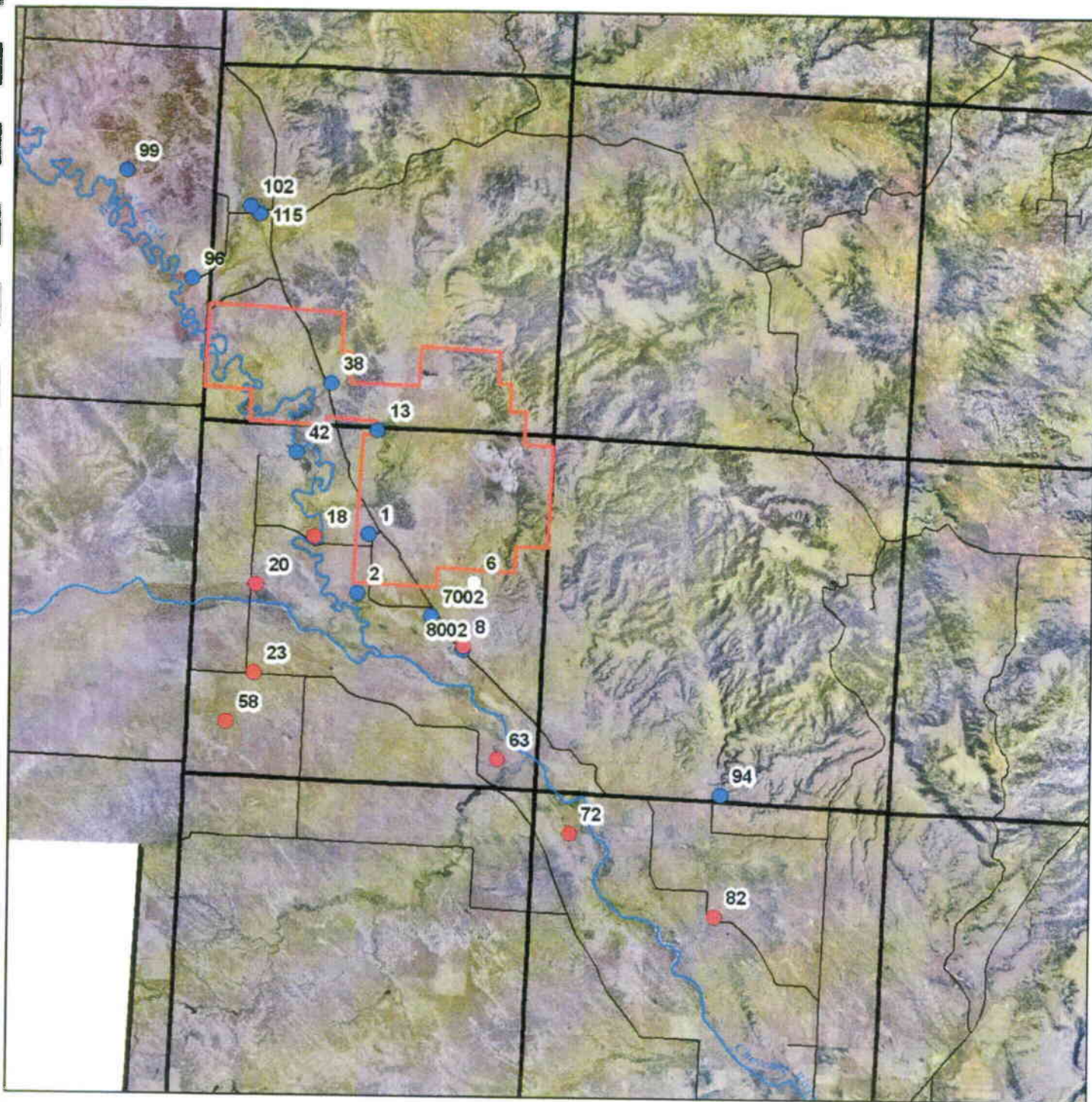













# **GEOCHEMISTRY ANALYSIS**





## Legend

- |   |                 |   |            |
|---|-----------------|---|------------|
|  | Township/Range  |  | Fall River |
|  | Permit Boundary |  | Lakota     |
|  | Roads           |  | Unknown    |
|  | Streams         |   |            |

0 1 2 3 4 Miles



## Dewey Burdock Water Wells with Statistics

Created By:	C.M. Hocking
Date:	8/29/07
Map File:	Wells with Statistics





## Minitab Project Report

### Descriptive Statistics: TSValue

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	493	242.81	171.00	193.00	250.50
	As	493	0.008280	0.005000	0.010000	0.010000
	B	243	0.97786	1.00000	1.00000	1.00000
	bicarbonate	493	248.75	171.00	196.00	264.00
	Ca	493	97.85	26.50	54.00	135.00
	carbonate	493	11.199	0.000	0.000	22.000
	Cl	493	22.21	10.00	14.00	21.00
	Cond	493	1602.5	1300.0	1475.0	1745.0
	Fe	493	2.277	0.275	0.800	2.225
	hardness	487	371.6	100.0	220.0	497.0
	K	493	13.806	9.000	12.000	16.000
	Mg	487	36.22	8.00	19.00	47.00
	Mn	493	0.2265	0.0400	0.0900	0.1850
	N	493	0.9348	0.1500	0.3700	0.8050
	Na	493	269.91	190.50	279.00	344.50
	Pb	493	0.0481	0.0050	0.0290	0.0500
	pH	493	7.9060	7.6800	7.9800	8.2000
	PO4	487	0.840	0.010	0.030	0.030
	Radium 226	136	6.87	0.74	1.52	3.51
	Se	243	0.009877	0.010000	0.010000	0.010000
	SiO2	493	6.332	4.855	6.590	7.600
	SO4	493	662.8	480.5	560.0	744.5
	TDS	493	1239.1	926.0	1039.0	1315.5
	Total Uranium	115	4.588	0.600	3.000	7.600
	TSS	487	5.699	1.000	2.800	5.200
	V	243	0.051235	0.050000	0.050000	0.050000
	Zn	491	0.1336	0.0100	0.0100	0.0300

**Note: Significant #'s of B, Carbonate, and Se were below the detection limit**  
 2 column(s) excluded because they have the wrong number of rows.  
 Subset worksheet Frequencies larger than or equal to 10.MTW created.

### Descriptive Statistics: TSValue

#### Results for FeatureID = 1

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	221.00	214.00	218.00	220.00
	As	11	0.006455	0.005000	0.005000	0.010000
	bicarbonate	11	221.36	210.00	218.00	231.00
	Ca	11	51.82	46.00	47.00	64.00
	carbonate	11	5.82	0.00	0.00	0.00
	Cl	11	12.82	10.00	12.00	16.00
	Cond	11	1560.5	1530.0	1560.0	1580.0
	Fe	11	2.539	2.100	2.270	2.400
	hardness	11	189.00	178.00	184.00	196.00
	K	11	13.664	13.000	14.000	14.300
	Mg	11	17.14	15.00	17.00	19.00
	Mn	11	0.1400	0.1100	0.1200	0.1300
	N	11	0.3536	0.1000	0.2900	0.6100
	Na	11	299.09	292.00	304.00	310.00
	Pb	11	0.01318	0.00500	0.00500	0.00500
	pH	11	7.9855	7.9200	7.9600	8.1500
	PO4	11	0.03000	0.03000	0.03000	0.03000



SiO2	11	6.361	3.000	7.500	9.090
SO4	11	571.6	563.0	578.0	590.0
TDS	11	1068.0	1028.0	1038.0	1108.0
TSS	11	4.345	3.000	4.000	6.000
Zn	11	0.01273	0.01000	0.01000	0.01000

### Results for FeatureID = 2

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	10	219.50	216.00	219.00	222.25
	As	10	0.00710	0.00500	0.00500	0.00625
	bicarbonate	10	216.60	216.00	219.00	222.25
	Ca	10	61.00	49.75	55.50	69.50
	carbonate	10	3.60	0.00	0.00	0.00
	Cl	10	9.850	8.750	10.000	10.250
	Cond	10	1547.5	1497.5	1527.5	1575.0
	Fe	10	1.273	0.423	0.650	1.218
	hardness	10	211.40	191.50	211.50	233.25
	K	10	14.960	14.000	15.000	16.000
	Mg	10	17.900	15.750	17.500	20.000
	Mn	10	0.1400	0.0975	0.1000	0.1750
	N	10	0.511	0.100	0.180	1.053
	Na	10	281.70	260.75	284.00	301.50
	Pb	10	0.00950	0.00500	0.00500	0.00500
	pH	10	7.7020	7.6150	7.6900	7.8075
	PO4	10	0.04090	0.03000	0.03000	0.06225
	SiO2	10	6.68	3.83	7.95	9.25
	SO4	10	561.9	551.0	577.0	593.5
	TDS	10	1043.0	1009.5	1038.5	1065.0
	TSS	10	3.76	1.00	1.00	3.50
	Zn	10	0.01300	0.00875	0.01000	0.01500

### Results for FeatureID = 6

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	10	282.2	273.5	284.5	290.5
	As	10	0.006000	0.005000	0.005000	0.006250
	bicarbonate	10	310.1	280.3	287.5	307.0
	Ca	10	388.1	340.3	365.0	403.8
	carbonate	10	1.20	0.00	0.00	0.00
	Cl	10	10.350	8.500	10.000	11.750
	Cond	10	2647.5	2475.0	2750.0	2800.0
	Fe	10	5.277	3.958	4.720	5.600
	hardness	10	1361.4	1349.0	1368.0	1401.8
	K	10	34.95	28.75	36.00	39.13
	Mg	10	137.30	128.75	139.00	148.25
	Mn	10	0.5860	0.4800	0.5200	0.6650
	N	10	0.3500	0.1075	0.2650	0.5750
	Na	10	147.60	134.00	147.50	167.00
	Pb	10	0.01400	0.00500	0.00500	0.01625
	pH	10	7.382	7.140	7.240	7.608
	PO4	10	0.02860	0.03000	0.03000	0.03000
	SiO2	10	7.48	4.25	8.00	9.75
	SO4	10	1388.0	1302.5	1425.0	1480.0
	TDS	10	2366.3	2261.5	2363.5	2461.0
	TSS	10	10.26	6.75	10.00	13.00



### Results for FeatureID = 8

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	178.00	170.00	178.00	182.00
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	180.18	170.00	181.00	194.00
	Ca	11	59.82	54.00	58.00	60.00
	carbonate	11	3.64	0.00	0.00	0.00
	Cl	11	11.864	9.000	12.000	13.000
	Cond	11	1385.0	1375.0	1390.0	1425.0
	Fe	11	0.2900	0.1700	0.2500	0.3000
	hardness	11	239.00	220.00	233.00	260.00
	K	11	17.536	17.000	18.000	18.900
	Mg	11	24.000	22.000	24.000	25.000
	Mn	11	0.1091	0.0800	0.0900	0.1300
	N	11	0.701	0.100	0.240	1.230
	Na	11	236.45	218.00	232.00	253.00
	Pb	11	0.01318	0.00500	0.00500	0.00500
	pH	11	7.8664	7.6400	7.7400	8.0800
	PO4	11	0.02636	0.03000	0.03000	0.03000
	SiO2	11	5.830	3.600	6.500	7.500
	SO4	11	526.2	504.0	520.0	536.0
	TDS	11	965.1	904.0	942.0	974.0
	TSS	11	2.109	1.000	1.000	4.000
	Zn	11	0.01273	0.01000	0.01000	0.01000

### Results for FeatureID = 13

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	12	173.08	167.25	170.00	179.00
	As	12	0.006583	0.005000	0.005000	0.009750
	bicarbonate	12	179.58	168.25	174.00	192.75
	Ca	12	73.17	66.00	67.50	73.00
	carbonate	12	1.42	0.00	0.00	0.00
	Cl	12	11.000	9.000	11.000	11.750
	Cond	12	1275.0	1275.0	1285.0	1300.0
	Fe	12	2.181	1.230	1.615	2.175
	hardness	11	273.82	264.00	268.00	284.00
	K	12	14.183	14.000	15.000	15.000
	Mg	11	26.909	25.000	26.000	29.000
	Mn	12	0.1383	0.0900	0.1050	0.1375
	N	12	0.3383	0.1000	0.1750	0.6475
	Na	12	188.08	171.75	188.00	203.50
	Pb	12	0.01500	0.00500	0.00500	0.02275
	pH	12	7.7767	7.5700	7.7700	7.9375
	PO4	11	0.03455	0.03000	0.03000	0.03000
	SiO2	12	6.613	6.450	7.050	7.725
	SO4	12	477.0	461.0	476.0	489.0
	TDS	12	885.7	845.0	878.0	930.0
	TSS	11	9.36	1.00	2.00	6.00
	Zn	12	0.0473	0.0100	0.0100	0.0300

### Results for FeatureID = 18

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	196.45	184.00	192.00	202.00
	As	11	0.00709	0.00500	0.00500	0.01000
	bicarbonate	11	186.91	180.00	184.00	195.00
	Ca	11	38.00	37.00	38.00	40.00
	carbonate	11	10.36	0.00	0.00	24.00



Cl	11	12.727	12.000	12.000	13.000
Cond	11	1379.1	1350.0	1390.0	1410.0
Fe	11	2.251	1.340	1.450	2.600
hardness	11	137.36	136.00	139.00	140.00
K	11	9.855	9.000	10.000	10.000
Mg	11	12.318	12.000	13.000	14.000
Mn	11	0.0909	0.0700	0.0800	0.1200
N	11	0.527	0.280	0.360	0.870
Na	11	267.0	263.0	280.0	287.0
Pb	11	0.01318	0.00500	0.00500	0.00500
pH	11	7.9373	7.7700	7.8800	8.0200
PO4	11	0.02755	0.03000	0.03000	0.03000
SiO2	11	5.190	2.140	6.400	7.400
SO4	11	517.91	506.00	520.00	530.00
TDS	11	908.6	898.0	922.0	974.0
TSS	11	2.545	1.000	2.000	4.000
Zn	11	0.01455	0.01000	0.01000	0.03000

#### Results for FeatureID = 20

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	188.27	180.00	190.00	192.00
	As	11	0.00836	0.00500	0.00500	0.01000
	bicarbonate	11	190.55	180.00	190.00	204.00
	Ca	11	28.64	26.00	27.00	32.00
	carbonate	11	7.00	0.00	0.00	20.00
	Cl	11	16.364	14.000	16.000	18.000
	Cond	11	1426.4	1410.0	1440.0	1460.0
	Fe	11	0.6164	0.6000	0.6500	0.6800
	hardness	10	111.50	100.00	102.50	105.50
	K	11	9.909	10.000	10.000	10.000
	Mg	10	11.07	8.00	9.00	10.10
	Mn	11	0.865	0.040	0.040	0.070
	N	11	0.452	0.180	0.290	0.590
	Na	11	301.55	286.00	303.00	310.00
	Pb	11	0.01373	0.00500	0.00500	0.01000
	pH	11	7.9600	7.8400	7.9500	8.0800
	PO4	10	0.02630	0.02500	0.03000	0.03000
	SiO2	11	5.932	3.000	7.100	7.850
	SO4	11	536.9	515.0	524.0	556.0
	TDS	11	975.6	932.0	950.0	980.0
	TSS	10	2.660	1.000	1.300	4.500
	Zn	11	0.01273	0.01000	0.01000	0.01000

#### Results for FeatureID = 38

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	165.27	160.00	161.00	174.00
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	163.55	157.00	163.00	174.00
	Ca	11	54.73	54.00	56.00	56.00
	carbonate	11	4.73	0.00	0.00	12.00
	Cl	11	26.091	26.000	26.000	27.000
	Cond	11	1274.1	1250.0	1290.0	1300.0
	Fe	11	0.7809	0.6800	0.7500	0.8000
	hardness	11	210.5	212.0	220.0	226.0
	K	11	12.182	11.000	12.000	13.000
	Mg	11	19.45	19.00	21.00	21.00
	Mn	11	0.0927	0.0800	0.0800	0.1000
	N	11	0.461	0.180	0.420	0.830



Na	11	225.00	210.00	220.00	232.00
Pb	11	0.01318	0.00500	0.00500	0.00500
pH	11	7.8664	7.6900	7.7500	8.0500
PO4	11	0.02909	0.03000	0.03000	0.03000
SiO2	11	5.975	3.000	6.600	7.500
SO4	11	485.55	468.00	480.00	488.00
TDS	11	891.2	858.0	900.0	916.0
TSS	11	3.15	1.00	2.00	5.00
Zn	11	0.01273	0.01000	0.01000	0.01000

#### Results for FeatureID = 42

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	187.64	180.00	188.00	192.00
	As	11	0.00818	0.00500	0.00500	0.01000
	bicarbonate	11	189.64	179.00	188.00	198.00
	Ca	11	42.18	37.00	39.00	48.00
	carbonate	11	5.91	0.00	0.00	12.00
	Cl	11	11.955	11.000	12.000	14.000
	Cond	11	1358.2	1360.0	1380.0	1400.0
	Fe	11	0.555	0.380	0.500	0.630
	hardness	10	145.10	140.00	143.00	147.25
	K	11	9.764	9.400	10.000	10.000
	Mg	10	11.70	9.75	13.00	13.25
	Mn	11	0.1000	0.0800	0.0900	0.1200
	N	11	0.2791	0.1000	0.1700	0.4000
	Na	11	270.27	260.00	274.00	282.00
	Pb	11	0.01600	0.00500	0.00500	0.02600
	pH	11	7.9500	7.7900	7.9200	8.0100
	PO4	10	0.02600	0.02500	0.03000	0.03000
	SiO2	11	5.519	3.000	6.400	7.500
	SO4	11	520.55	504.00	520.00	525.00
	TDS	11	938.9	906.0	920.0	964.0
	TSS	10	2.600	1.000	1.500	4.900
	Zn	11	0.01364	0.01000	0.01000	0.01000

#### Results for FeatureID = 58

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	208.36	196.00	198.00	210.00
	As	11	0.00718	0.00500	0.00500	0.01000
	bicarbonate	11	197.91	192.00	196.00	210.00
	Ca	11	58.18	53.00	55.00	60.00
	carbonate	11	13.09	0.00	0.00	36.00
	Cl	11	13.073	12.000	12.000	14.000
	Cond	11	1729.5	1720.0	1760.0	1770.0
	Fe	11	0.3636	0.3000	0.3000	0.4000
	hardness	11	229.45	222.00	228.00	236.00
	K	11	14.882	14.000	15.000	16.000
	Mg	11	22.09	21.00	23.00	25.00
	Mn	11	0.0955	0.0700	0.0900	0.1100
	N	11	0.756	0.100	0.210	1.080
	Na	11	336.27	321.00	343.00	350.00
	Pb	11	0.01336	0.00500	0.00500	0.00700
	pH	11	7.9855	7.8000	7.8700	8.0700
	PO4	11	0.02636	0.03000	0.03000	0.03000
	SiO2	11	5.701	2.100	6.590	7.400
	SO4	11	684.5	670.0	693.0	717.0
	TDS	11	1219.4	1188.0	1210.0	1278.0



TSS	11	2.200	1.000	2.000	4.000
Zn	11	0.01273	0.01000	0.01000	0.01000

### Results for FeatureID = 63

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	179.09	171.00	181.00	185.00
	As	11	0.00773	0.00500	0.00500	0.01000
	bicarbonate	11	174.27	170.00	176.00	182.00
	Ca	11	27.91	23.00	24.00	30.00
	carbonate	11	7.64	0.00	0.00	8.00
	Cl	11	13.636	11.000	14.000	14.000
	Cond	11	1532.3	1525.0	1560.0	1575.0
	Fe	11	0.0755	0.0400	0.0500	0.0900
	hardness	11	96.91	91.00	94.00	100.00
	K	11	10.382	10.000	10.000	11.000
	Mg	11	7.800	7.000	8.000	8.000
	Mn	11	0.05000	0.04000	0.05000	0.05000
	N	11	1.352	0.120	0.420	0.640
	Na	11	339.55	326.00	333.00	352.00
	Pb	11	0.01427	0.00500	0.00500	0.01500
	pH	11	7.783	7.840	7.880	8.010
	PO4	11	0.02636	0.03000	0.03000	0.03000
	SiO2	11	5.532	2.700	6.200	7.500
	SO4	11	621.8	568.0	608.0	667.0
	TDS	11	1059.1	1020.0	1030.0	1102.0
	TSS	11	1.564	0.800	1.000	2.000
	Zn	11	0.0382	0.0100	0.0100	0.0100

### Results for FeatureID = 72

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	775.5	786.0	824.0	834.0
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	749.5	708.0	756.0	810.0
	Ca	11	12.364	11.000	12.000	14.000
	carbonate	11	42.2	0.0	40.0	68.0
	Cl	11	79.45	78.00	82.00	92.00
	Cond	11	1638.2	1600.0	1650.0	1680.0
	Fe	11	0.04364	0.03000	0.05000	0.05000
	hardness	11	54.91	50.00	56.00	56.00
	K	11	8.973	8.000	9.000	9.000
	Mg	11	6.209	5.000	6.000	6.700
	Mn	11	0.02455	0.01000	0.03000	0.03000
	N	11	0.897	0.100	0.100	0.100
	Na	11	439.8	423.0	432.0	460.0
	Pb	11	0.01600	0.00500	0.00500	0.03600
	pH	11	8.235	7.990	8.300	8.460
	PO4	11	0.04491	0.03000	0.05000	0.06000
	SiO2	11	7.06	3.60	8.10	9.40
	SO4	11	205.6	146.0	270.0	273.0
	TDS	11	1056.7	1004.0	1034.0	1091.0
	TSS	11	3.109	1.000	2.800	4.400
	Zn	11	0.01645	0.01000	0.01000	0.03000

### Results for FeatureID = 82

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	617.5	640.0	652.0	680.0



As	11	0.01273	0.00500	0.01300	0.01800
bicarbonate	11	609.7	590.0	643.0	664.0
Ca	11	21.00	19.00	20.00	25.00
carbonate	11	18.45	0.00	0.00	48.00
Cl	11	61.82	50.00	60.00	83.00
Cond	11	1617.3	1610.0	1630.0	1650.0
Fe	11	0.1364	0.0300	0.0600	0.1400
hardness	11	80.45	68.00	80.00	86.00
K	11	7.727	7.000	7.000	8.000
Mg	11	8.300	7.000	8.000	9.000
Mn	11	0.04818	0.03000	0.04000	0.06000
N	11	0.223	0.100	0.100	0.100
Na	11	385.3	376.0	386.0	400.0
Pb	11	0.01318	0.00500	0.00500	0.00500
pH	11	8.1073	7.8800	8.1400	8.2600
PO4	11	0.03782	0.03000	0.03600	0.05000
SiO2	11	5.720	3.900	6.590	7.400
SO4	11	292.4	200.0	340.0	393.0
TDS	11	1033.5	966.0	984.0	1118.0
TSS	11	2.218	1.000	1.000	3.200
Zn	11	0.01273	0.01000	0.01000	0.01000

#### Results for FeatureID = 94

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	10	322.6	312.0	334.0	348.5
	As	10	0.006000	0.005000	0.005000	0.006250
	bicarbonate	10	320.9	327.5	334.0	348.5
	Ca	10	265.5	237.8	246.5	288.8
	carbonate	10	6.00	0.00	0.00	0.00
	Cl	10	10.600	9.250	10.500	12.250
	Cond	10	1872.8	1850.0	1919.0	1950.0
	Fe	10	11.27	8.91	10.47	11.85
	hardness	10	1001.5	970.8	1020.0	1045.0
	K	10	25.92	23.50	27.00	28.25
	Mg	10	105.00	101.75	106.50	110.50
	Mn	10	0.1190	0.1000	0.1000	0.1325
	N	10	0.397	0.123	0.230	0.450
	Na	10	88.50	79.75	80.00	85.75
	Pb	10	0.01430	0.00500	0.00500	0.01850
	pH	10	7.491	7.170	7.310	7.810
	PO4	10	0.02600	0.02500	0.03000	0.03000
	SiO2	10	6.17	2.33	7.10	8.88
	SO4	10	854.3	827.8	851.0	879.5
	TDS	10	1576.5	1504.5	1564.0	1691.0
	TSS	10	18.84	16.75	18.50	21.25
	Zn	10	0.01350	0.01000	0.01000	0.01500

#### Results for FeatureID = 96

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	187.36	185.00	188.00	198.00
	As	11	0.00836	0.00500	0.00500	0.01000
	bicarbonate	11	184.73	184.00	188.00	195.00
	Ca	11	43.36	38.00	40.00	51.00
	carbonate	11	7.27	0.00	0.00	0.00
	Cl	11	12.364	10.000	13.000	13.000
	Cond	11	1380.9	1350.0	1400.0	1420.0
	Fe	11	1.417	1.100	1.250	1.400
	hardness	11	140.45	132.00	134.00	139.00



K	11	8.645	8.000	8.000	10.000
Mg	11	10.836	10.000	11.000	12.000
Mn	11	0.1445	0.1200	0.1300	0.1500
N	11	0.458	0.100	0.190	0.760
Na	11	278.73	271.00	283.00	290.00
Pb	11	0.01591	0.00500	0.00500	0.03200
pH	11	7.8618	7.6600	7.8000	8.0800
PO4	11	0.143	0.030	0.030	0.030
SiO2	11	5.515	3.750	6.200	6.600
SO4	11	515.45	504.00	516.00	526.00
TDS	11	944.8	920.0	934.0	980.0
TSS	11	2.618	2.000	3.000	3.000
Zn	11	0.01318	0.01000	0.01000	0.01000

### Results for FeatureID = 99

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	178.18	172.00	178.00	184.00
	As	11	0.00818	0.00500	0.00500	0.01000
	bicarbonate	11	173.64	164.00	174.00	183.00
	Ca	11	23.818	22.000	23.000	25.000
	carbonate	11	9.45	0.00	0.00	24.00
	Cl	11	10.409	8.500	10.000	12.000
	Cond	11	1533.2	1540.0	1560.0	1575.0
	Fe	11	0.3718	0.3000	0.3500	0.3700
	hardness	11	84.82	80.00	84.00	88.00
	K	11	6.645	6.000	6.100	7.000
	Mg	11	7.155	7.000	7.000	8.000
	Mn	11	0.05000	0.04000	0.05000	0.05000
	N	11	0.487	0.100	0.230	0.790
	Na	11	341.45	336.00	346.00	350.00
	Pb	11	0.01591	0.00500	0.00500	0.03200
	pH	11	7.9873	7.9000	7.9500	8.0500
	PO4	11	0.03764	0.01800	0.04000	0.05000
	SiO2	11	5.854	3.750	6.600	7.900
	SO4	11	624.0	576.0	600.0	623.0
	TDS	11	1048.6	1002.0	1032.0	1104.0
	TSS	11	1.436	1.000	1.000	2.000
	Zn	11	0.01318	0.01000	0.01000	0.01000

### Results for FeatureID = 102

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	153.00	150.00	158.00	160.00
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	158.18	152.00	160.00	163.00
	Ca	11	145.64	122.00	135.00	165.00
	carbonate	11	0.000000	0.000000	0.000000	0.000000
	Cl	11	7.591	7.000	8.000	9.000
	Cond	11	1211.4	1190.0	1230.0	1250.0
	Fe	11	2.265	0.970	1.520	2.300
	hardness	11	453.82	444.00	460.00	464.00
	K	11	12.218	11.000	12.000	13.000
	Mg	11	38.455	37.000	39.000	40.000
	Mn	11	0.4018	0.3400	0.3700	0.4000
	N	11	0.3964	0.1600	0.3000	0.6400
	Na	11	100.18	83.00	107.00	112.00
	Pb	11	0.01891	0.00500	0.00500	0.03700
	pH	11	7.4464	7.2600	7.3000	7.4800
	PO4	11	0.02773	0.01000	0.03000	0.04000



SiO2	11	5.305	2.250	5.800	6.600
SO4	11	504.45	488.00	505.00	532.00
TDS	11	898.7	870.0	912.0	958.0
TSS	11	2.509	1.000	2.400	4.000
Zn	11	0.203	0.010	0.010	0.030

### Results for FeatureID = 115

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	192.45	190.00	195.00	202.00
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	199.27	190.00	196.00	205.00
	Ca	11	147.18	132.00	137.00	145.00
	carbonate	11	0.000000	0.000000	0.000000	0.000000
	Cl	11	9.273	8.000	9.000	11.000
	Cond	11	1186.4	1200.0	1210.0	1210.0
	Fe	11	0.853	0.550	0.850	1.070
	hardness	11	485.18	484.00	488.00	490.00
	K	11	12.582	12.000	13.000	13.000
	Mg	11	40.64	38.00	40.00	44.00
	Mn	11	0.2627	0.2200	0.2300	0.2500
	N	11	0.436	0.130	0.260	0.660
	Na	11	90.36	86.00	89.00	92.00
	Pb	11	0.01318	0.00500	0.00500	0.00500
	pH	11	7.4764	7.2500	7.3200	7.8300
	PO4	11	0.02727	0.03000	0.03000	0.03000
	SiO2	11	5.166	2.140	5.800	7.400
	SO4	11	483.18	472.00	479.00	490.00
	TDS	11	891.00	868.00	902.00	914.00
	TSS	11	2.109	1.000	2.000	3.000
	Zn	11	0.01655	0.01000	0.01000	0.01700

### Results for FeatureID = 7002

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	261.18	263.00	264.00	269.00
	As	11	0.006455	0.005000	0.005000	0.010000
	bicarbonate	11	269.82	264.00	267.00	273.00
	Ca	11	255.3	233.0	238.0	243.0
	carbonate	11	0.000000	0.000000	0.000000	0.000000
	Cl	11	9.82	8.00	9.00	10.00
	Cond	11	2338.6	2400.0	2400.0	2400.0
	Fe	11	2.927	2.470	2.500	3.380
	hardness	11	959.8	928.0	956.0	990.0
	K	11	29.55	25.00	30.00	33.00
	Mg	11	96.18	90.00	95.00	100.00
	Mn	11	0.4209	0.3300	0.3800	0.4600
	N	11	0.440	0.100	0.290	0.520
	Na	11	190.55	181.00	192.00	200.00
	Pb	11	0.01318	0.00500	0.00500	0.00500
	pH	11	7.4355	7.2600	7.3000	7.6300
	PO4	11	0.02864	0.03000	0.03000	0.03000
	SiO2	11	6.577	4.170	7.400	8.600
	SO4	11	1042.4	973.0	1090.0	1107.0
	TDS	11	1842.8	1793.0	1820.0	1940.0
	TSS	11	5.655	4.000	6.000	7.200
	Zn	11	0.01273	0.01000	0.01000	0.01000



### Results for FeatureID = 8002

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	11	247.64	250.00	254.00	266.00
	As	11	0.005909	0.005000	0.005000	0.005000
	bicarbonate	11	250.82	250.00	254.00	266.00
	Ca	11	134.09	122.00	123.00	160.00
	carbonate	11	2.18	0.00	0.00	0.00
	Cl	11	8.045	6.000	8.000	8.000
	Cond	11	1793.2	1800.0	1825.0	1840.0
	Fe	11	1.410	1.200	1.250	1.400
	hardness	11	487.1	456.0	488.0	516.0
	K	11	23.727	22.000	24.000	25.000
	Mg	11	47.55	48.00	50.00	54.00
	Mn	11	0.1991	0.1600	0.1800	0.2000
	N	11	0.406	0.100	0.170	0.790
	Na	11	230.9	233.0	250.0	261.0
	Pb	11	0.01318	0.00500	0.00500	0.00500
	pH	11	7.6927	7.5200	7.5700	7.9100
	PO4	11	0.02818	0.03000	0.03000	0.03000
	SiO2	11	6.183	3.000	6.700	8.100
	SO4	11	753.8	747.0	760.0	787.0
	TDS	11	1355.6	1286.0	1304.0	1388.0
	TSS	11	2.927	1.000	2.800	5.000
	Zn	11	0.01273	0.01000	0.01000	0.01000

### Results for FeatureID = \*

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	12	193.67	186.50	194.50	200.00
	As	12	0.00767	0.00500	0.00500	0.01000
	bicarbonate	12	196.00	186.50	195.00	205.25
	Ca	12	42.75	39.25	41.50	46.50
	carbonate	12	6.75	0.00	0.00	19.75
	Cl	12	14.667	14.000	15.000	16.000
	Cond	12	1315.8	1312.5	1355.0	1395.0
	Fe	12	1.902	1.213	2.130	2.238
	hardness	12	162.08	153.25	157.50	169.00
	K	12	11.350	11.000	11.000	12.000
	Mg	12	15.500	14.000	15.000	16.750
	Mn	12	0.1017	0.0825	0.0900	0.1200
	N	12	1.263	0.143	0.460	1.008
	Na	12	263.25	248.25	266.00	278.25
	Pb	12	0.02083	0.00500	0.00500	0.05000
	pH	12	7.9983	7.8500	7.9950	8.0275
	PO4	12	0.02333	0.01000	0.03000	0.03000
	SiO2	12	5.986	3.650	6.600	7.800
	SO4	12	508.25	497.00	504.00	520.00
	TDS	12	942.2	912.5	936.0	968.3
	TSS	12	2.750	1.100	2.200	3.000
	Zn	12	0.0413	0.0100	0.0200	0.0600

### Descriptive Statistics: TSValue

#### Results for C7:Wrksht 1 Excluding Drawdown = 1979

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	43	218.0	170.0	200.0	210.0
	As	43	0.010535	0.010000	0.010000	0.010000



bicarbonate	43	237.3	171.0	195.0	232.0
Ca	43	83.1	28.0	50.0	117.0
carbonate	43	16.28	0.00	12.00	24.00
Cl	43	20.84	14.00	16.00	20.00
Cond	43	1419.3	1200.0	1325.0	1550.0
Fe	43	2.047	0.350	0.990	2.160
hardness	43	334.9	138.0	203.0	440.0
K	43	13.535	10.000	11.000	16.000
Mg	43	30.93	9.00	19.00	31.00
Mn	43	0.353	0.060	0.110	0.160
N	43	1.379	0.280	0.520	1.200
Na	43	259.4	193.0	277.0	325.0
Pb	43	0.050000	0.050000	0.050000	0.050000
pH	43	8.1419	8.0000	8.2000	8.3000
PO4	43	0.0407	0.0100	0.0100	0.0100
SiO2	43	6.316	5.800	6.400	6.800
SO4	43	643.1	500.0	570.0	690.0
TDS	43	1182.0	978.0	1106.0	1246.0
TSS	43	3.735	0.800	2.800	4.800
Zn	41	0.01220	0.01000	0.01000	0.01000

#### Results for C7:Wrksht 1 Excluding Drawdown = 1980

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	21	265.9	183.0	200.0	267.5
	As	21	0.005762	0.005000	0.005000	0.005000
	bicarbonate	21	255.8	176.0	200.0	267.5
	Ca	21	89.4	30.0	52.0	129.5
	carbonate	21	10.10	0.00	0.00	21.00
	Cl	21	12.90	7.00	10.00	12.50
	Cond	21	1626.4	1400.0	1525.0	1755.0
	Fe	21	1.588	0.275	0.850	2.275
	hardness	21	347.9	120.0	222.0	472.0
	K	21	14.95	10.00	12.00	15.50
	Mg	21	36.28	10.70	21.00	45.00
	Mn	21	0.1419	0.0650	0.0900	0.1650
	N	21	0.1638	0.1000	0.1000	0.2050
	Na	21	252.2	168.0	279.0	321.5
	Pb	21	0.00843	0.00500	0.00500	0.00500
	pH	21	7.7538	7.5300	7.8600	7.9950
	PO4	21	0.02852	0.03000	0.03000	0.03000
	SiO2	21	3.227	2.550	3.000	3.750
	SO4	21	540.0	432.5	520.0	581.5
	TDS	21	1153.2	921.0	1000.0	1140.0
	TSS	21	3.76	0.50	1.00	6.00
	Zn	20	0.01500	0.00500	0.00500	0.01000

#### Results for C7:Wrksht 1 Excluding Drawdown = 1981

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	81	261.1	181.5	193.0	261.0
	As	81	0.005444	0.005000	0.005000	0.005000
	bicarbonate	81	253.6	170.5	188.0	261.0
	Ca	81	105.3	38.0	56.0	127.5
	carbonate	81	7.53	0.00	0.00	0.00
	Cl	81	17.12	9.00	11.00	13.50
	Cond	81	1581.8	1362.5	1520.0	1697.5
	Fe	81	1.755	0.335	1.070	2.085
	hardness	81	327.6	130.5	216.0	460.0
	K	81	15.214	10.000	13.000	16.400



Mg	81	31.47	10.10	19.00	39.00
Mn	81	0.1786	0.0700	0.1000	0.2350
N	81	0.3740	0.1000	0.2100	0.5150
Na	81	245.2	188.5	260.0	303.0
Pb	81	0.006889	0.005000	0.005000	0.005000
pH	81	7.7602	7.5750	7.8200	7.9700
PO4	81	0.03642	0.03000	0.03000	0.03000
SiO2	81	6.318	2.140	7.500	8.600
SO4	81	588.2	488.0	526.0	623.0
TDS	81	1126.4	931.0	980.0	1095.0
TSS	81	5.210	2.000	3.000	5.000
Zn	78	0.0421	0.0100	0.0100	0.0100

#### Results for C7:Wrksht 1 Excluding Drawdown = 1982

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	42	268.2	187.5	203.0	267.5
	As	42	0.00919	0.00500	0.00500	0.01100
	bicarbonate	42	266.2	187.5	203.0	267.5
	Ca	42	86.6	27.0	47.5	122.0
	carbonate	42	2.00	0.00	0.00	0.00
	Cl	42	16.27	8.00	10.00	13.00
	Cond	42	1603.0	1386.3	1552.5	1685.0
	Fe	42	1.590	0.365	0.845	2.125
	hardness	42	335.7	118.0	187.0	467.5
	K	42	14.83	10.00	12.00	16.25
	Mg	42	31.83	9.50	16.00	39.00
	Mn	42	0.1690	0.0800	0.1200	0.1725
	N	42	0.1490	0.1000	0.1200	0.1825
	Na	42	251.6	178.0	272.0	312.8
	Pb	42	0.005000	0.005000	0.005000	0.005000
	pH	42	7.6714	7.4675	7.6900	7.8525
	PO4	42	0.03514	0.03000	0.03000	0.03600
	SiO2	42	4.740	2.000	3.900	7.300
	SO4	42	617.3	498.0	528.0	672.5
	TDS	42	1130.8	916.0	1003.0	1171.0
	TSS	42	3.095	1.000	1.000	3.000
	Zn	40	0.03025	0.01000	0.02000	0.03000

#### Results for C7:Wrksht 1 Excluding Drawdown = 1983

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	21	256.1	174.0	188.0	261.0
	As	21	0.005429	0.005000	0.005000	0.005500
	bicarbonate	21	252.9	174.0	188.0	261.0
	Ca	21	87.0	30.0	51.0	124.0
	carbonate	21	3.24	0.00	0.00	0.00
	Cl	21	20.57	11.00	12.00	14.00
	Cond	21	1612.6	1395.0	1560.0	1730.0
	Fe	21	2.97	0.34	1.30	2.70
	hardness	21	351.3	121.0	192.0	464.0
	K	21	15.14	10.00	12.00	16.50
	Mg	21	31.95	9.50	15.00	42.00
	Mn	21	0.1376	0.0650	0.0900	0.1550
	N	21	0.9052	0.5800	0.9100	1.2800
	Na	21	259.2	199.5	276.0	316.0
	Pb	21	0.005000	0.005000	0.005000	0.005000
	pH	21	7.7476	7.5350	7.8000	7.9050
	PO4	21	0.03381	0.03000	0.03000	0.04000
	SiO2	21	7.829	7.050	8.000	8.700



SO4	21	590.8	495.0	520.0	662.0
TDS	21	1094.6	893.0	930.0	1137.0
TSS	21	3.000	1.000	1.000	3.000
Zn	20	0.030000	0.030000	0.030000	0.030000

#### Results for C7:Wrksht 1 Excluding Drawdown = 1984

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	19	256.2	177.0	194.0	254.0
	As	19	0.005000	0.005000	0.005000	0.005000
	bicarbonate	19	254.5	177.0	194.0	254.0
	Ca	19	81.5	27.0	50.0	122.0
	carbonate	19	1.68	0.00	0.00	0.00
	Cl	19	20.95	10.00	12.00	16.00
	Cond	19	1627.4	1350.0	1560.0	1750.0
	Fe	19	1.067	0.350	1.000	1.450
	hardness	19	309.6	110.0	196.0	428.0
	K	19	13.84	9.00	12.00	15.00
	Mg	19	31.68	9.00	17.00	42.00
	Mn	19	0.1326	0.0500	0.0900	0.1800
	N	19	0.4263	0.2100	0.4200	0.6400
	Na	19	275.6	209.0	280.0	323.0
	Pb	19	0.005421	0.005000	0.005000	0.005000
	pH	19	7.6800	7.5200	7.6700	7.8500
	PO4	19	0.03158	0.03000	0.03000	0.03000
	SiO2	19	7.705	6.590	7.230	8.450
	SO4	19	590.9	480.0	524.0	623.0
	TDS	19	1070.3	876.0	984.0	1074.0
	TSS	19	4.526	2.000	4.000	6.000
	Zn	18	0.00794	0.00500	0.00500	0.00500

#### Results for C7:Wrksht 1 Excluding Drawdown = 2006

Variable	Variable	N	Mean	Q1	Median	Q3
TSValue	alkalinity	3	176.67	170.00	180.00	180.00
	As	3	0.010000	0.010000	0.010000	0.010000
	bicarbonate	3	213.33	200.00	220.00	220.00
	Ca	3	43.33	34.00	35.00	61.00
	carbonate	3	5.0000	5.0000	5.0000	5.0000
	Cl	3	13.00	11.00	14.00	14.00
	Cond	3	1376.7	1290.0	1410.0	1430.0
	Fe	3	0.030000	0.030000	0.030000	0.030000
	K	3	7.567	7.000	7.000	9.000
	Mn	3	0.0833	0.0600	0.0800	0.1100
	N	3	0.10000	0.10000	0.10000	0.10000
	Na	3	230.0	180.0	250.0	260.0
	Pb	3	0.010000	0.010000	0.010000	0.010000
	pH	3	8.0167	7.9300	8.0100	8.1100
	SiO2	3	7.0000	7.0000	7.0000	7.0000
	SO4	3	471.33	460.00	473.00	481.00
	TDS	3	923.3	880.0	940.0	950.0
	Zn	3	0.010000	0.010000	0.010000	0.010000



## ALKALINITY BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

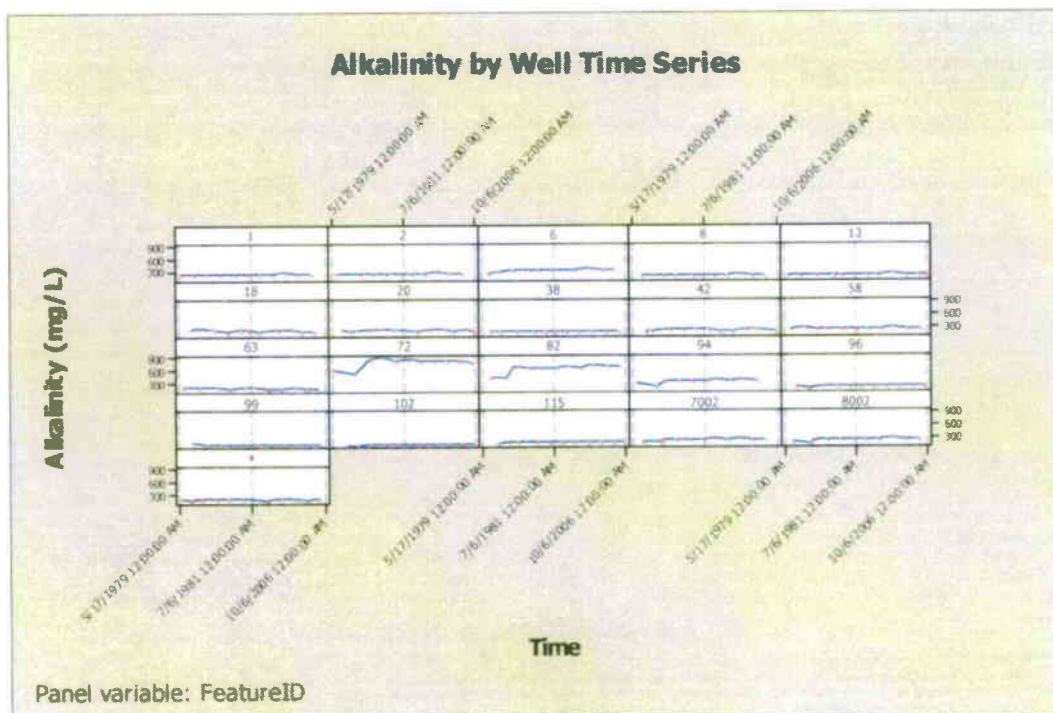
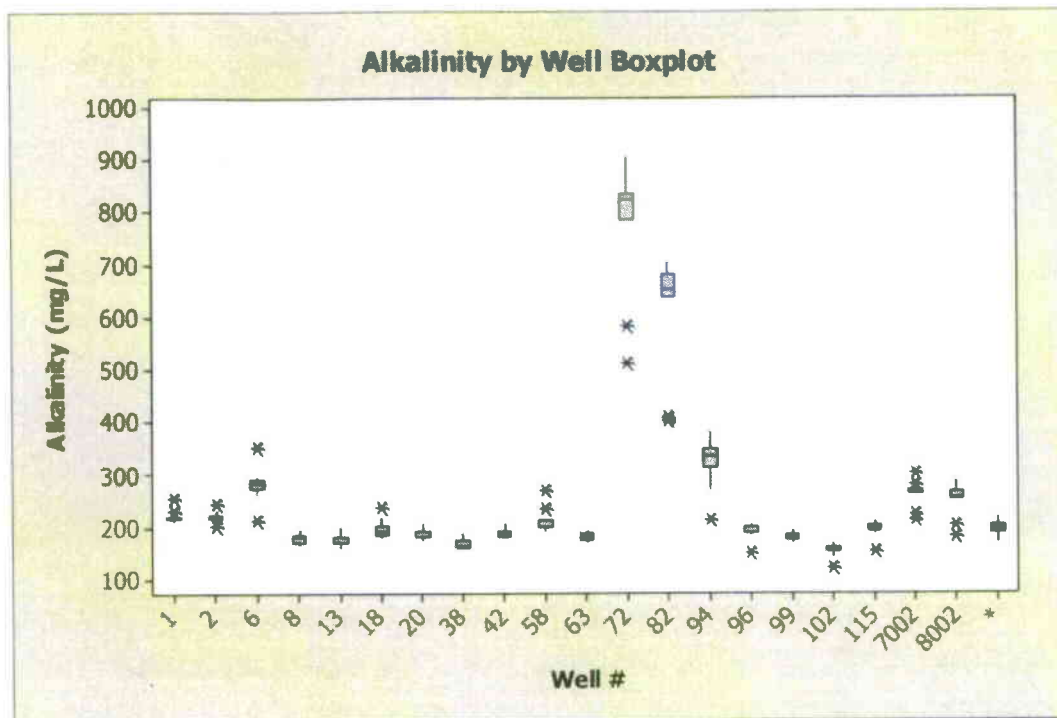
Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	218.0	145.7	1.95
2	10	219.0	145.1	1.83
6	10	284.5	177.1	3.47
8	11	178.0	54.0	-2.99
13	12	170.0	41.5	-3.84
18	11	192.0	101.3	-0.44
20	11	190.0	85.4	-1.30
38	11	161.0	25.5	-4.53
42	11	188.0	81.9	-1.49
58	11	198.0	124.7	0.82
63	11	181.0	58.3	-2.76
72	11	824.0	211.4	5.50
82	11	652.0	203.6	5.08
94	10	334.0	184.6	3.85
96	11	188.0	86.7	-1.23
99	11	178.0	54.5	-2.97
102	11	158.0	10.4	-5.35
115	11	195.0	100.3	-0.50
7002	11	264.0	168.0	3.15
8002	11	254.0	152.4	2.31
Overall	218		109.5	

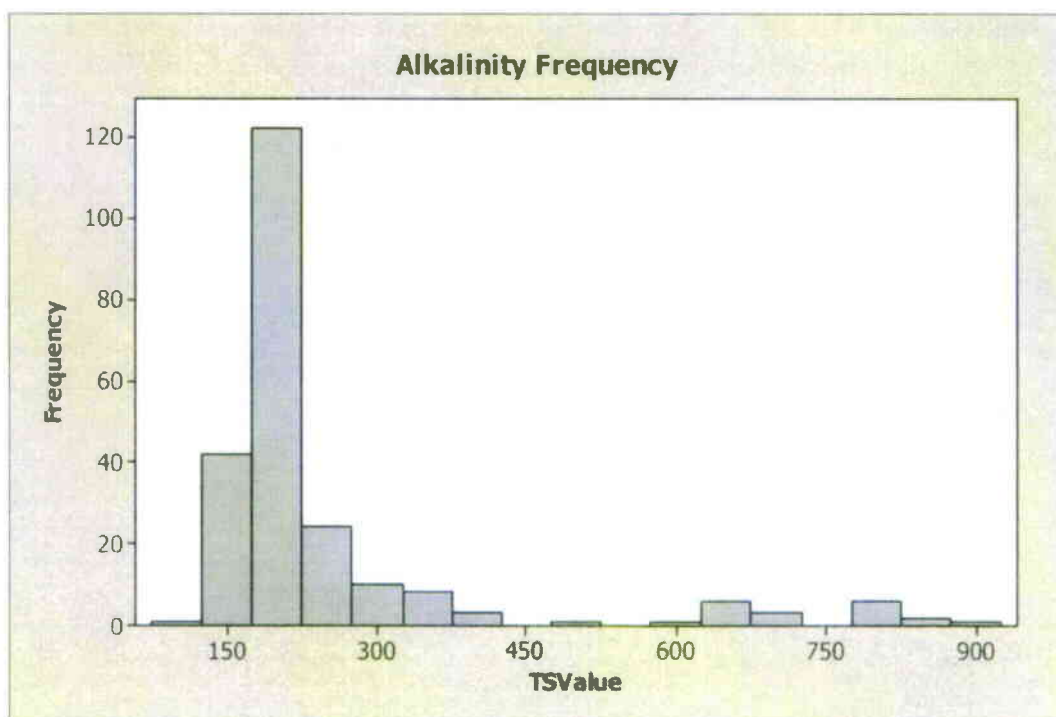
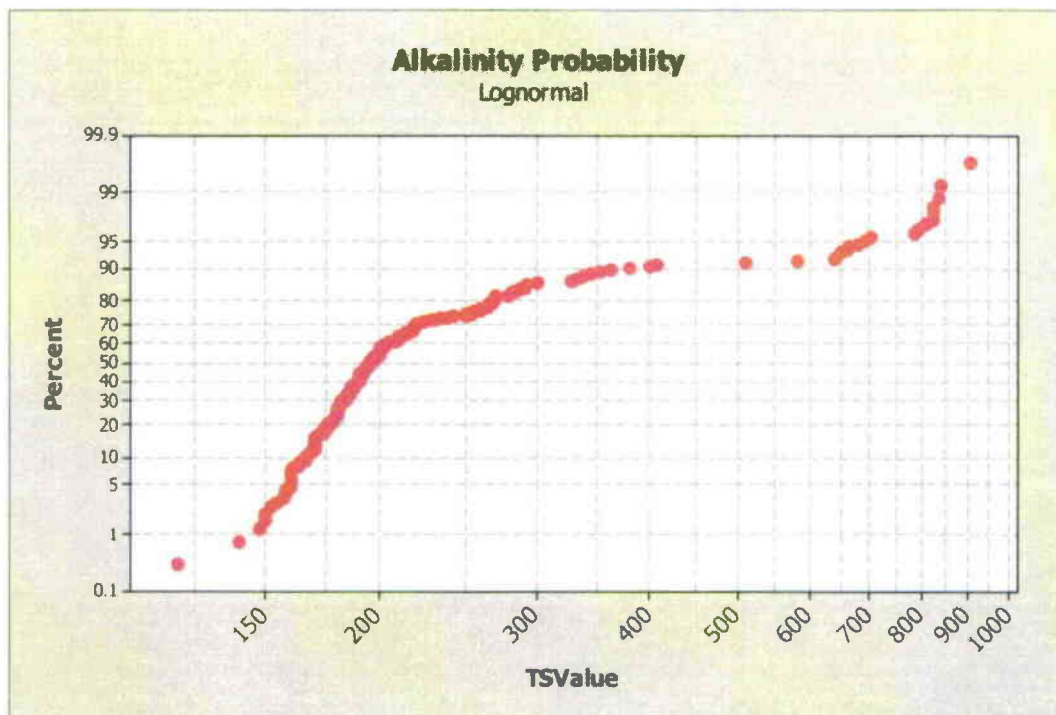
H = 191.08 DF = 19 P = 0.000

H = 191.16 DF = 19 P = 0.000 (adjusted for ties)











## ALKALINITY BY AQUIFER RESULTS

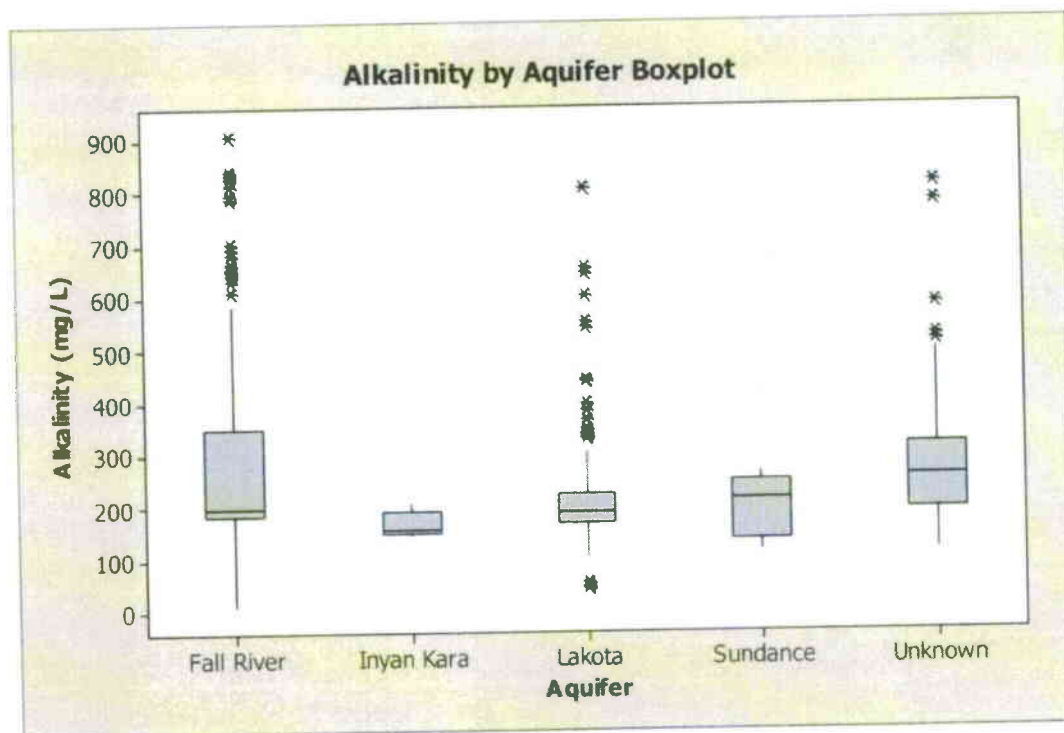
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	195.0	257.9	2.85
Inyan Kara	16	154.5	118.7	-3.45
Lakota	217	187.0	204.2	-4.20
Sundance	16	210.0	200.3	-0.96
Unknown	66	252.5	300.7	4.50
Overall	463		232.0	

H = 44.66 DF = 4 P = 0.000

H = 44.68 DF = 4 P = 0.000 (adjusted for ties)



## ARSENIC BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

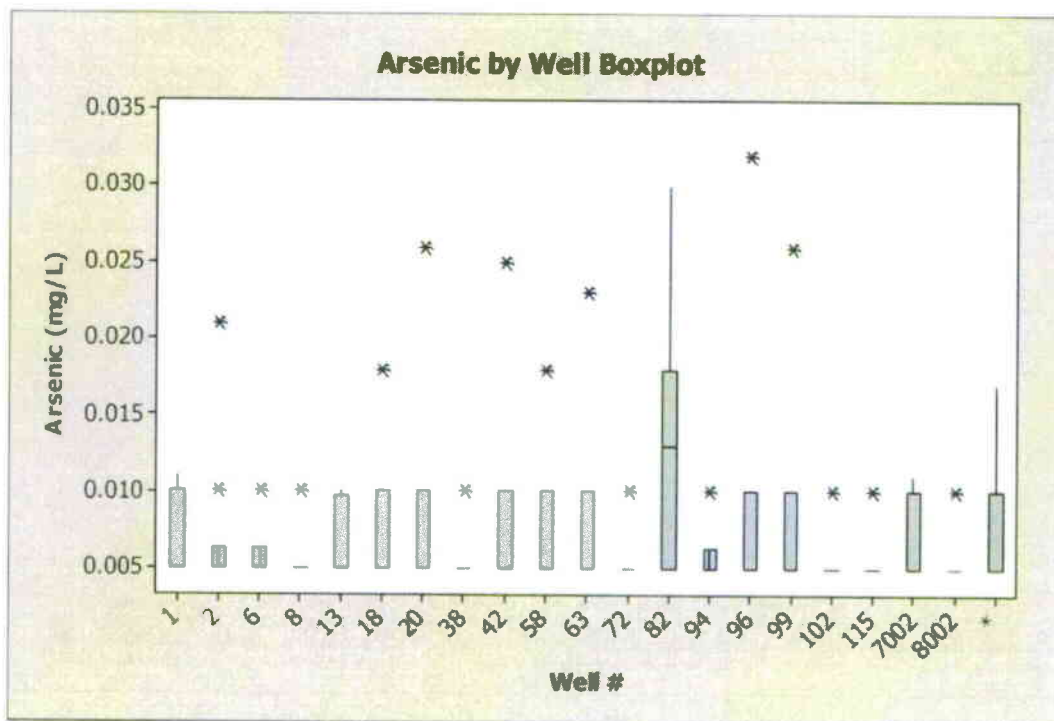
FeatureID	N	Median	Ave Rank	Z
1	11	0.005000	108.4	-0.06
2	10	0.005000	101.8	-0.40
6	10	0.005000	98.9	-0.54



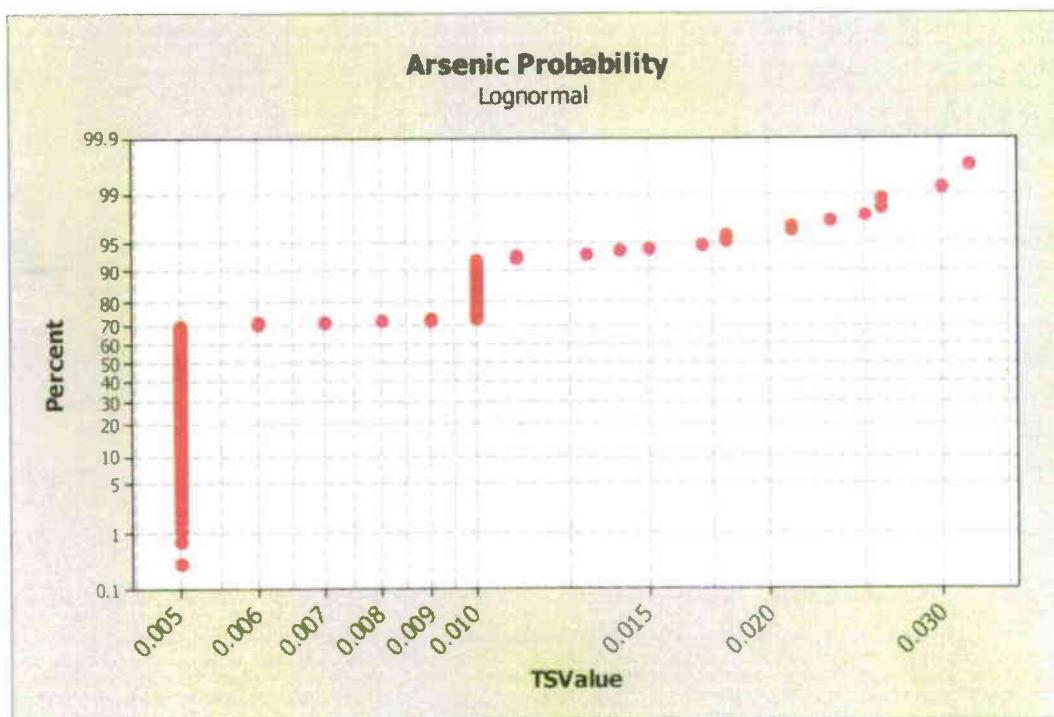
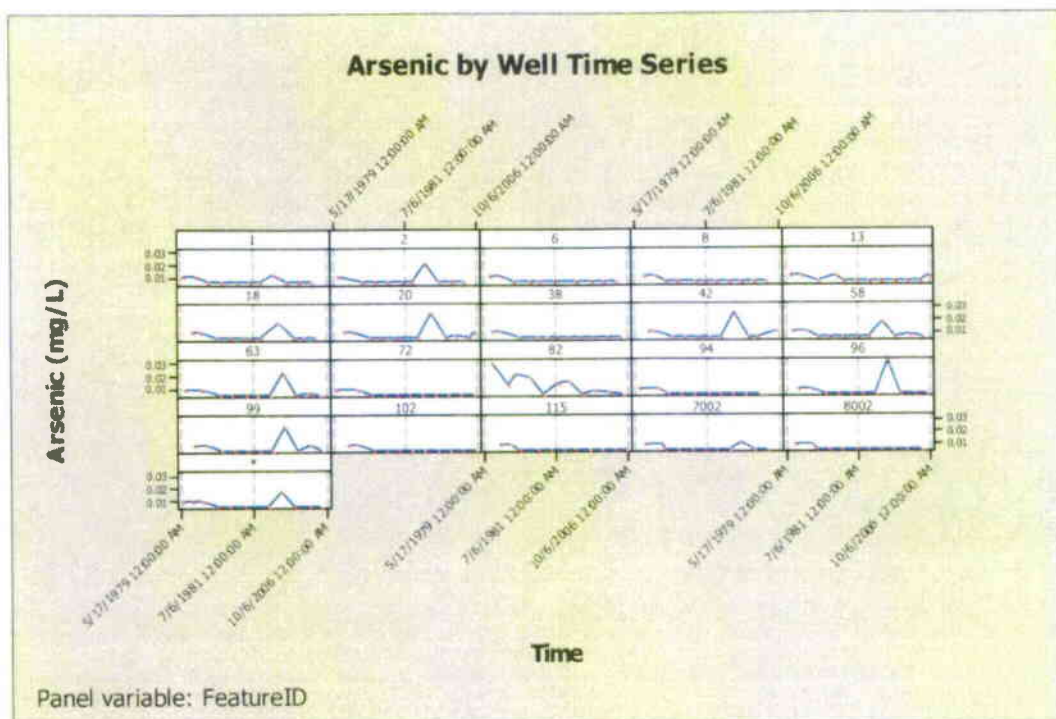
8	11	0.005000	97.0	-0.67
13	12	0.005000	111.1	0.09
18	11	0.005000	108.9	-0.03
20	11	0.005000	126.2	0.90
38	11	0.005000	97.0	-0.67
42	11	0.005000	118.9	0.51
58	11	0.005000	116.1	0.36
63	11	0.005000	116.6	0.39
72	11	0.005000	97.0	-0.67
82	11	0.013000	164.2	2.95
94	10	0.005000	98.9	-0.54
96	11	0.005000	109.7	0.01
99	11	0.005000	117.1	0.41
102	11	0.005000	97.0	-0.67
115	11	0.005000	97.0	-0.67
7002	11	0.005000	108.4	-0.06
8002	11	0.005000	97.0	-0.67
Overall	218		109.5	

H = 13.03 DF = 19 P = 0.837

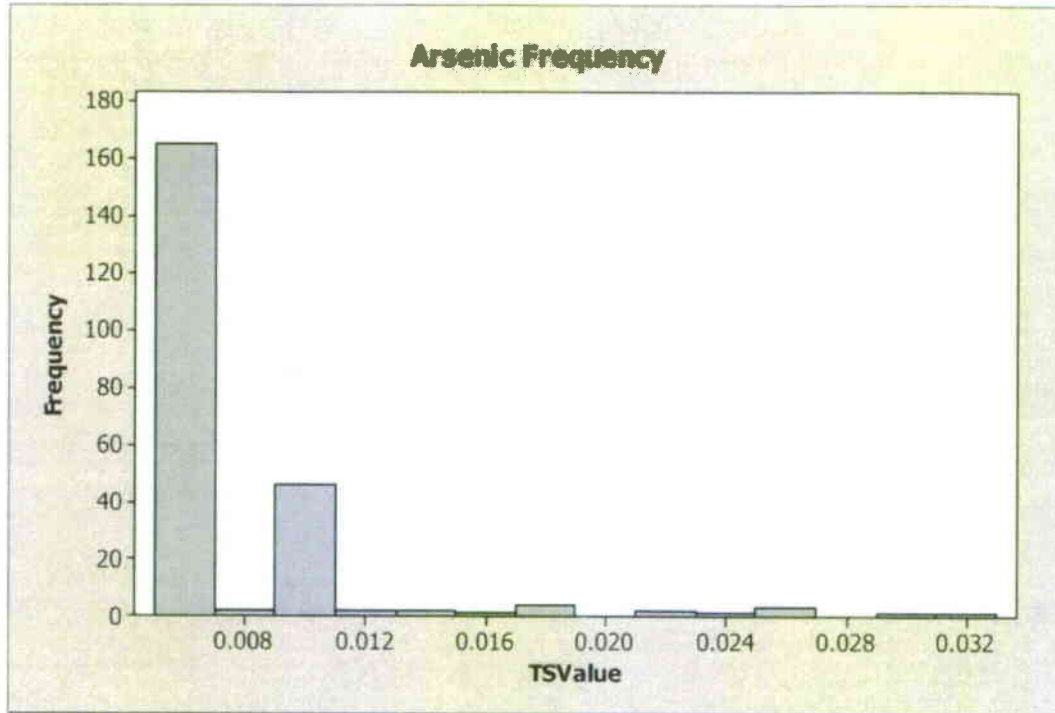
H = 20.55 DF = 19 P = 0.362 (adjusted for ties)











## ARSENIC BY AQUIFER RESULTS

### Kruskal-Wallis Test: TSVValue versus Aquifer

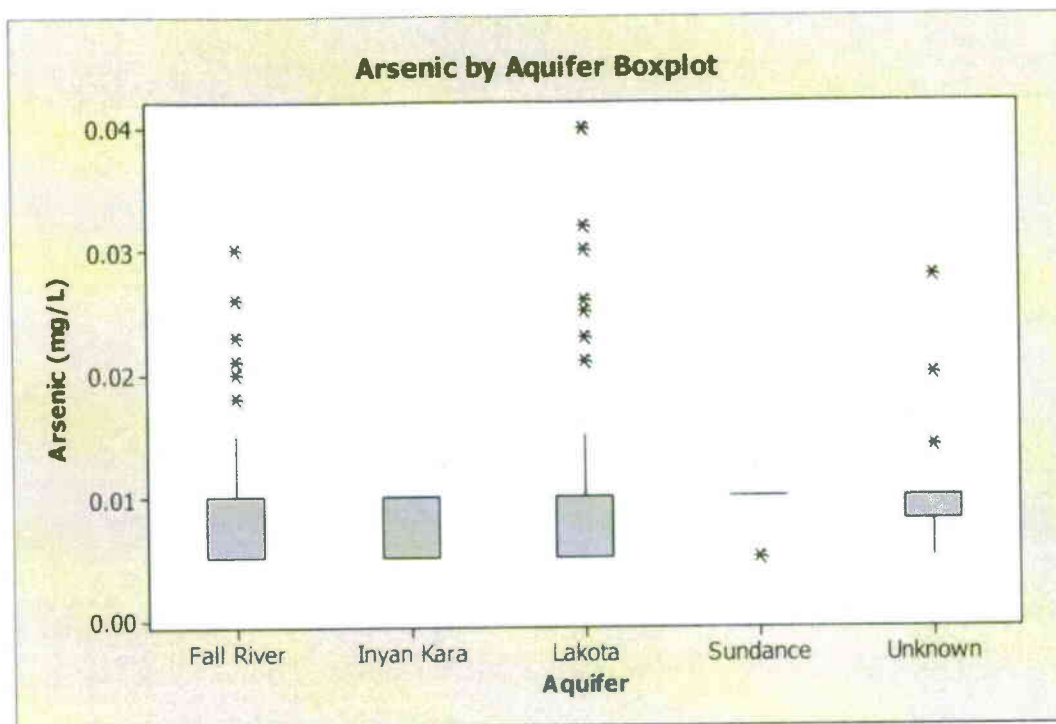
Kruskal-Wallis Test on TSVValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.010000	244.2	1.35
Inyan Kara	16	0.005000	203.3	-0.87
Lakota	217	0.005000	206.6	-3.84
Sundance	16	0.010000	300.7	2.09
Unknown	66	0.010000	278.4	3.04
Overall	463		232.0	

H = 21.97 DF = 4 P = 0.000

H = 27.43 DF = 4 P = 0.000 (adjusted for ties)





#### BICARBONATE BY WELL RESULTS

#### Kruskal-Wallis Test: TSValue versus FeatureID

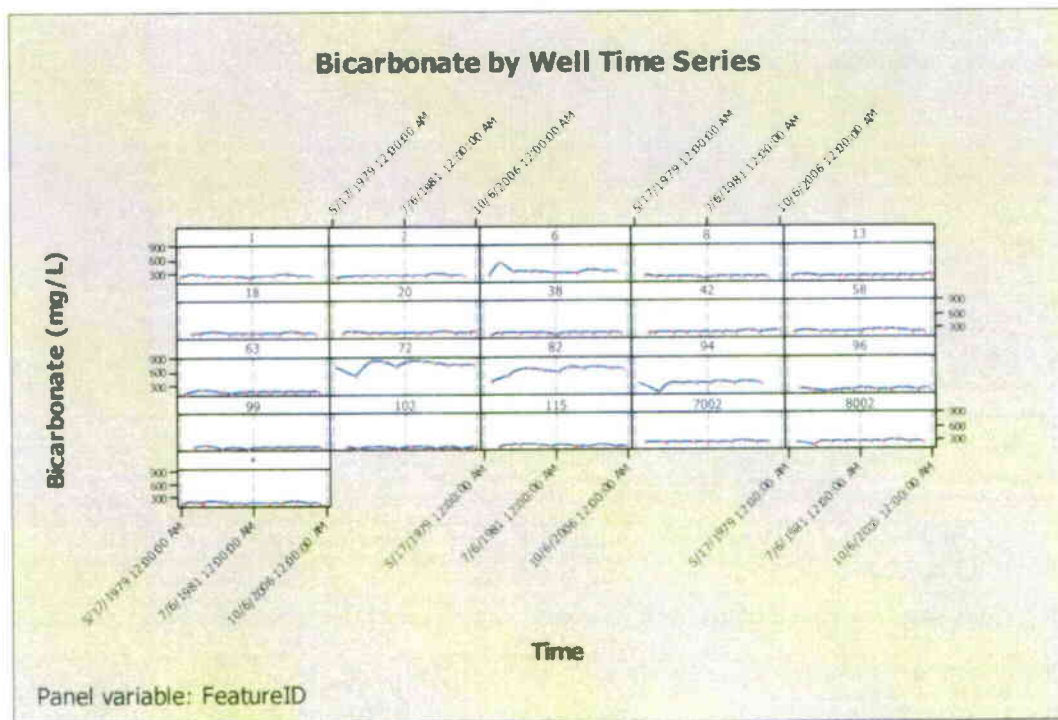
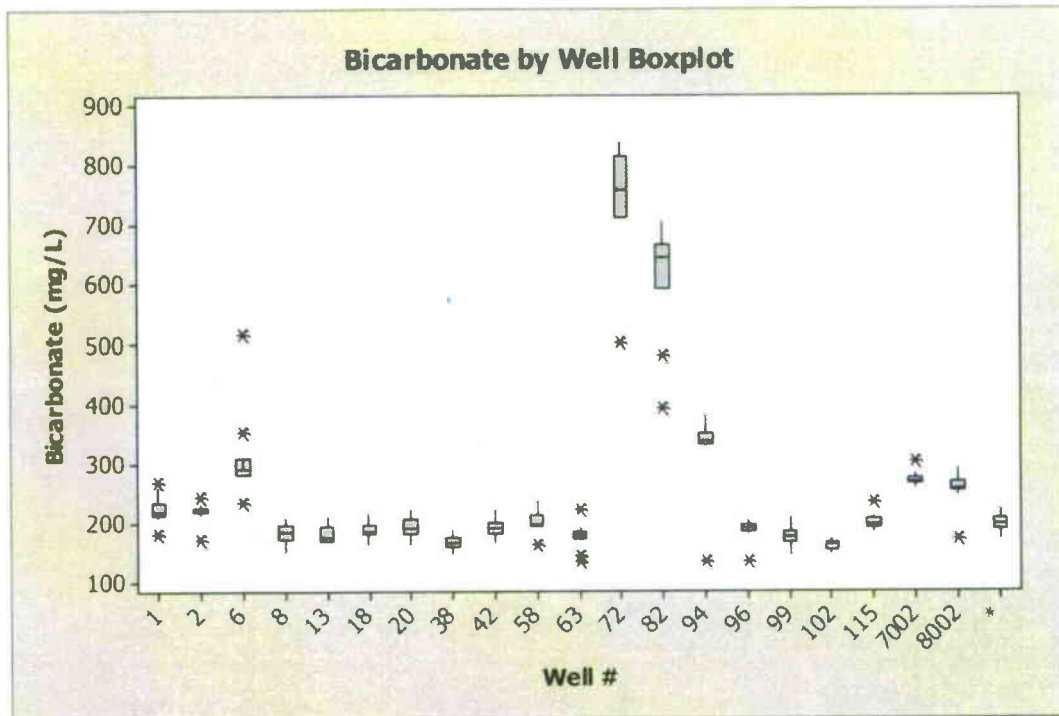
218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

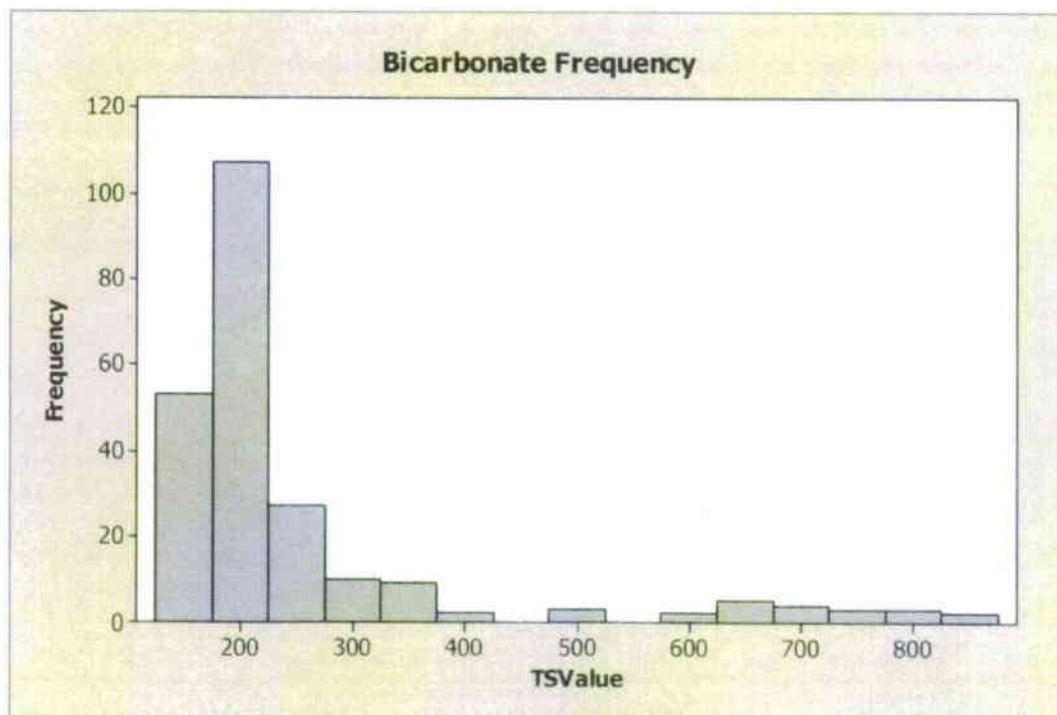
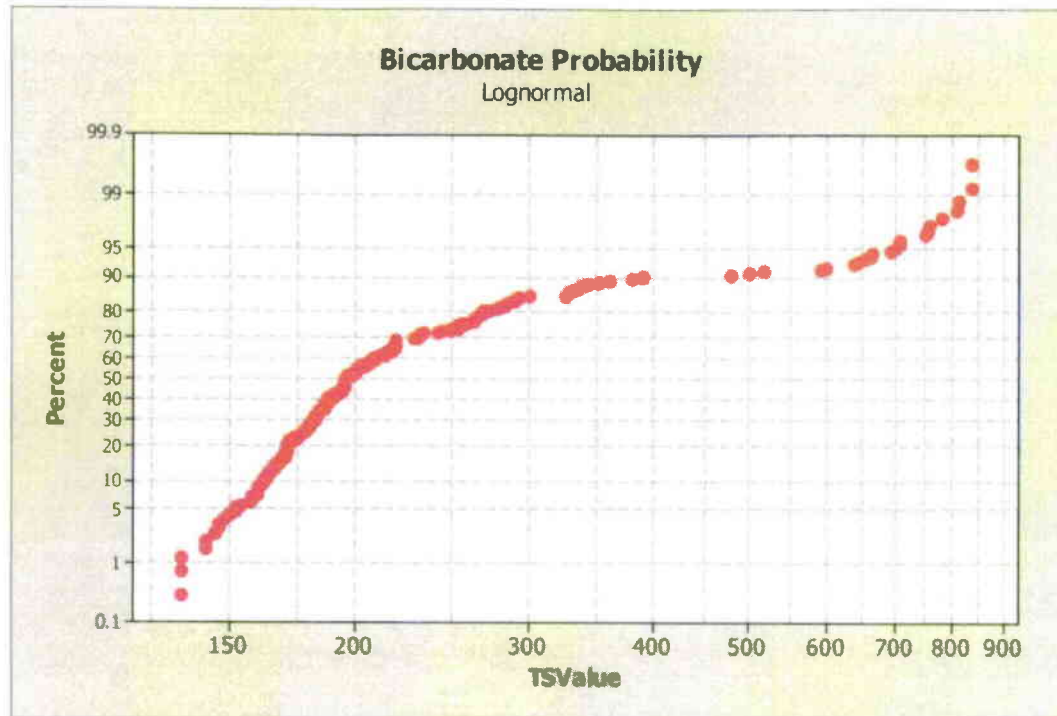
FeatureID	N	Median	Ave Rank	Z
1	11	218.0	136.0	1.43
2	10	219.0	132.8	1.20
6	10	287.5	180.6	3.65
8	11	181.0	67.3	-2.28
13	12	174.0	64.5	-2.54
18	11	184.0	82.1	-1.48
20	11	190.0	89.0	-1.11
38	11	163.0	31.4	-4.22
42	11	188.0	88.5	-1.14
58	11	196.0	102.7	-0.37
63	11	176.0	56.7	-2.85
72	11	756.0	212.1	5.54
82	11	643.0	202.6	5.03
94	10	334.0	171.4	3.18
96	11	188.0	83.3	-1.42
99	11	174.0	54.0	-3.00
102	11	160.0	19.4	-4.86
115	11	196.0	110.0	0.02
7002	11	267.0	171.1	3.32
8002	11	254.0	153.0	2.35
Overall	218		109.5	



H = 167.55 DF = 19 P = 0.000  
H = 167.59 DF = 19 P = 0.000 (adjusted for ties)









## BICARBONATE BY AQUIFER RESULTS

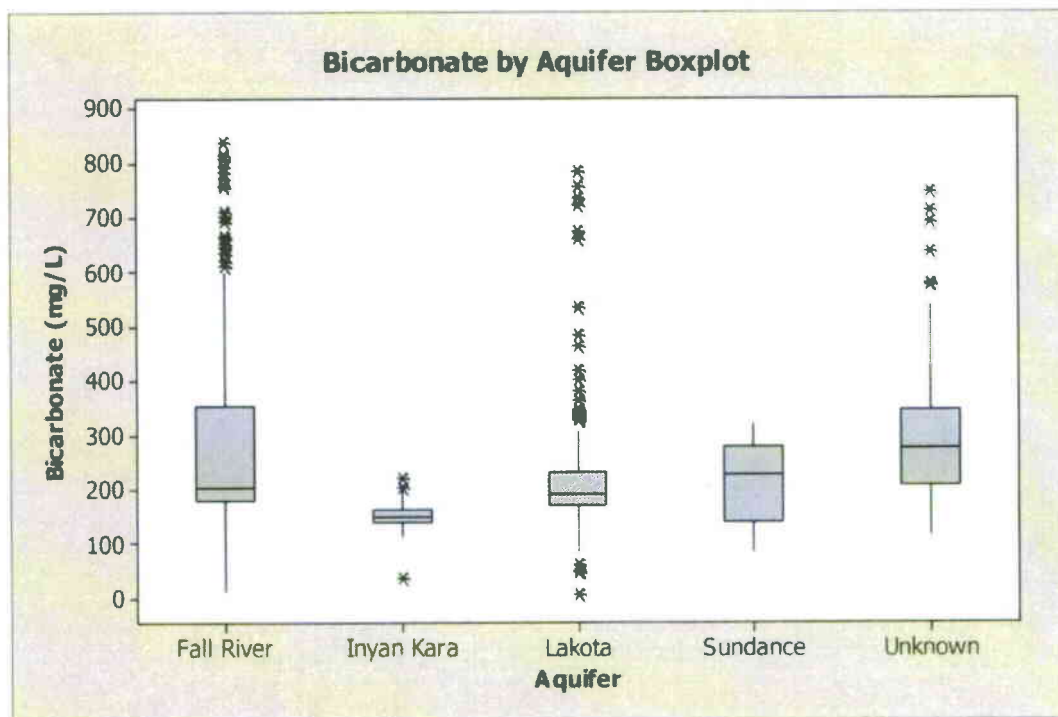
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	202.0	251.9	2.19
Inyan Kara	16	148.0	90.3	-4.31
Lakota	217	188.0	205.9	-3.94
Sundance	16	225.0	226.9	-0.16
Unknown	66	273.0	308.8	5.03
Overall	463		232.0	

H = 51.23 DF = 4 P = 0.000

H = 51.24 DF = 4 P = 0.000 (adjusted for ties)



## CALCIUM BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

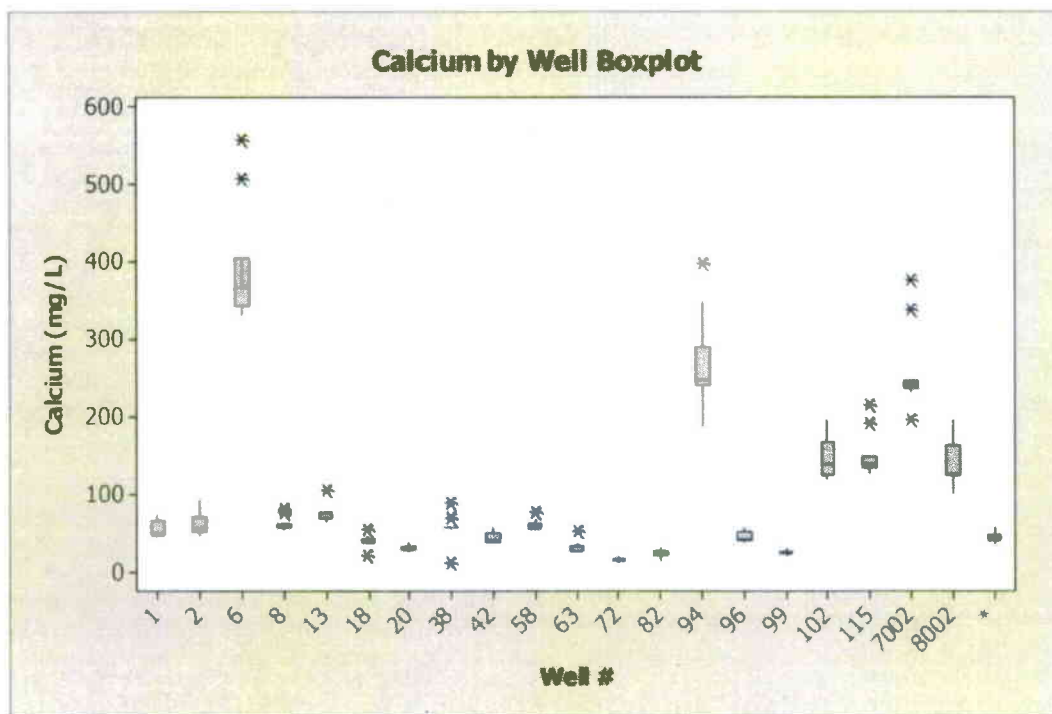
FeatureID	N	Median	Ave Rank	Z
1	11	47.00	99.3	-0.55
2	10	55.50	115.8	0.32
6	10	365.00	211.5	5.23



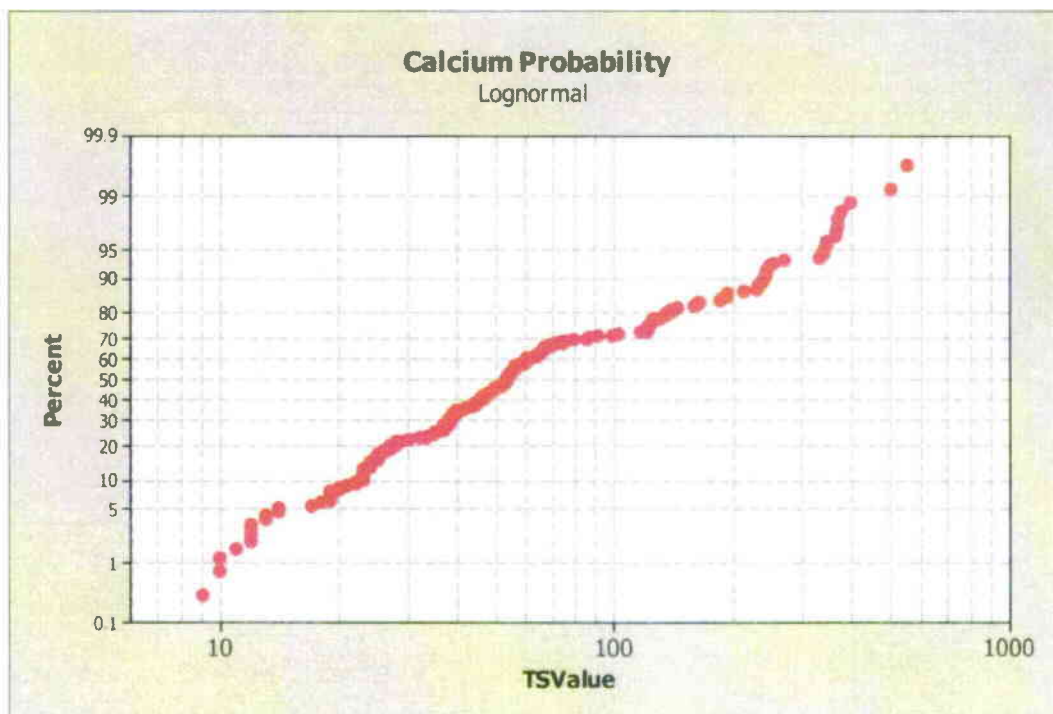
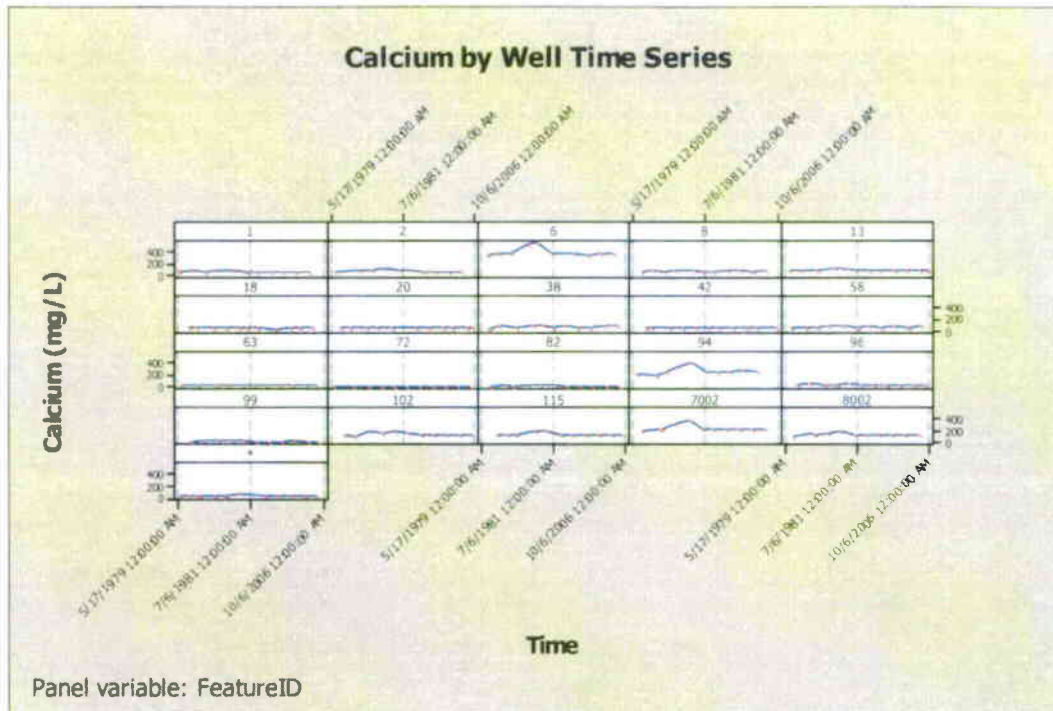
8	11	58.00	121.2	0.63
13	12	67.50	142.1	1.84
18	11	38.00	66.4	-2.33
20	11	27.00	47.1	-3.37
38	11	56.00	109.6	0.01
42	11	39.00	77.0	-1.75
58	11	55.00	118.4	0.48
63	11	24.00	42.3	-3.63
72	11	12.00	7.2	-5.52
82	11	20.00	24.5	-4.59
94	10	246.50	200.5	4.67
96	11	40.00	80.4	-1.57
99	11	23.00	31.5	-4.21
102	11	135.00	171.8	3.36
115	11	137.00	175.0	3.53
7002	11	238.00	197.0	4.72
8002	11	123.00	166.6	3.08
Overall	218		109.5	

H = 203.30 DF = 19 P = 0.000

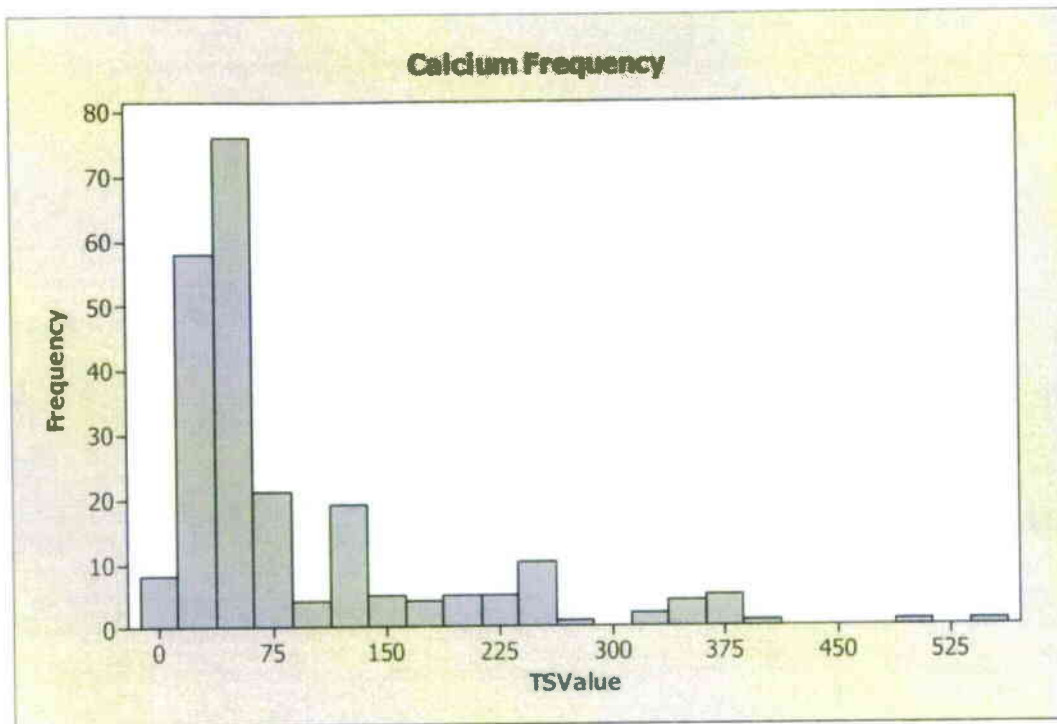
H = 203.34 DF = 19 P = 0.000 (adjusted for ties)











## CALCIUM BY AQUIFER RESULTS

### Kruskal-Wallis Test: TSVValue versus Aquifer

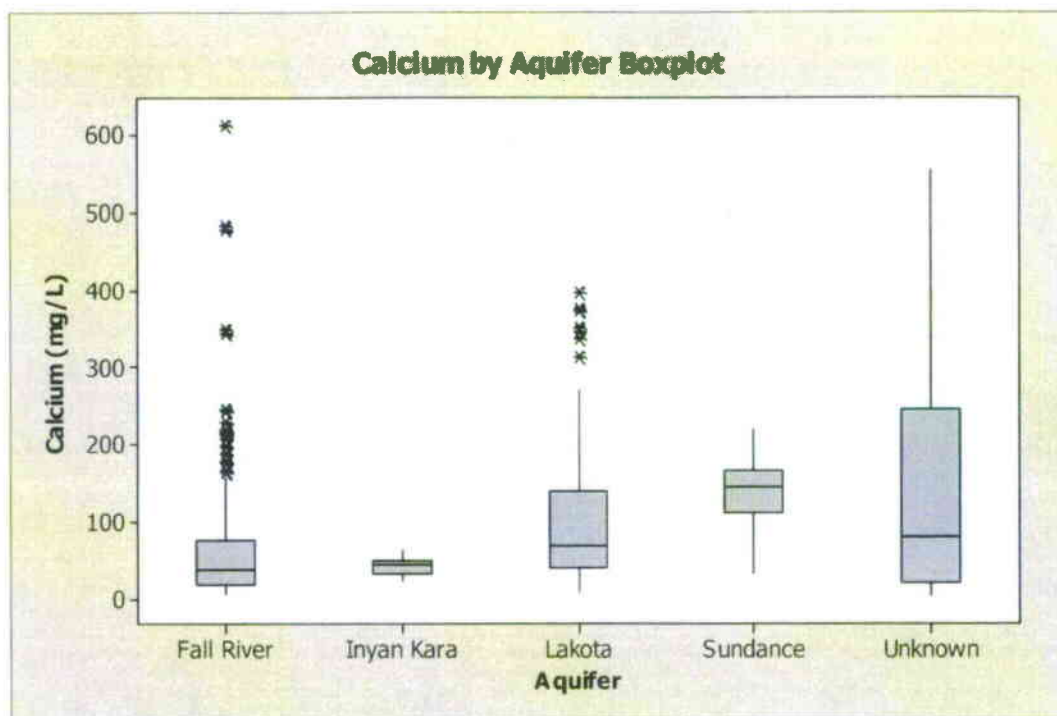
Kruskal-Wallis Test on TSVValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	37.00	182.4	-5.47
Inyan Kara	16	45.00	173.2	-1.79
Lakota	217	67.00	256.0	3.63
Sundance	16	144.00	343.4	3.39
Unknown	66	80.00	251.4	1.28
Overall	463		232.0	

H = 42.93 DF = 4 P = 0.000

H = 42.93 DF = 4 P = 0.000 (adjusted for ties)





## CARBONATE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	0.000000000	104.6	-0.26
2	10	0.000000000	96.2	-0.69
6	10	0.000000000	93.7	-0.81
8	11	0.000000000	102.8	-0.36
13	12	0.000000000	99.3	-0.58
18	11	0.000000000	115.7	0.33
20	11	0.000000000	120.2	0.58
38	11	0.000000000	110.7	0.06
42	11	0.000000000	119.1	0.52
58	11	0.000000000	126.2	0.90
63	11	0.000000000	113.6	0.22
72	11	4.00000E+01	174.8	3.52
82	11	0.000000000	137.7	1.52
94	10	0.000000000	97.5	-0.62
96	11	0.000000000	105.4	-0.22
99	11	0.000000000	122.6	0.71
102	11	0.000000000	84.5	-1.35
115	11	0.000000000	84.5	-1.35
7002	11	0.000000000	84.5	-1.35
8002	11	0.000000000	93.8	-0.85

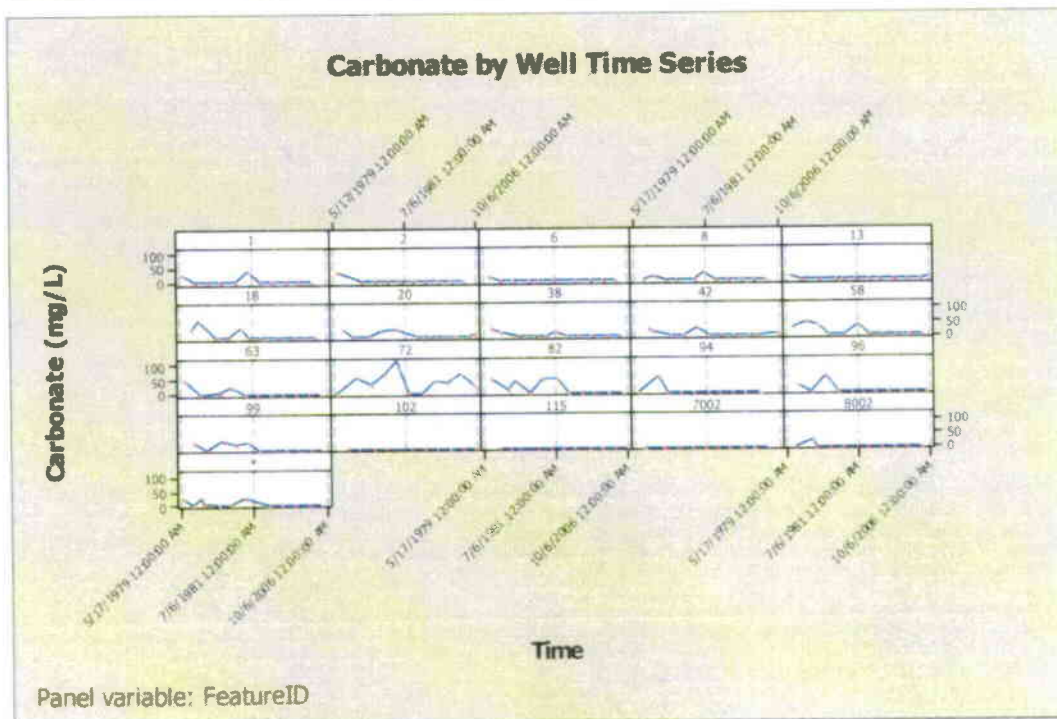
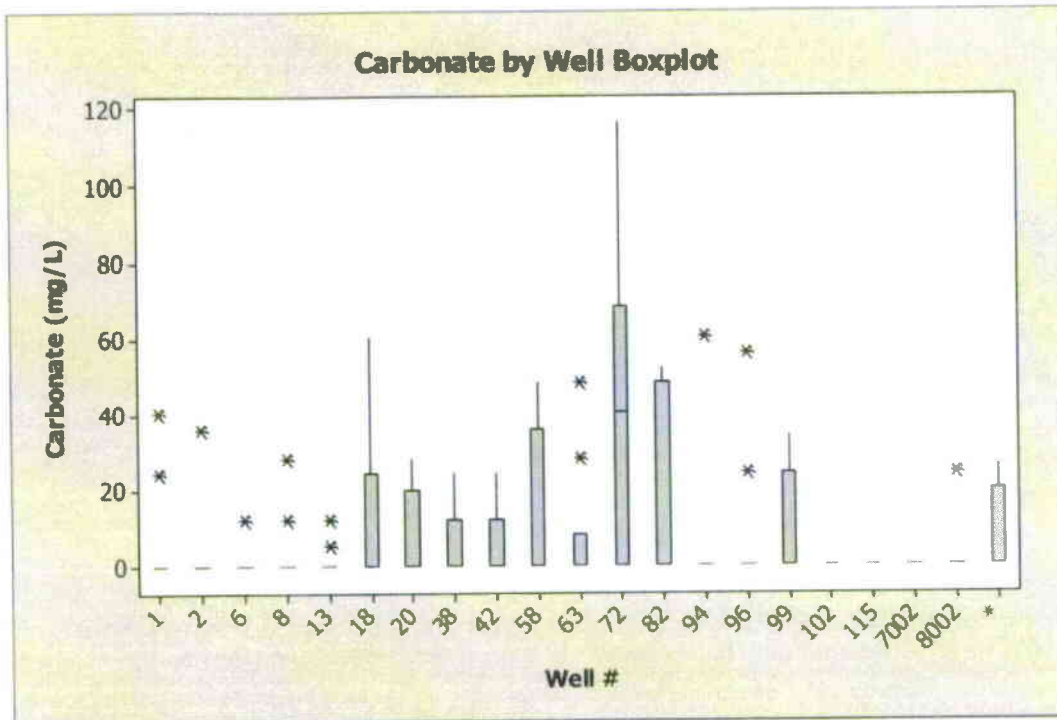


Overall 218

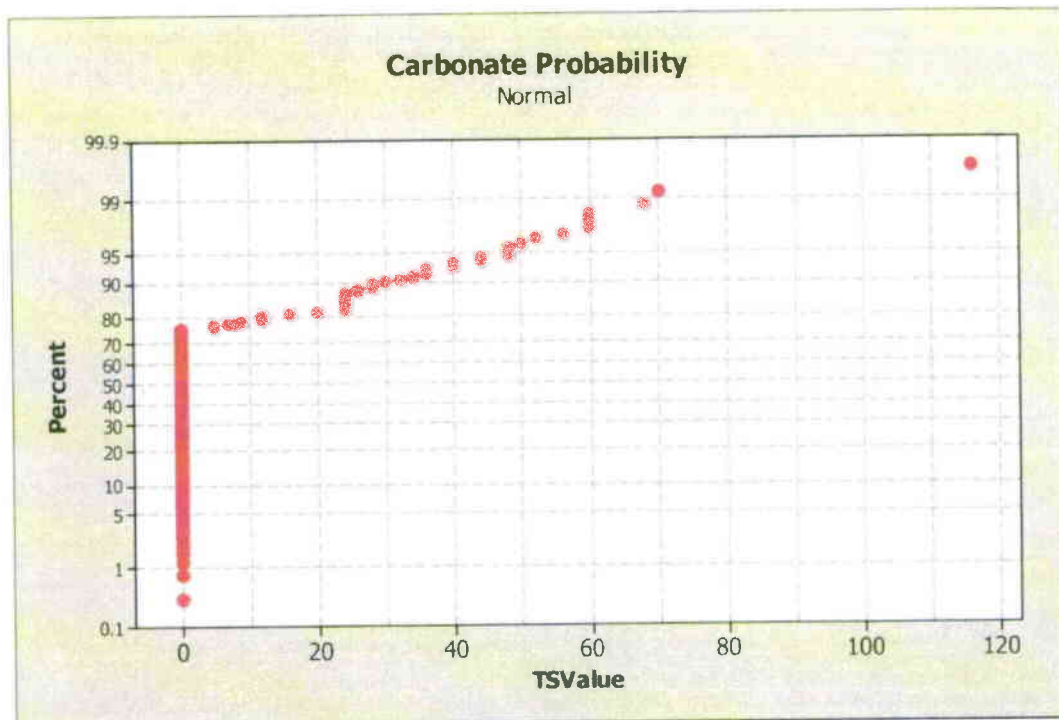
109.5

H = 23.84 DF = 19 P = 0.202

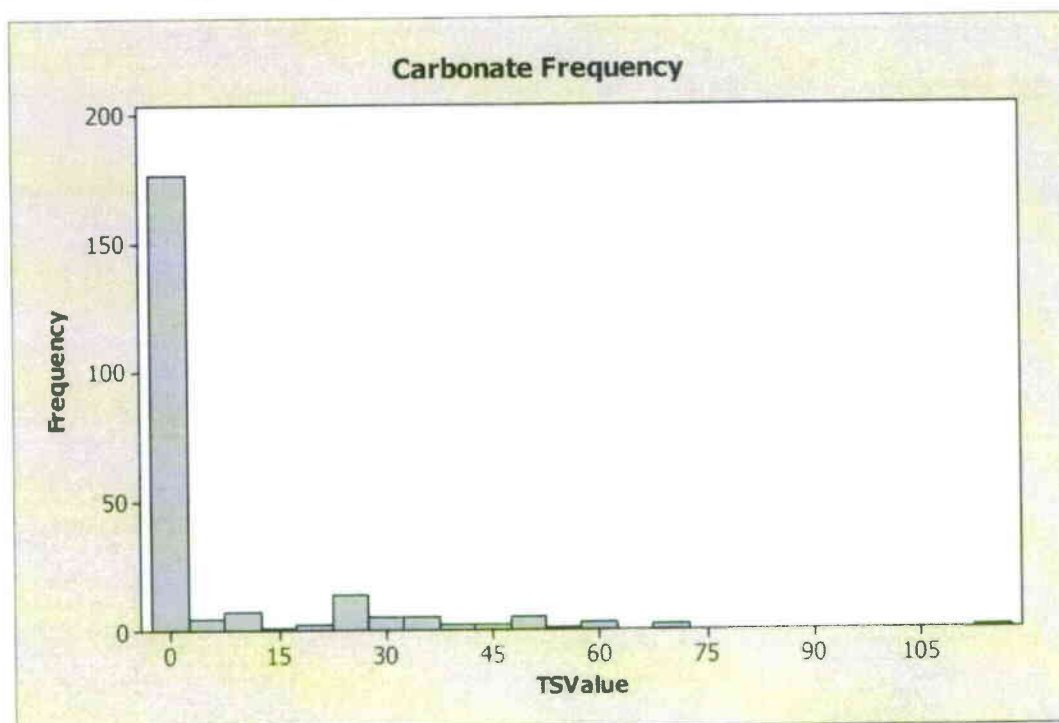
H = 43.97 DF = 19 P = 0.001 (adjusted for ties)







NOTE: Normal probability used due to Values  $\leq 0$





## CARBONATE BY AQUIFER RESULTS

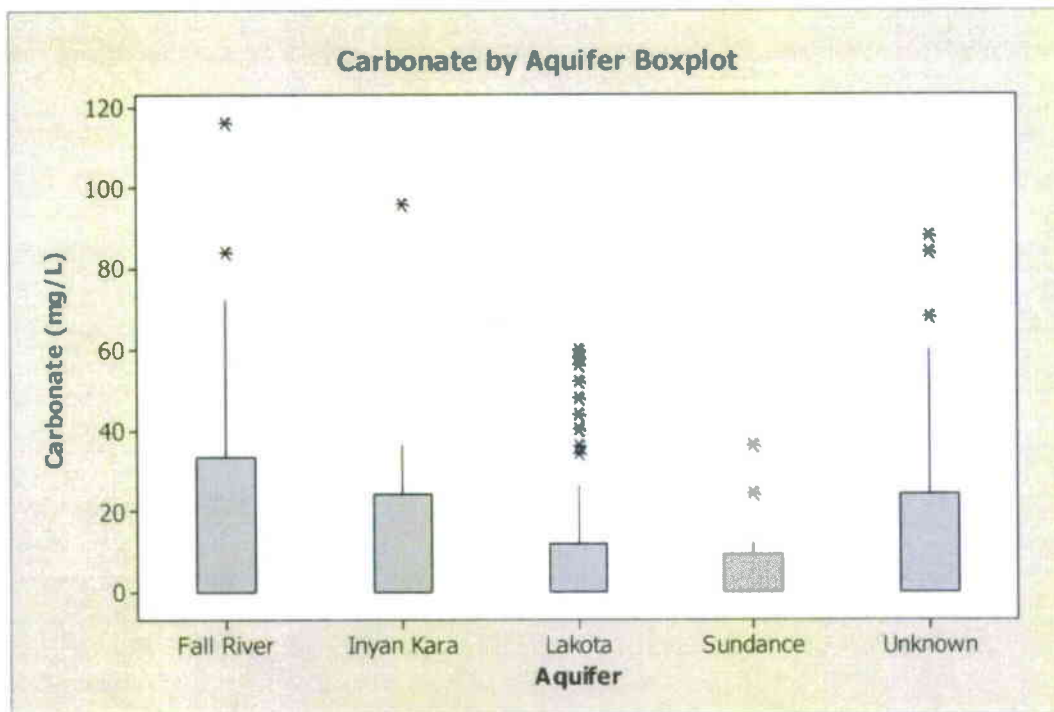
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.000000000	262.0	3.31
Inyan Kara	16	0.000000000	251.1	0.58
Lakota	217	0.000000000	206.7	-3.82
Sundance	16	0.000000000	200.2	-0.97
Unknown	66	0.000000000	250.9	1.24
Overall	463		232.0	

H = 17.76 DF = 4 P = 0.001

H = 23.58 DF = 4 P = 0.000 (adjusted for ties)



## CHLORINE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

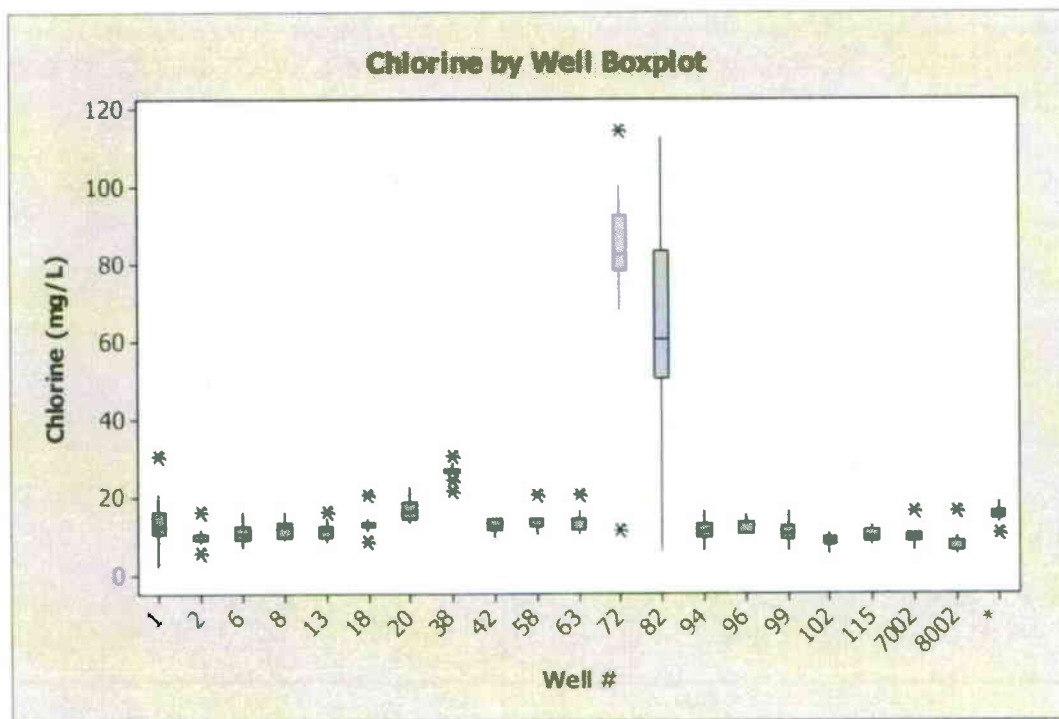
FeatureID	N	Median	Ave Rank	Z
1	11	12.000	105.0	-0.24
2	10	10.000	68.3	-2.12
6	10	10.000	78.6	-1.59



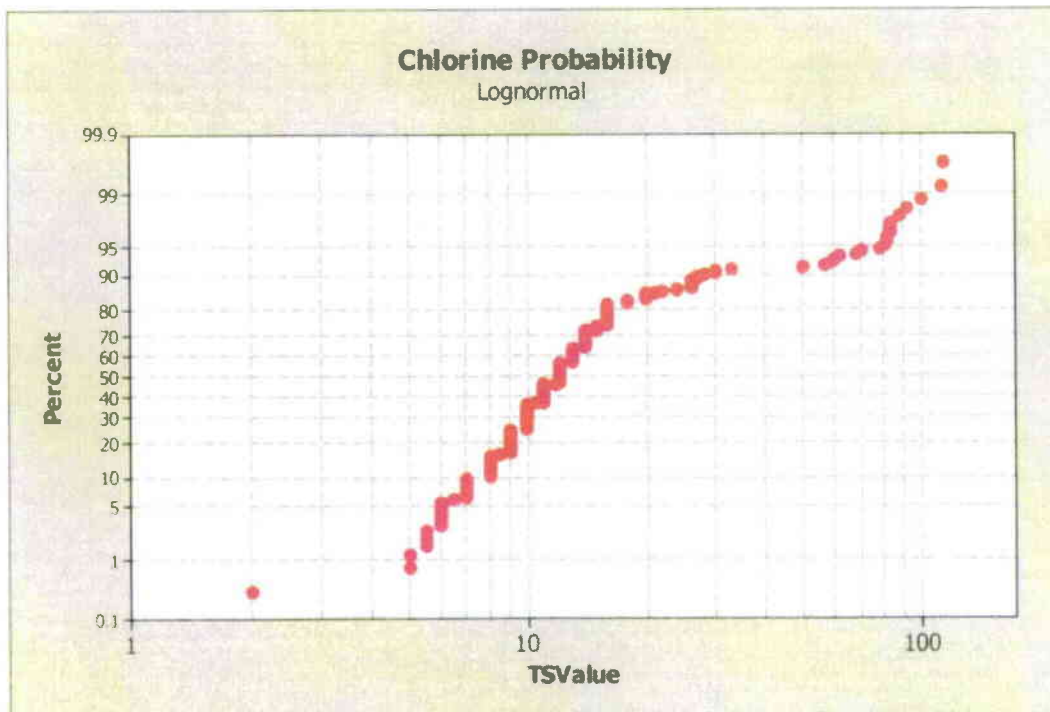
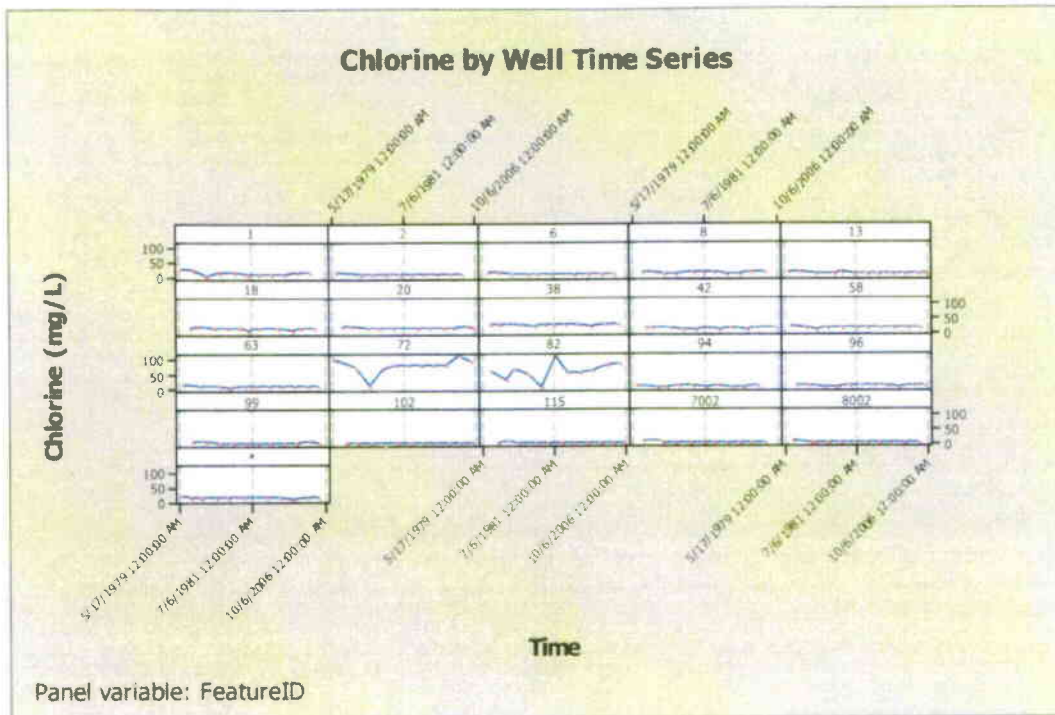
8	11	12.000	107.7	-0.10
13	12	11.000	91.2	-1.03
18	11	12.000	122.9	0.72
20	11	16.000	167.7	3.14
38	11	26.000	192.0	4.45
42	11	12.000	114.4	0.26
58	11	12.000	129.0	1.05
63	11	14.000	137.1	1.49
72	11	82.000	200.6	4.92
82	11	60.000	188.0	4.24
94	10	10.500	86.1	-1.20
96	11	13.000	121.9	0.67
99	11	10.000	81.6	-1.50
102	11	8.000	29.3	-4.33
115	11	9.000	58.3	-2.76
7002	11	9.000	66.3	-2.33
8002	11	8.000	37.0	-3.91
Overall	218		109.5	

H = 128.33 DF = 19 P = 0.000

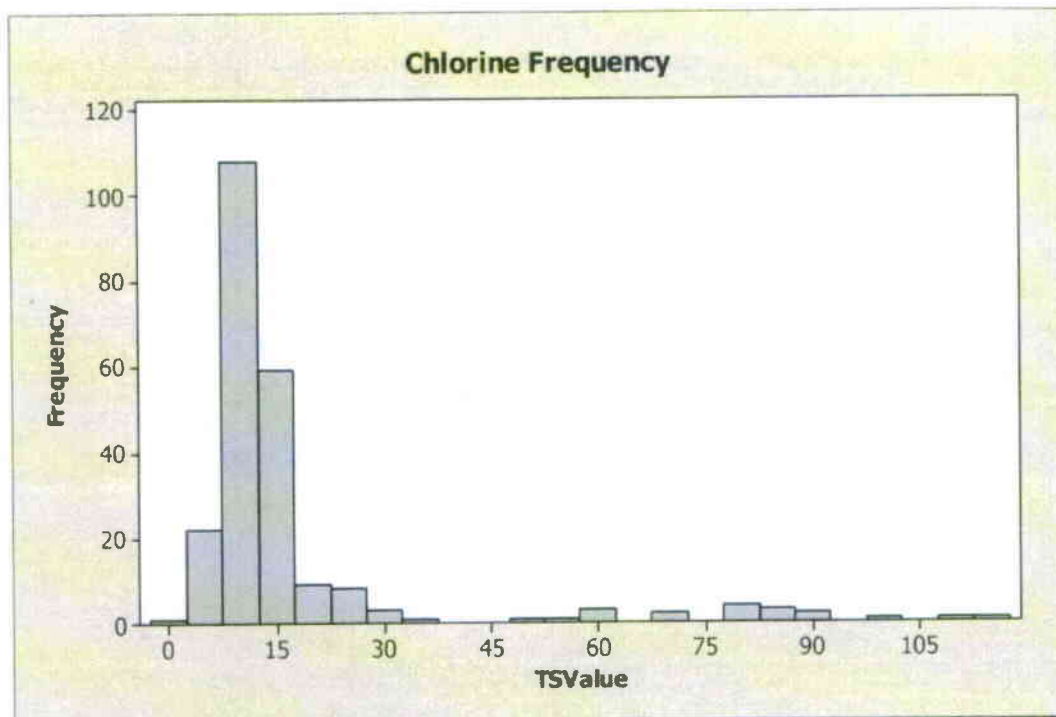
H = 129.10 DF = 19 P = 0.000 (adjusted for ties)











### CHLORINE BY AQUIFER RESULTS

#### Kruskal-Wallis Test: TSValue versus Aquifer

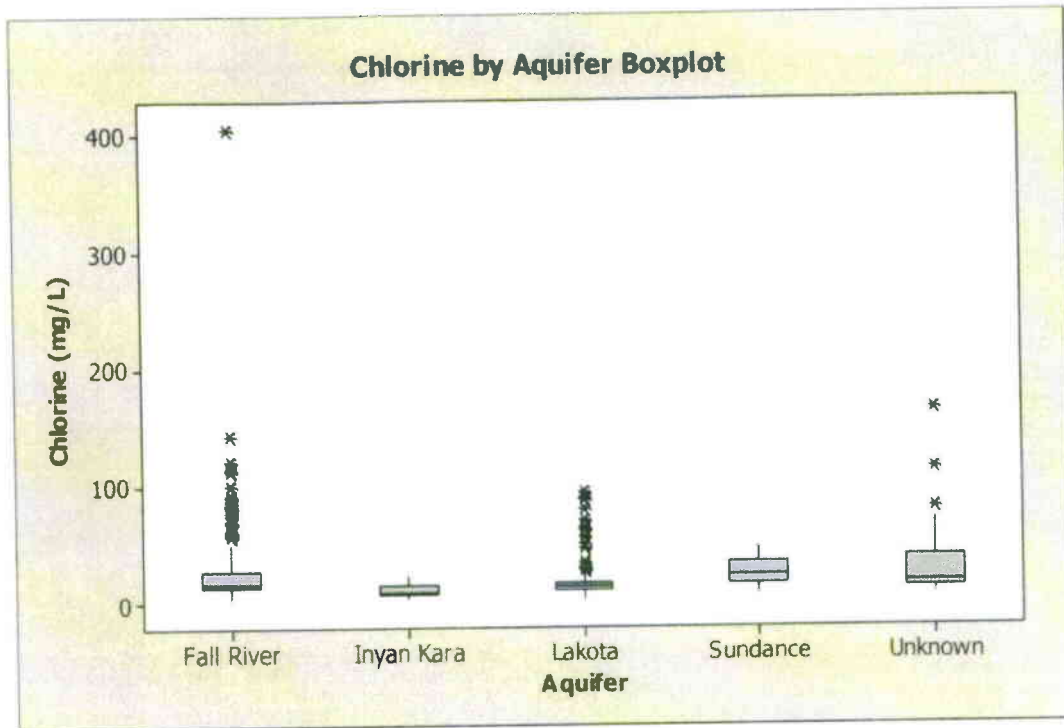
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	16.000	276.6	4.92
Inyan Kara	16	7.500	115.9	-3.53
Lakota	217	12.000	190.4	-6.28
Sundance	16	22.000	307.4	2.29
Unknown	66	16.000	278.4	3.04
Overall	463		232.0	

H = 62.49 DF = 4 P = 0.000

H = 62.67 DF = 4 P = 0.000 (adjusted for ties)





## CONDUCTIVITY BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

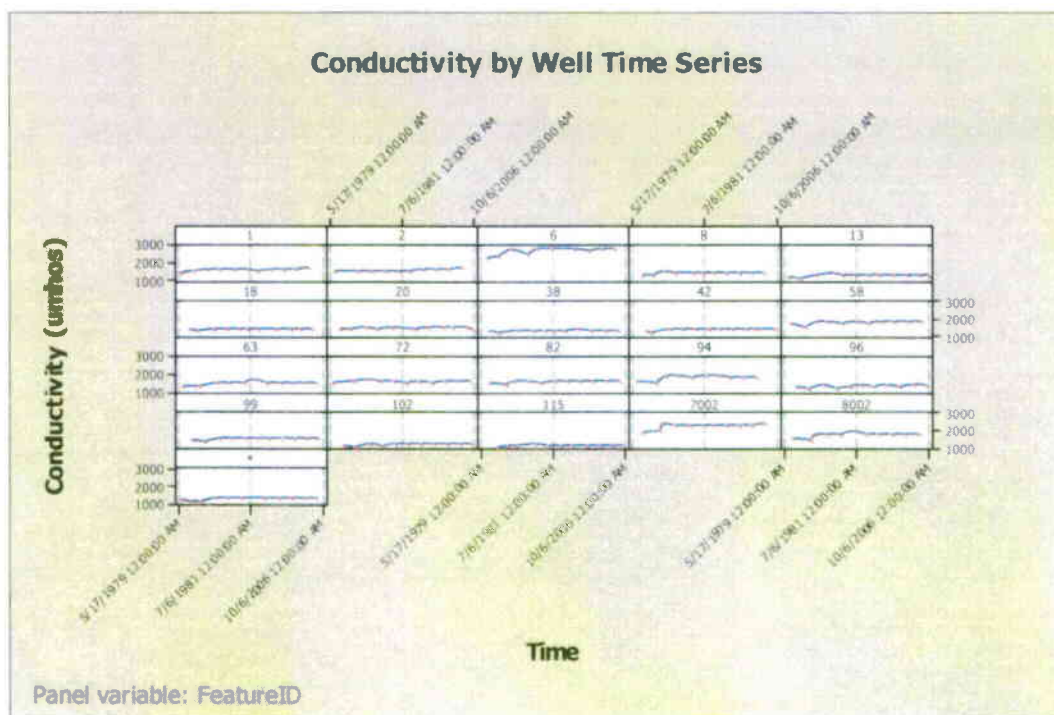
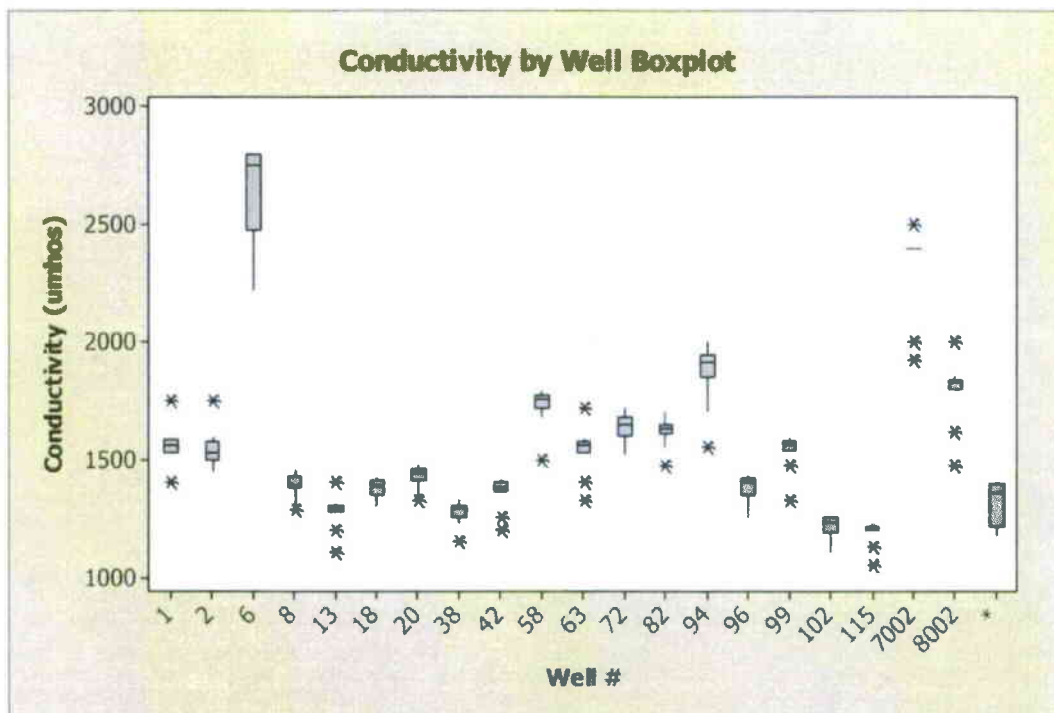
FeatureID	N	Median	Ave Rank	Z
1	11	1560	130.0	1.11
2	10	1528	125.6	0.82
6	10	2750	212.0	5.26
8	11	1390	72.4	-2.00
13	12	1285	36.5	-4.13
18	11	1390	70.1	-2.12
20	11	1440	90.8	-1.01
38	11	1290	36.2	-3.96
42	11	1380	61.3	-2.60
58	11	1760	168.3	3.17
63	11	1560	120.7	0.61
72	11	1650	152.4	2.31
82	11	1630	148.4	2.10
94	10	1919	183.6	3.80
96	11	1400	72.5	-2.00
99	11	1560	123.6	0.76
102	11	1230	18.7	-4.90
115	11	1210	11.8	-5.27
7002	11	2400	203.9	5.09
8002	11	1825	175.5	3.56



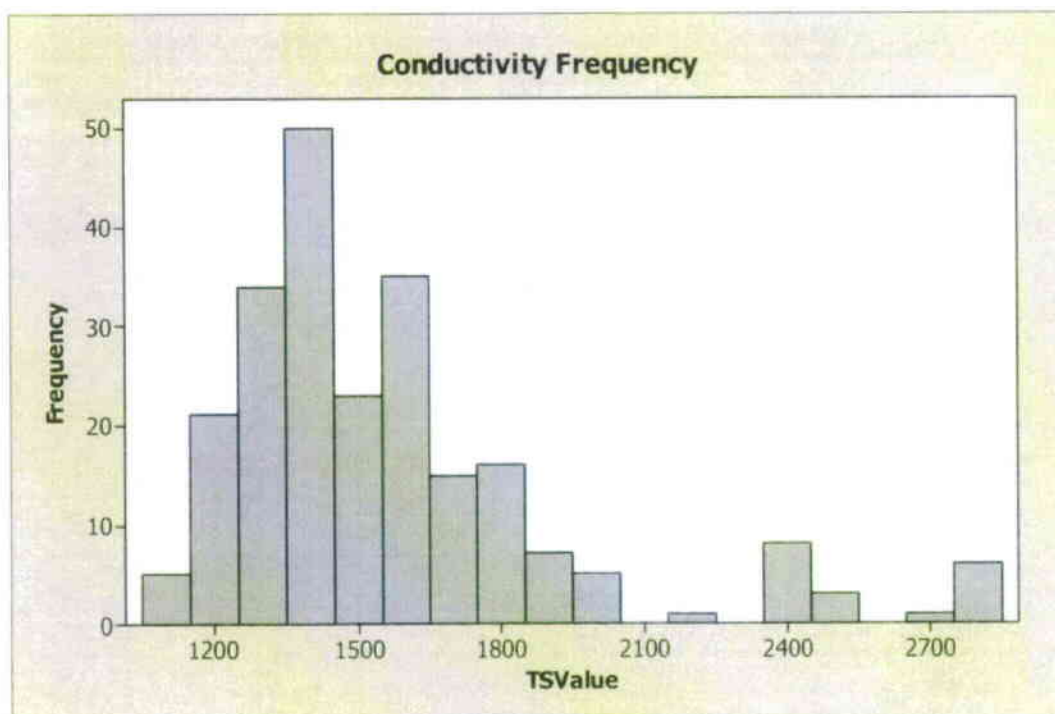
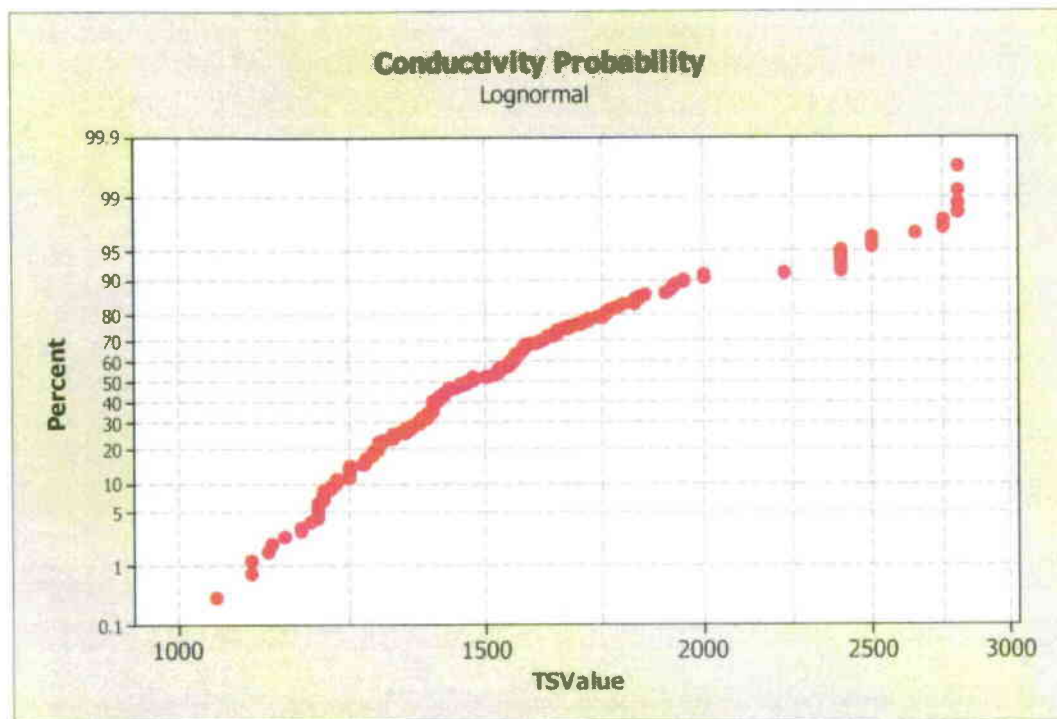
Overall 218 109.5

H = 197.86 DF = 19 P = 0.000

H = 197.95 DF = 19 P = 0.000 (adjusted for ties)









## CONDUCTIVITY BY AQUIFER RESULTS

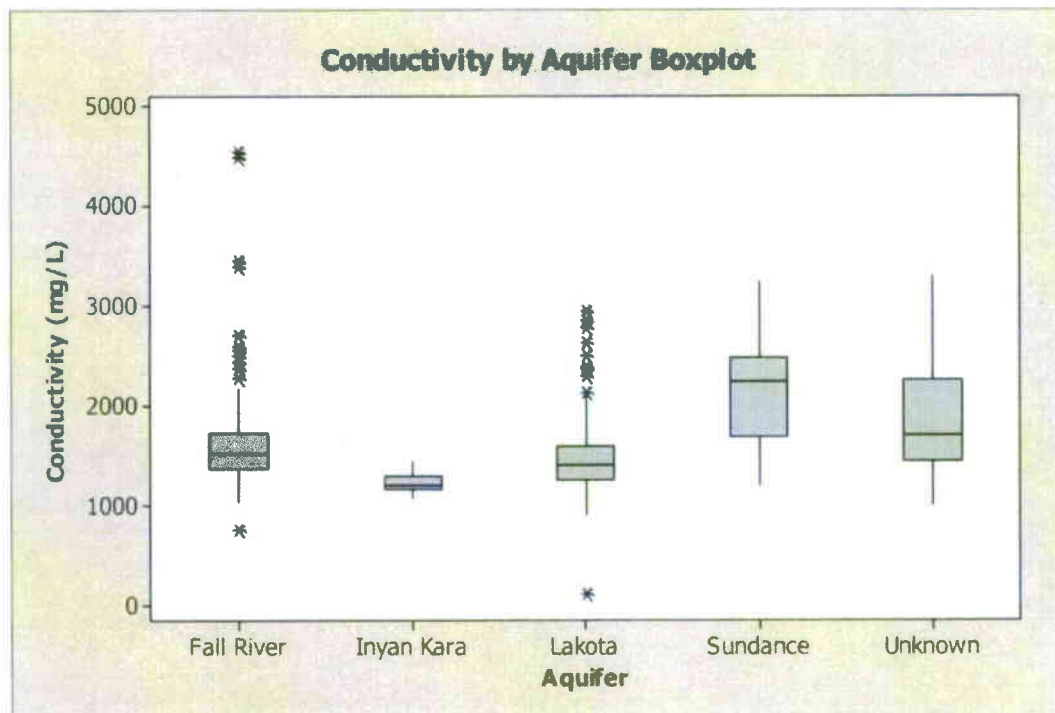
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	1510	249.4	1.92
Inyan Kara	16	1193	74.9	-4.78
Lakota	217	1410	205.7	-3.97
Sundance	16	2250	357.1	3.81
Unknown	66	1695	287.3	3.62
Overall	463		232.0	

H = 58.17 DF = 4 P = 0.000

H = 58.18 DF = 4 P = 0.000 (adjusted for ties)



## IRON BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

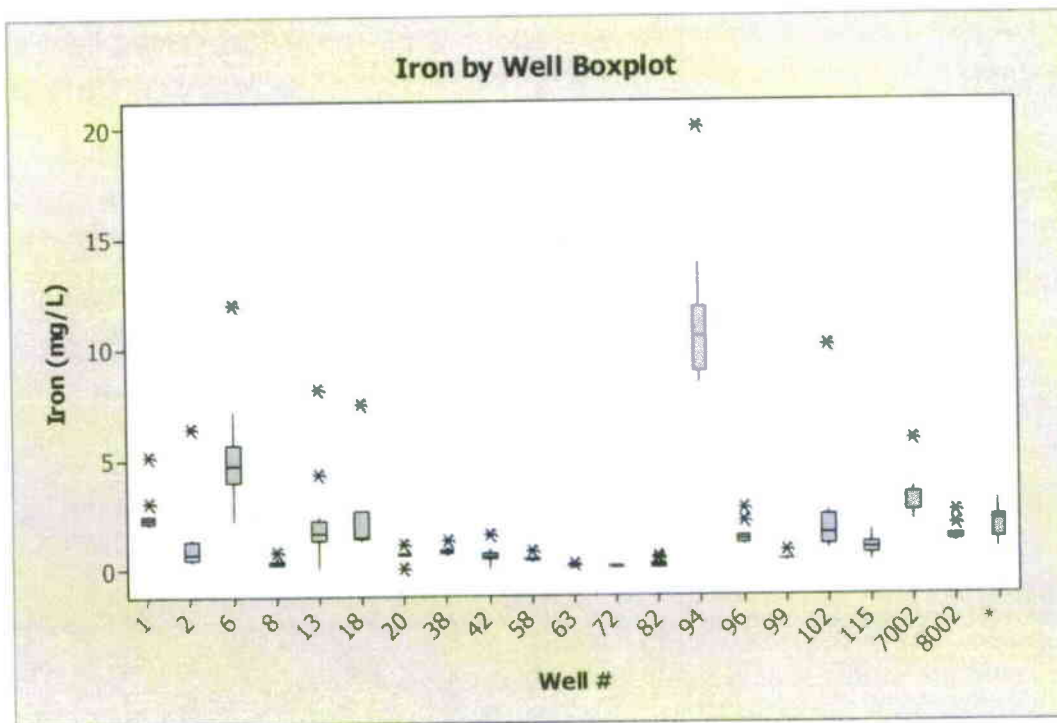
Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	2.27000	175.4	3.55
2	10	0.65000	102.3	-0.37
6	10	4.72000	196.7	4.47

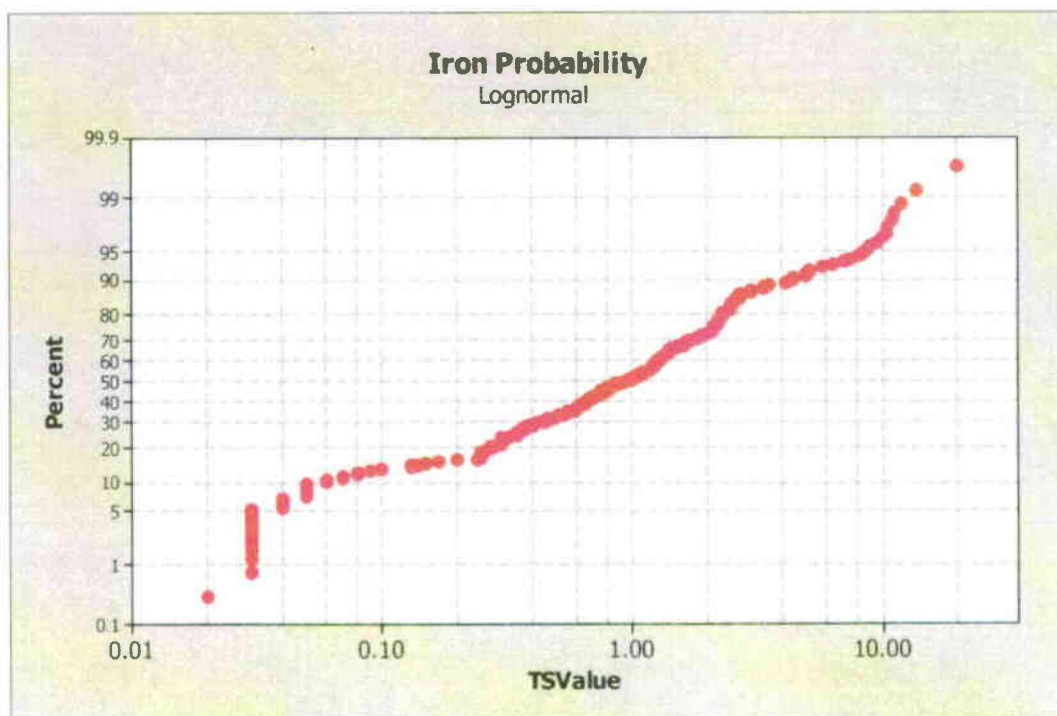
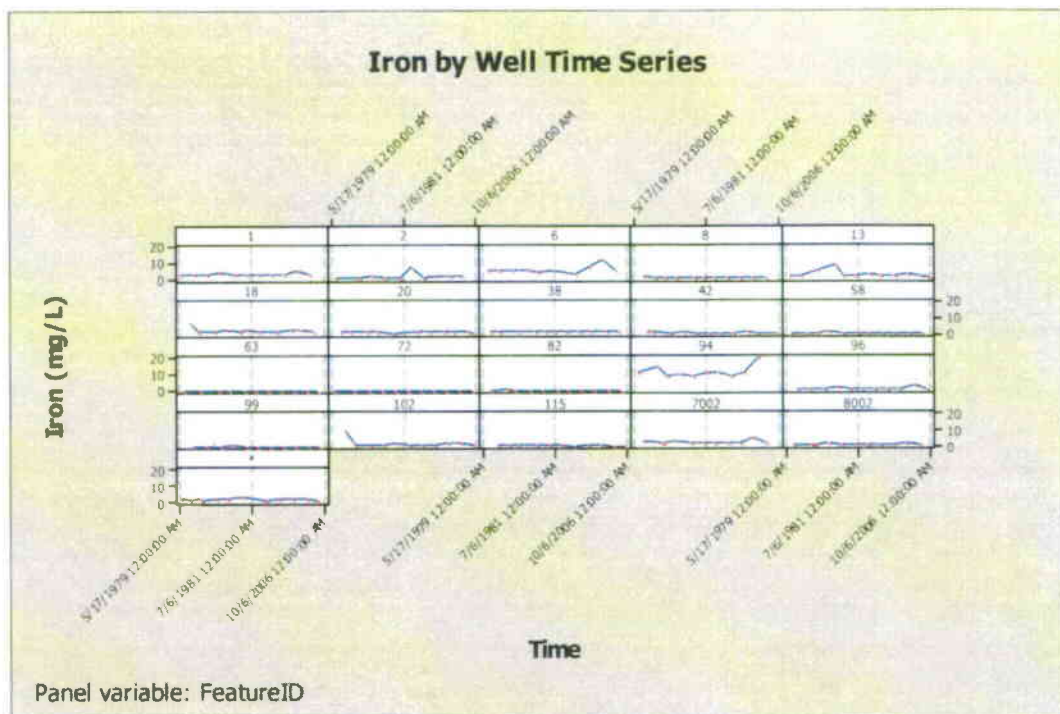


8	11	0.25000	49.0	-3.26
13	12	1.61500	143.2	1.90
18	11	1.45000	160.5	2.75
20	11	0.65000	84.2	-1.36
38	11	0.75000	102.4	-0.38
42	11	0.50000	76.5	-1.78
58	11	0.30000	59.4	-2.71
63	11	0.05000	22.8	-4.68
72	11	0.05000	14.7	-5.11
82	11	0.06000	28.5	-4.37
94	10	10.46500	212.3	5.28
96	11	1.25000	139.2	1.60
99	11	0.35000	61.3	-2.60
102	11	1.52000	148.5	2.11
115	11	0.85000	103.3	-0.34
7002	11	2.50000	183.5	4.00
8002	11	1.25000	139.7	1.63
Overall	218		109.5	

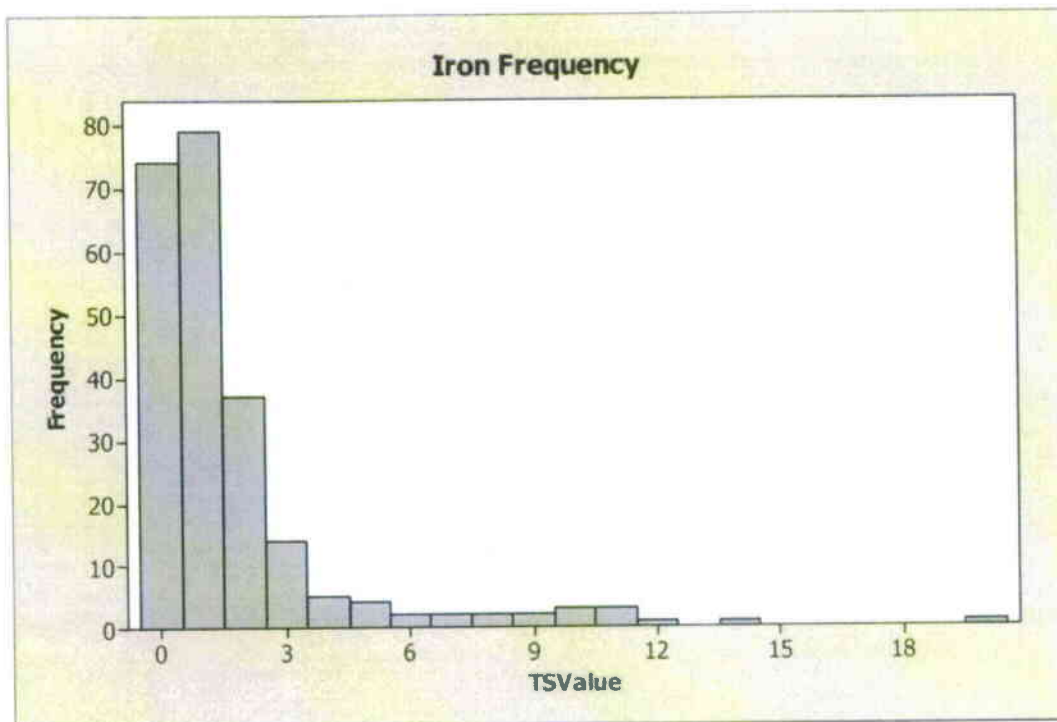
H = 184.97 DF = 19 P = 0.000  
H = 185.03 DF = 19 P = 0.000 (adjusted for ties)











## IRON BY AQUIFER RESULTS

### Kruskal-Wallis Test: TSVValue versus Aquifer

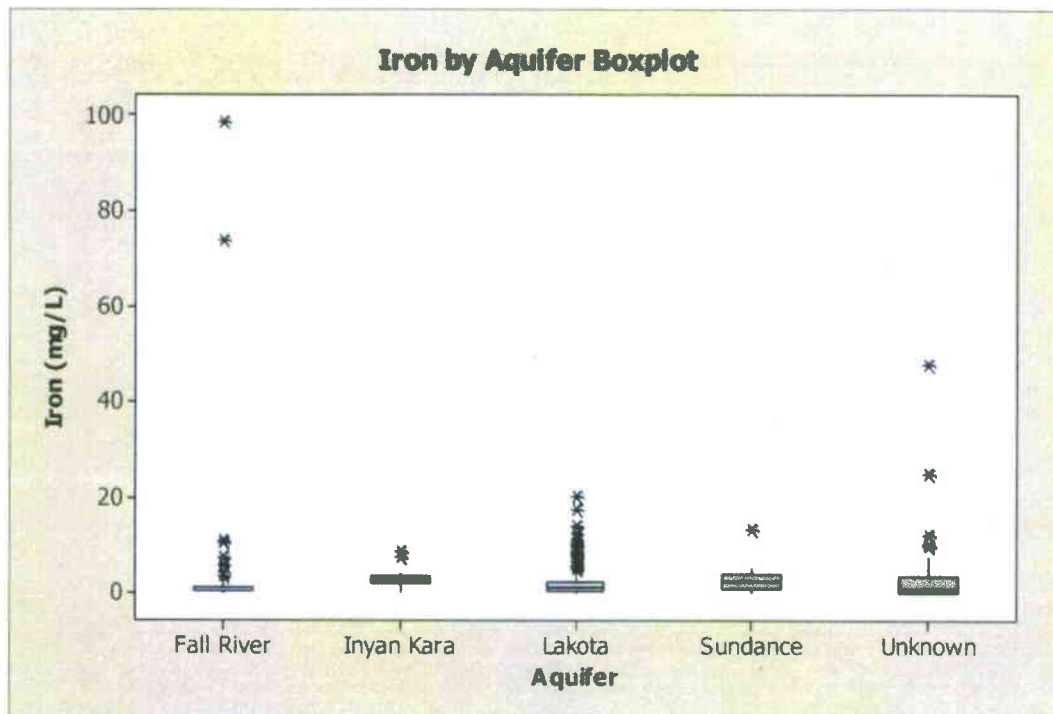
Kruskal-Wallis Test on TSVValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.5000	187.3	-4.93
Inyan Kara	16	2.5500	334.0	3.10
Lakota	217	1.0000	252.6	3.11
Sundance	16	2.0950	300.9	2.10
Unknown	66	0.6700	223.1	-0.58
Overall	463		232.0	

H = 35.53 DF = 4 P = 0.000

H = 35.54 DF = 4 P = 0.000 (adjusted for ties)





## HARDNESS BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

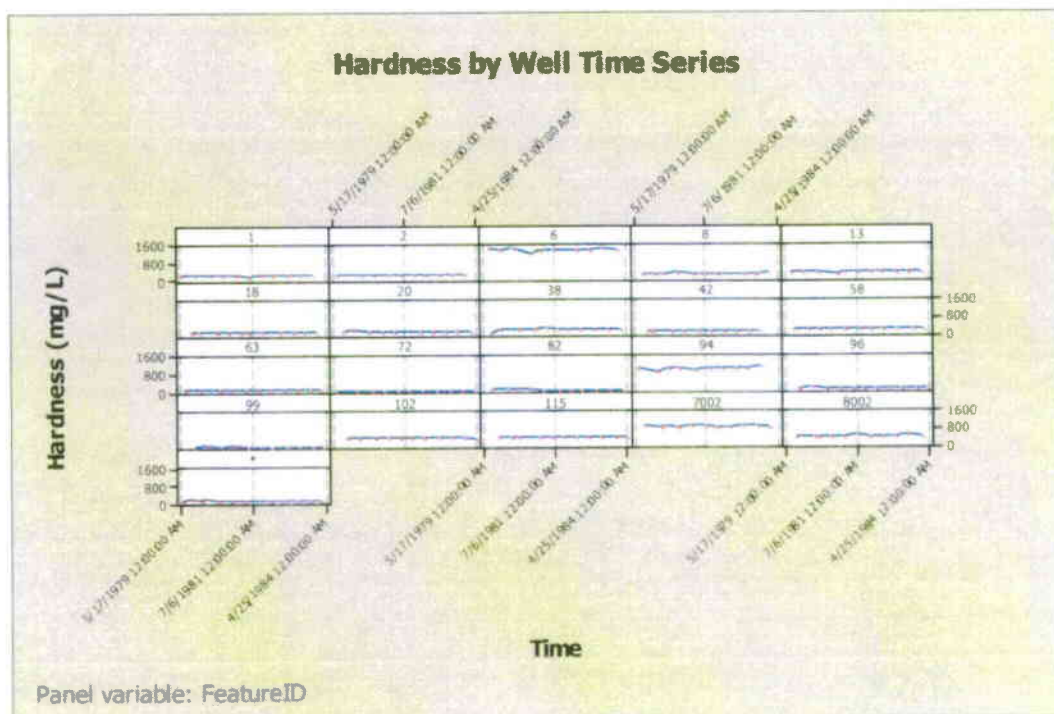
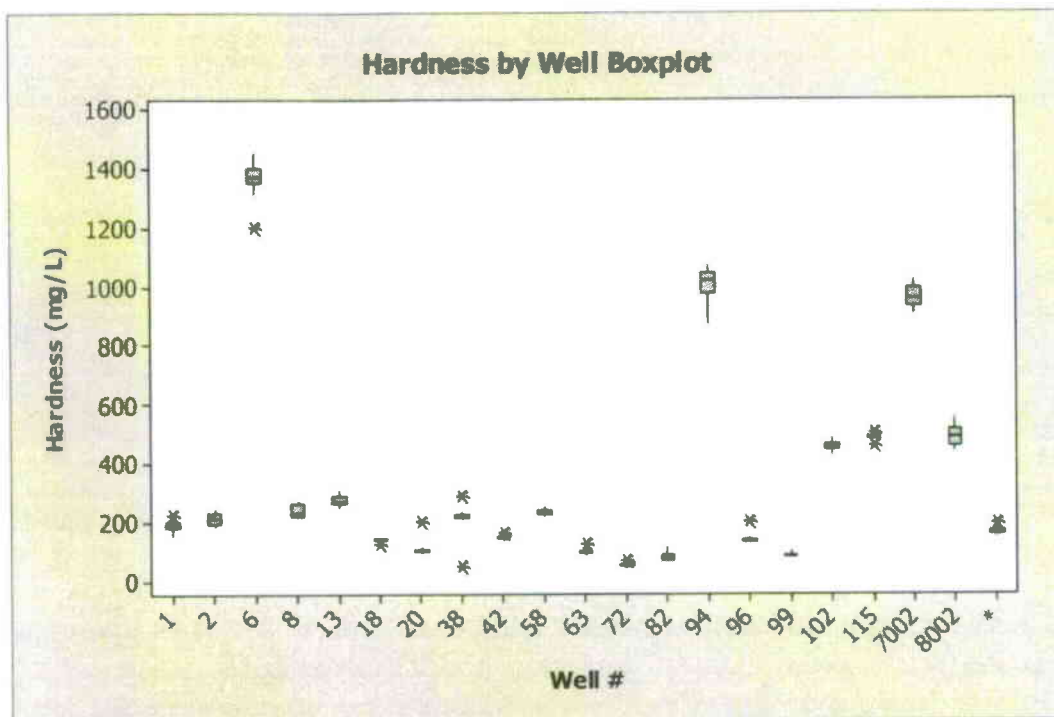
215 cases were used  
12 cases contained missing values

Kruskal-Wallis Test on TSValue

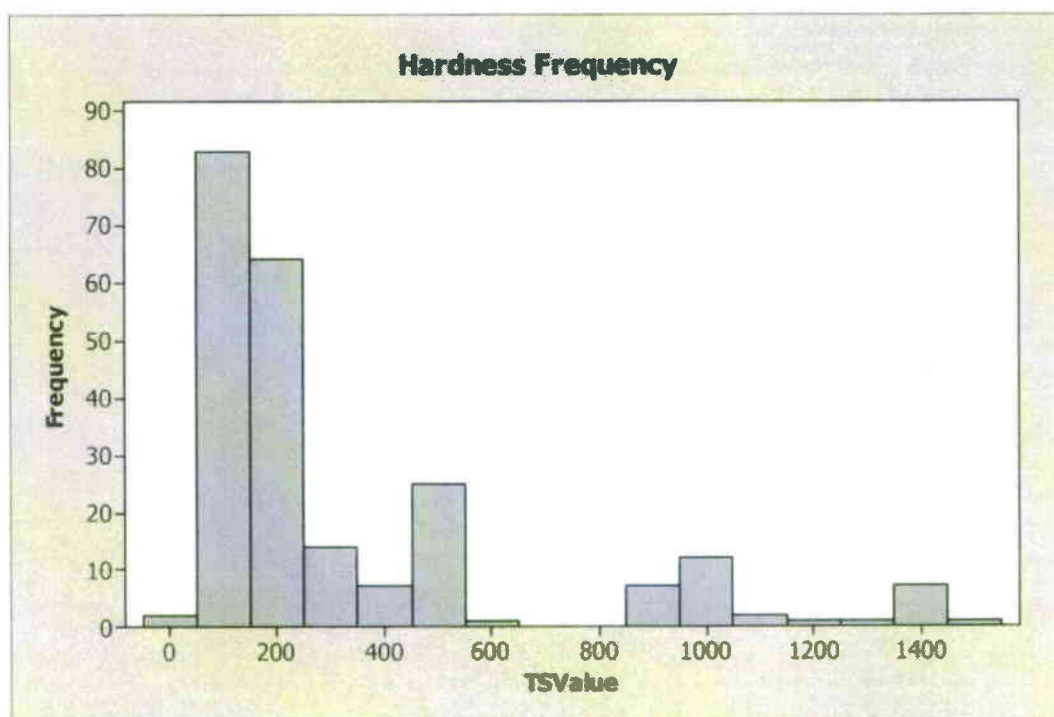
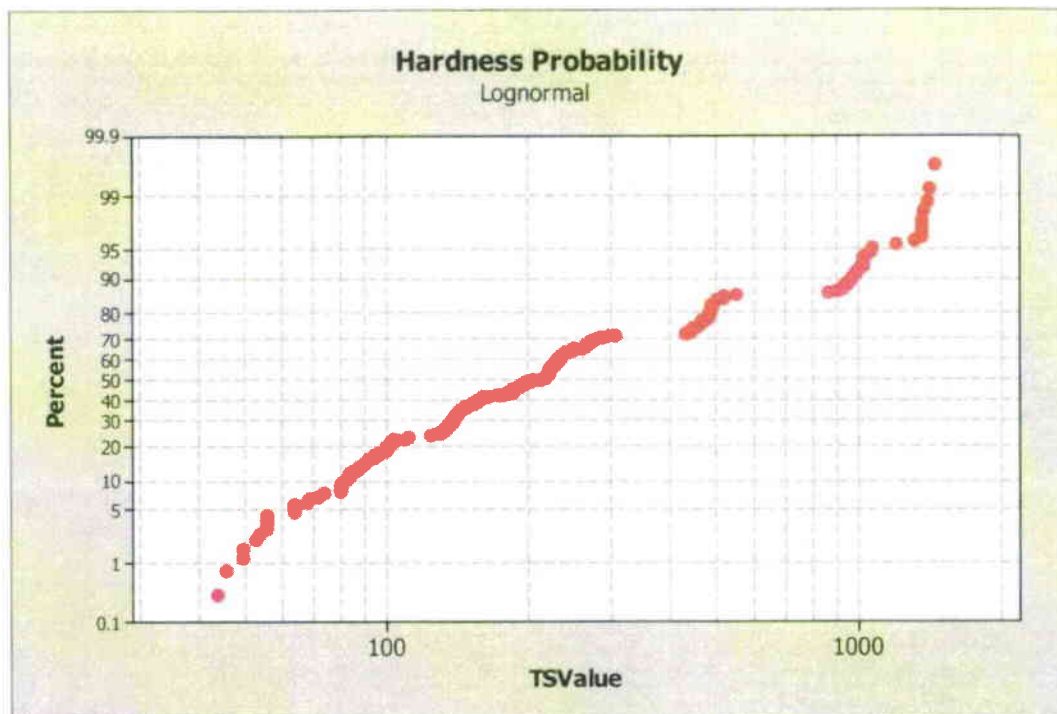
FeatureID	N	Median	Ave Rank	Z
1	11	184.00	94.8	-0.72
2	10	211.50	109.7	0.09
6	10	1368.00	210.5	5.34
8	11	233.00	126.5	1.02
13	11	268.00	144.4	1.99
18	11	139.00	68.8	-2.14
20	10	102.50	51.8	-2.93
38	11	220.00	104.9	-0.17
42	10	143.00	78.5	-1.54
58	11	228.00	122.8	0.81
63	11	94.00	39.2	-3.77
72	11	56.00	7.1	-5.52
82	11	80.00	24.0	-4.60
94	10	1020.00	197.9	4.68
96	11	134.00	66.2	-2.29
99	11	84.00	26.3	-4.47
102	11	460.00	160.0	2.85
115	11	488.00	172.7	3.54
7002	11	956.00	192.4	4.62
8002	11	488.00	171.3	3.47
Overall	215		108.0	



H = 206.27 DF = 19 P = 0.000  
H = 206.29 DF = 19 P = 0.000 (adjusted for ties)









## HARDNESS BY AQUIFER RESULTS

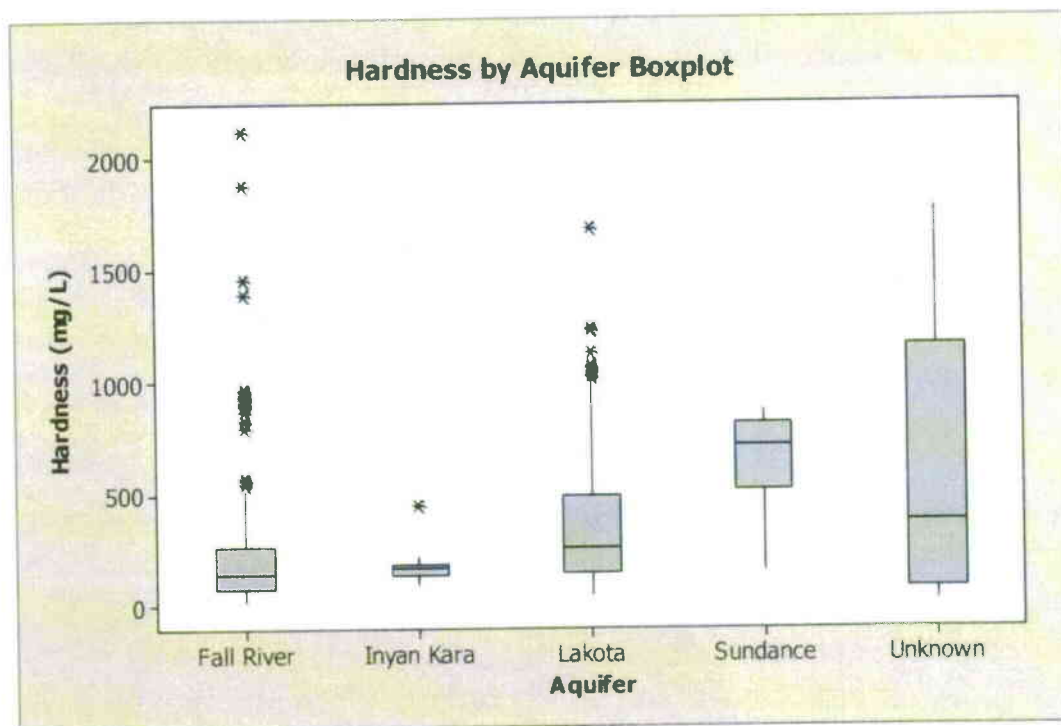
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	146	137.0	183.7	-5.07
Inyan Kara	16	165.0	176.3	-1.64
Lakota	214	255.5	248.0	2.79
Sundance	16	710.5	355.2	3.87
Unknown	66	371.5	253.5	1.59
Overall	458		229.5	

H = 40.86 DF = 4 P = 0.000

H = 40.87 DF = 4 P = 0.000 (adjusted for ties)



## POTASSIUM BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

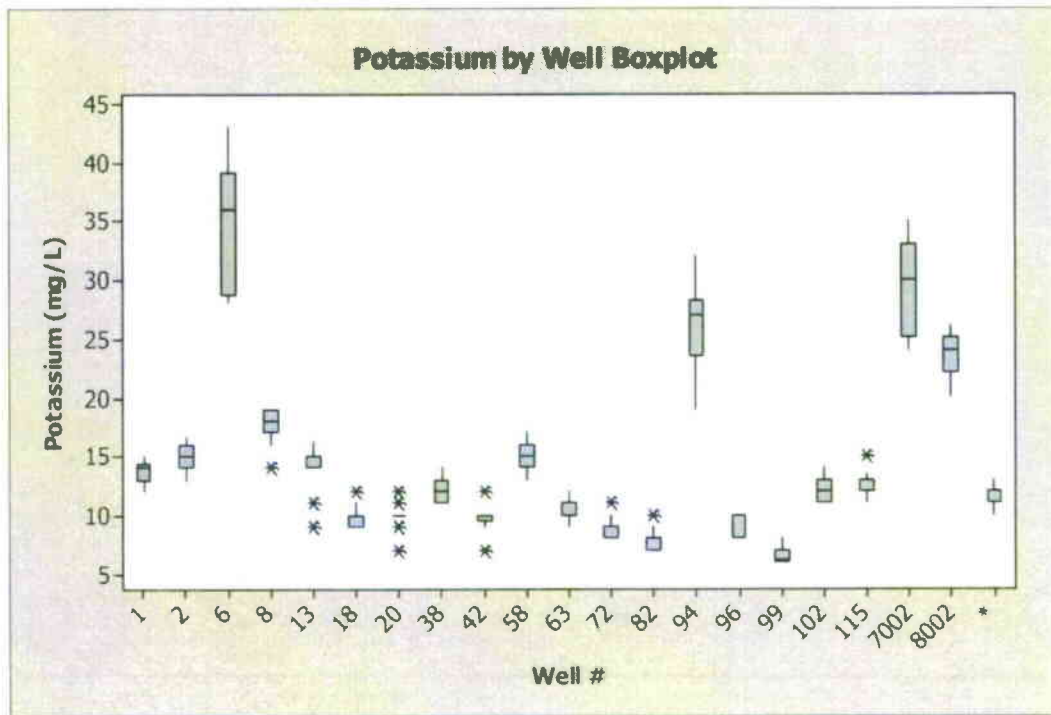
FeatureID	N	Median	Ave Rank	Z
1	11	14.000	129.2	1.06
2	10	15.000	147.1	1.93
6	10	36.000	210.5	5.18



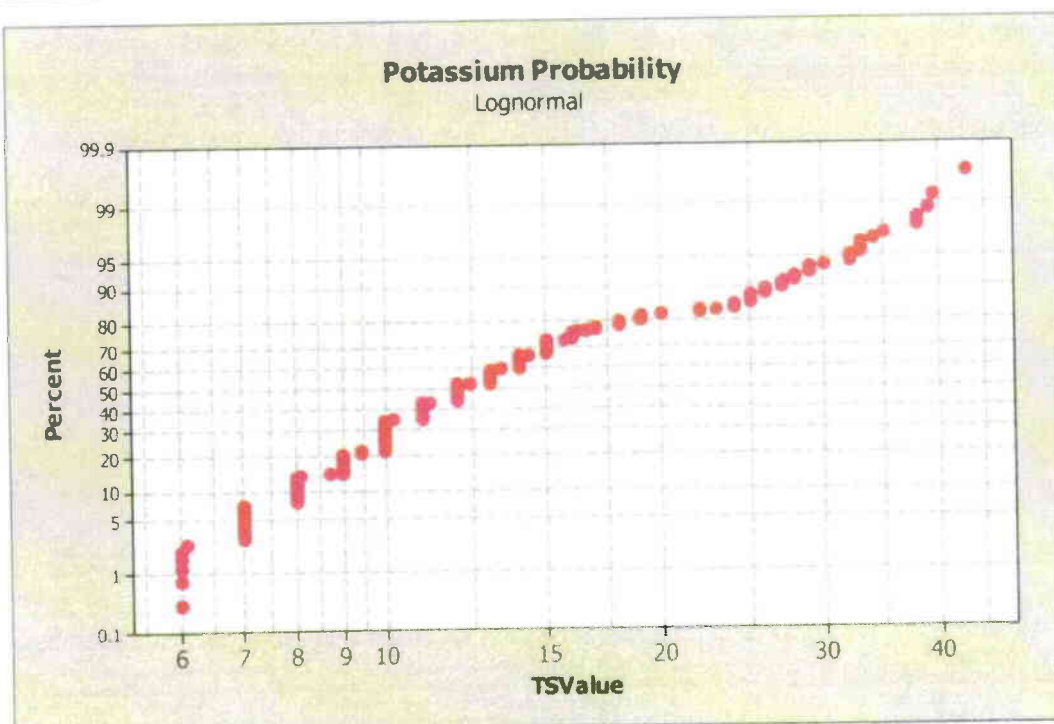
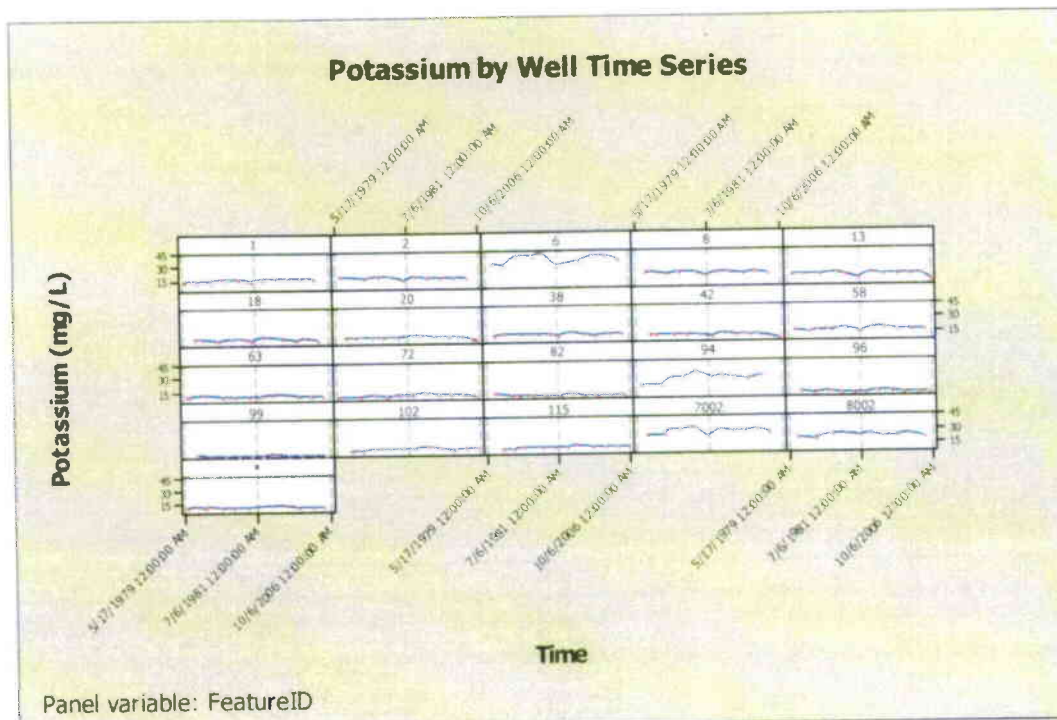
8	11	18.000	167.7	3.14
13	12	15.000	135.0	1.44
18	11	10.000	60.2	-2.66
20	11	10.000	63.4	-2.49
38	11	12.000	105.5	-0.22
42	11	10.000	60.0	-2.67
58	11	15.000	145.7	1.95
63	11	10.000	72.9	-1.97
72	11	9.000	42.1	-3.64
82	11	7.000	22.9	-4.67
94	10	27.000	193.5	4.31
96	11	8.000	37.7	-3.87
99	11	6.100	9.6	-5.39
102	11	12.000	106.3	-0.17
115	11	13.000	112.0	0.14
7002	11	30.000	201.2	4.95
8002	11	24.000	185.4	4.10
Overall	218		109.5	

H = 200.42 DF = 19 P = 0.000

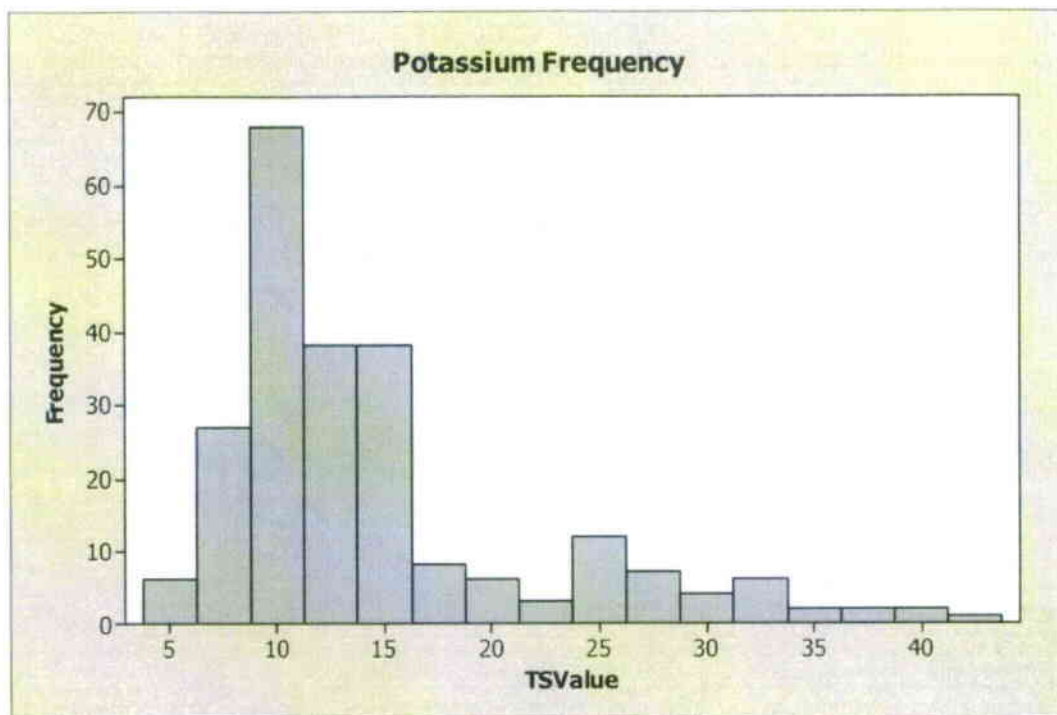
H = 201.36 DF = 19 P = 0.000 (adjusted for ties)











## POTASSIUM BY AQUIFER RESULTS

### Kruskal-Wallis Test: TSValue versus Aquifer

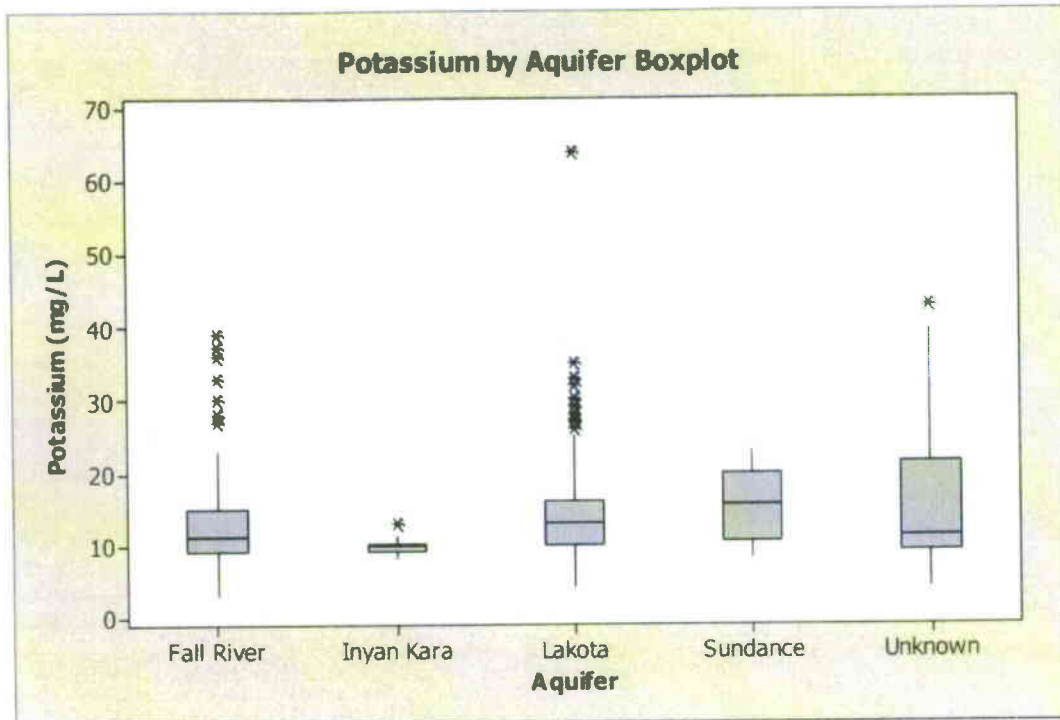
#### Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	11.000	214.5	-1.93
Inyan Kara	16	9.700	146.2	-2.61
Lakota	217	13.000	244.7	1.91
Sundance	16	15.500	286.3	1.65
Unknown	66	11.000	237.2	0.34
Overall	463		232.0	

H = 13.79 DF = 4 P = 0.008

H = 13.85 DF = 4 P = 0.008 (adjusted for ties)





## MAGNESIUM BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

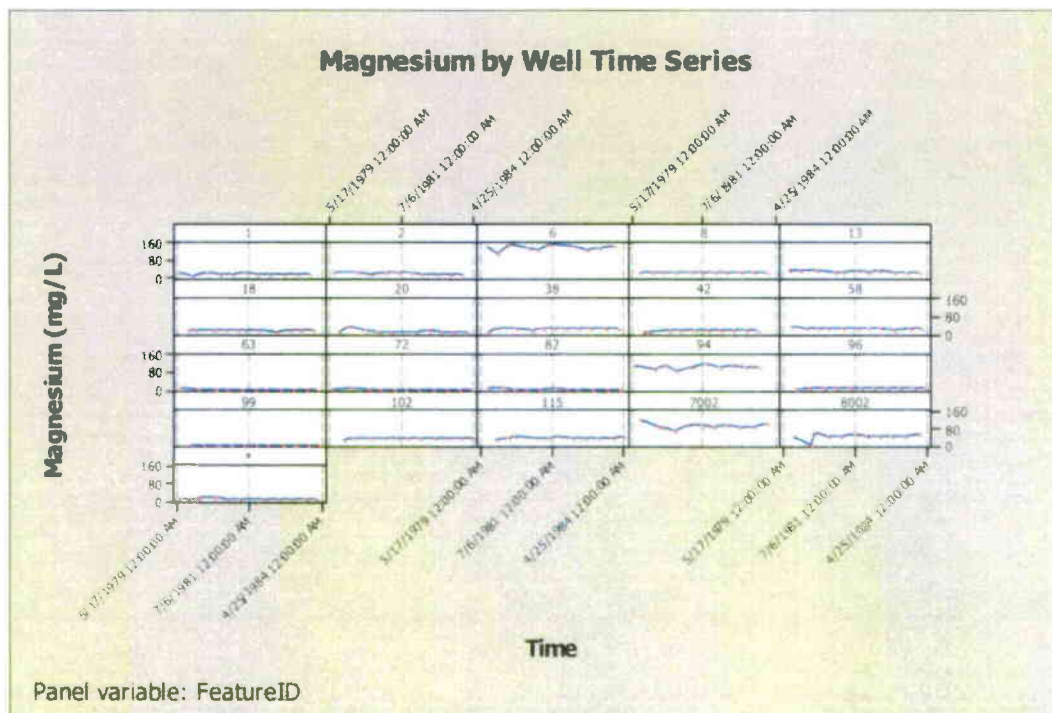
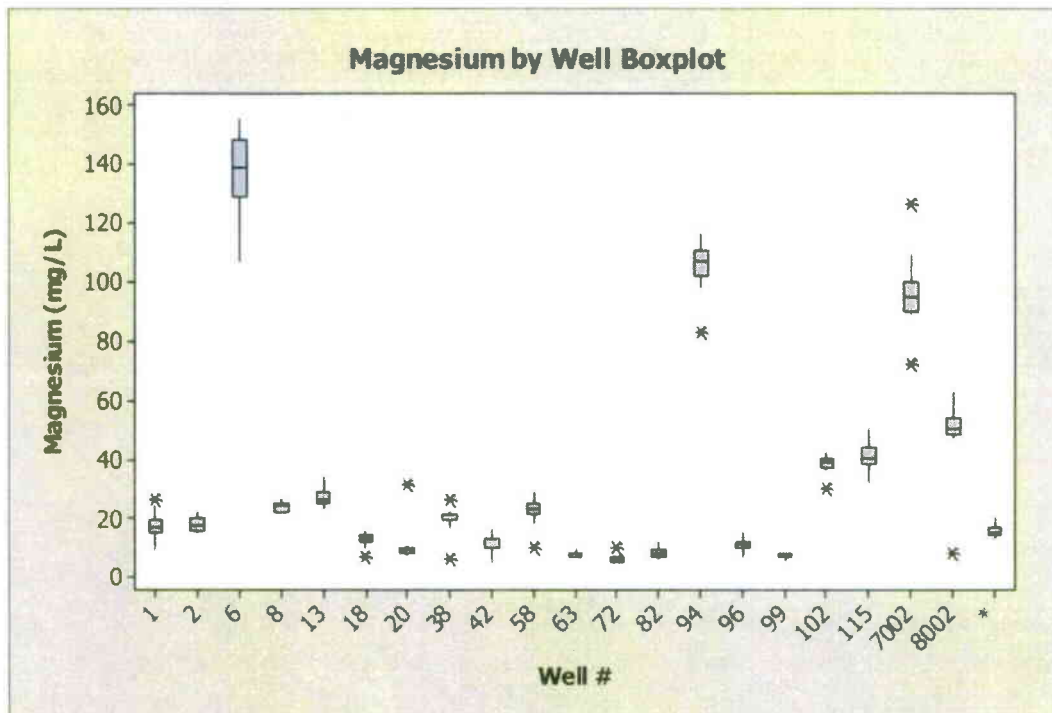
215 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

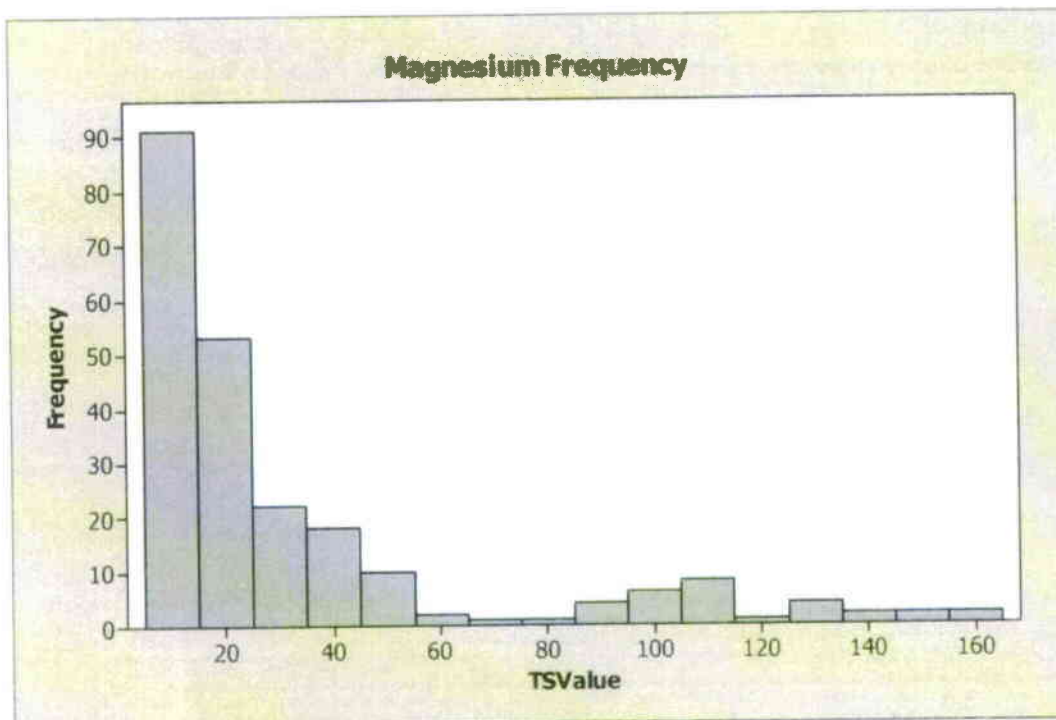
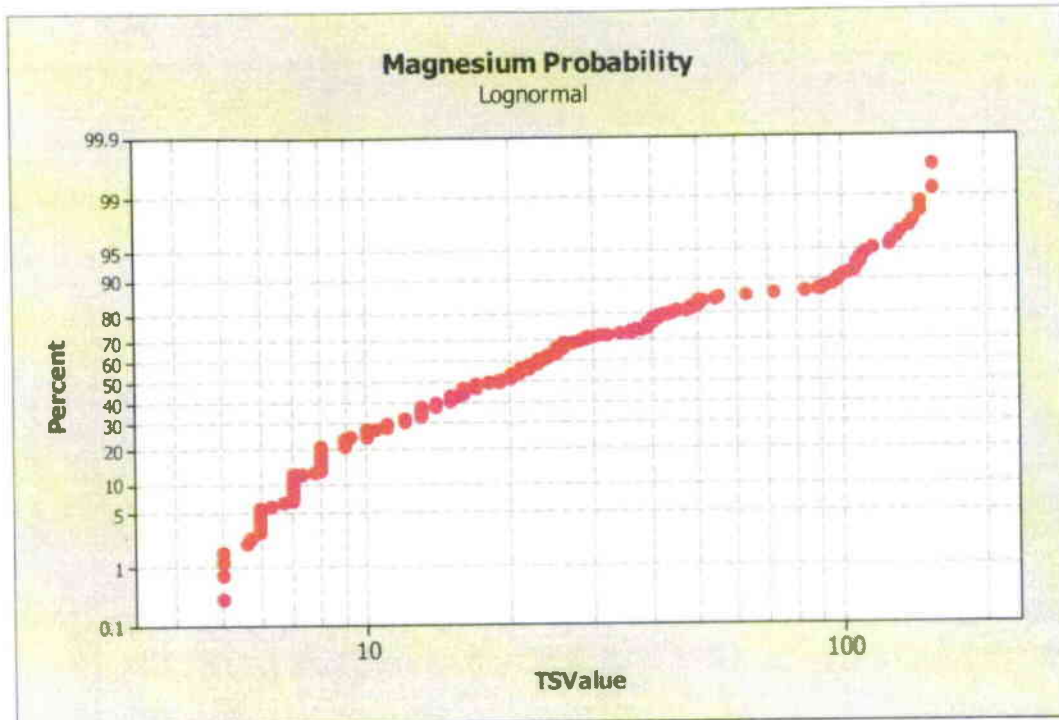
FeatureID	N	Median	Ave Rank	Z
1	11	17.000	99.0	-0.49
2	10	17.500	101.7	-0.33
6	10	139.000	209.8	5.30
8	11	24.000	130.7	1.24
13	11	26.000	141.6	1.84
18	11	13.000	73.0	-1.91
20	10	9.000	59.2	-2.54
38	11	21.000	104.7	-0.18
42	10	13.000	66.1	-2.18
58	11	23.000	120.3	0.67
63	11	8.000	35.0	-4.00
72	11	6.000	13.6	-5.17
82	11	8.000	40.0	-3.72
94	10	106.500	198.4	4.70
96	11	11.000	63.7	-2.43
99	11	7.000	25.8	-4.50
102	11	39.000	162.0	2.95
115	11	40.000	165.2	3.13
7002	11	95.000	192.6	4.63
8002	11	50.000	166.3	3.19
Overall	215		108.0	



H = 193.48 DF = 19 P = 0.000  
H = 193.72 DF = 19 P = 0.000 (adjusted for ties)









## MAGNESIUM BY AQUIFER RESULTS

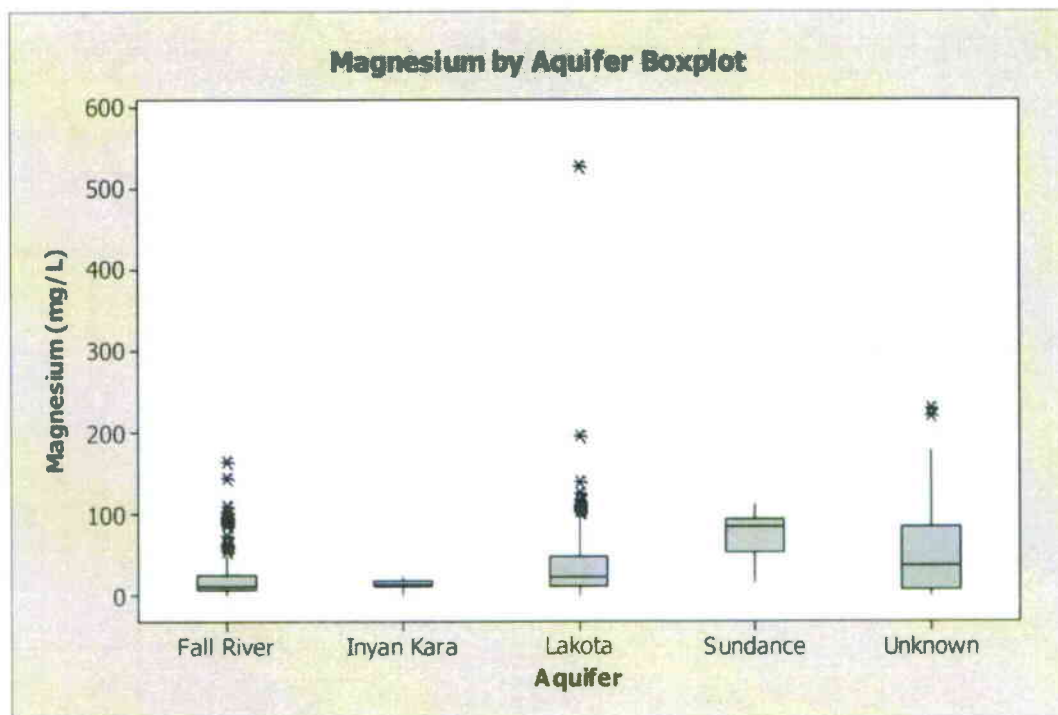
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	146	10.70	185.7	-4.85
Inyan Kara	16	15.00	177.8	-1.59
Lakota	214	23.25	243.9	2.19
Sundance	16	84.50	372.0	4.38
Unknown	66	37.00	257.7	1.87
Overall	458		229.5	

H = 42.53 DF = 4 P = 0.000

H = 42.55 DF = 4 P = 0.000 (adjusted for ties)



## MANGANESE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

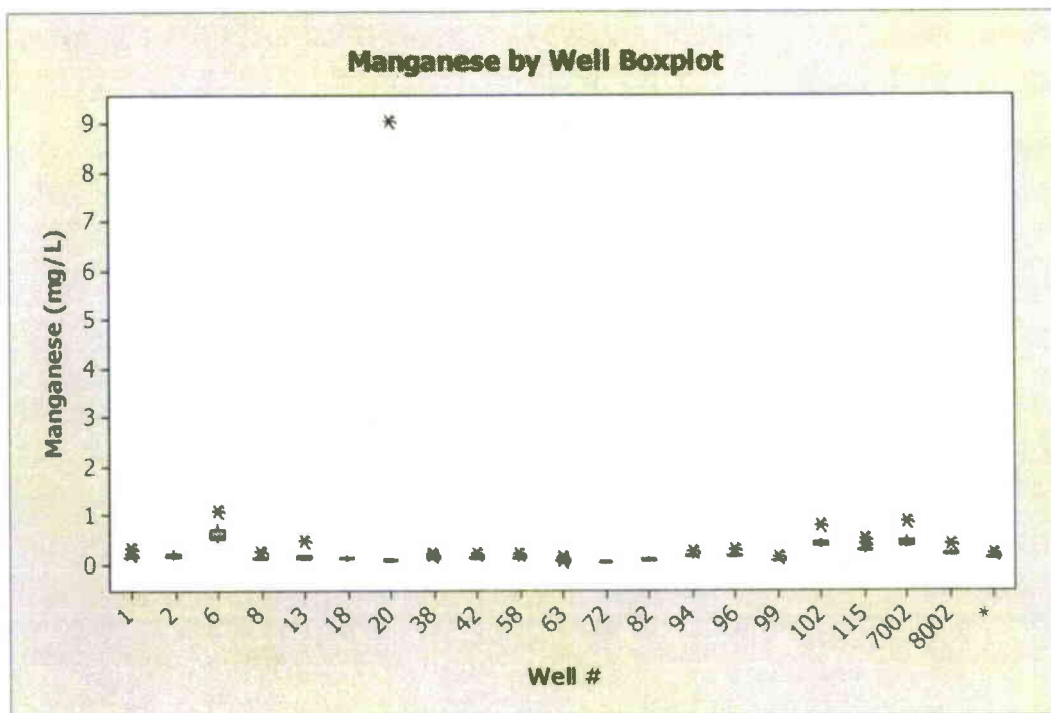
FeatureID	N	Median	Ave Rank	Z
1	11	0.12000	133.2	1.28
2	10	0.10000	124.4	0.76
6	10	0.52000	209.5	5.13



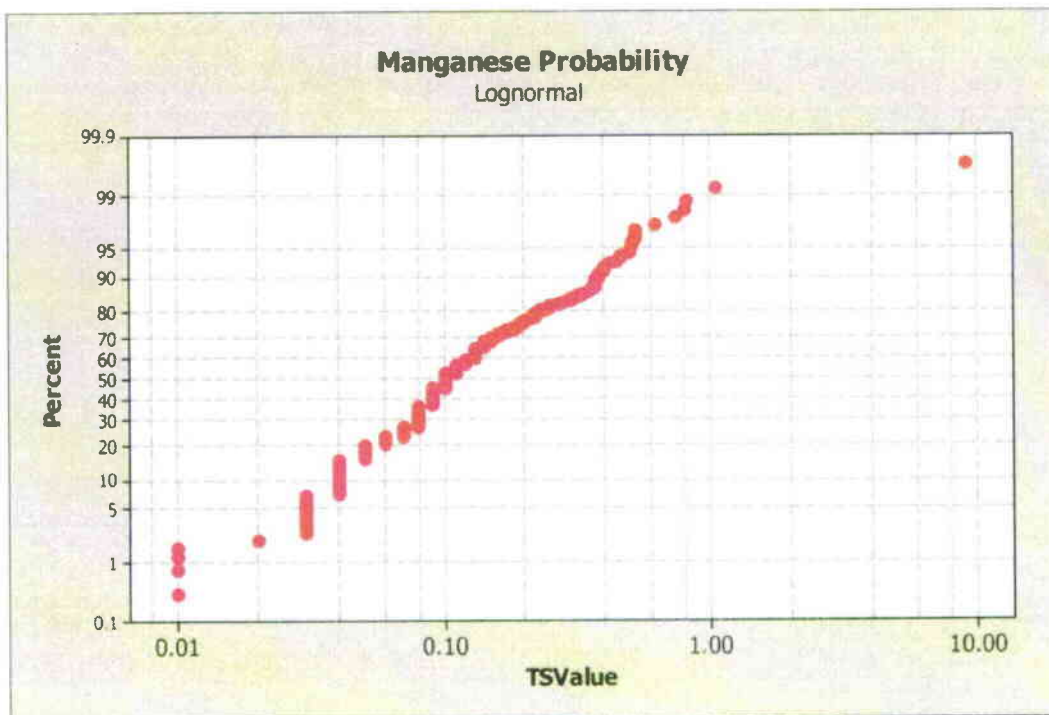
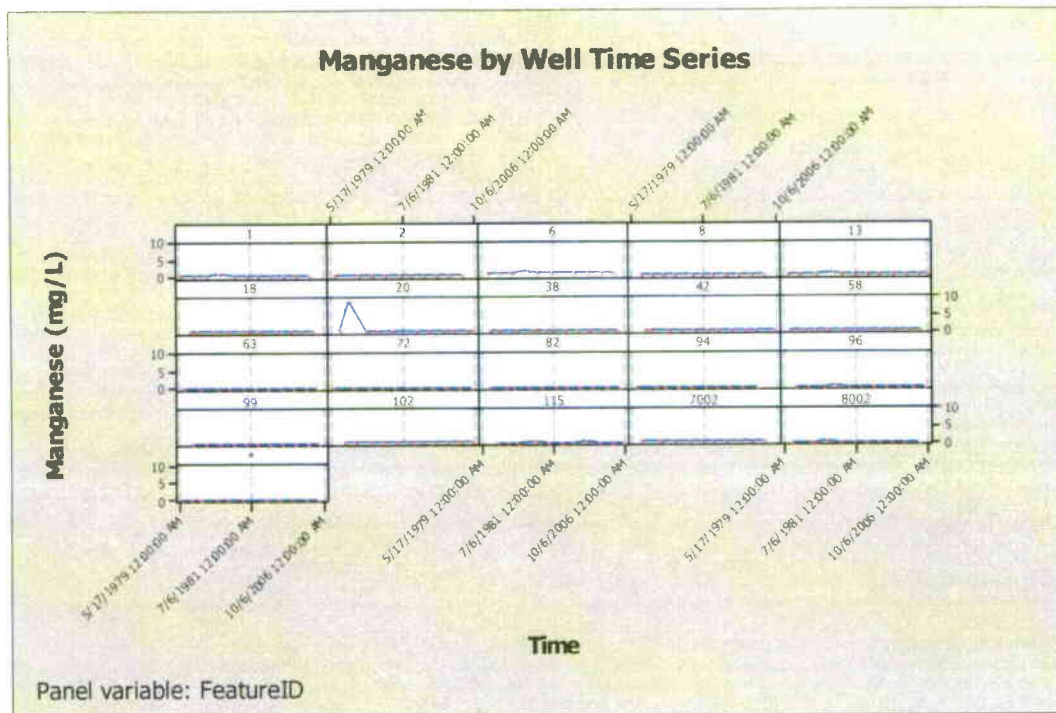
8	11	0.09000	101.9	-0.41
13	12	0.10500	119.0	0.54
18	11	0.08000	83.3	-1.42
20	11	0.04000	52.5	-3.08
38	11	0.08000	86.0	-1.27
42	11	0.09000	93.0	-0.89
58	11	0.09000	88.1	-1.15
63	11	0.05000	39.4	-3.78
72	11	0.03000	10.6	-5.33
82	11	0.04000	35.2	-4.01
94	10	0.10000	117.5	0.41
96	11	0.13000	139.0	1.59
99	11	0.05000	39.3	-3.79
102	11	0.37000	194.2	4.57
115	11	0.23000	176.0	3.59
7002	11	0.38000	196.0	4.67
8002	11	0.18000	162.1	2.84
Overall	218		109.5	

H = 174.57 DF = 19 P = 0.000

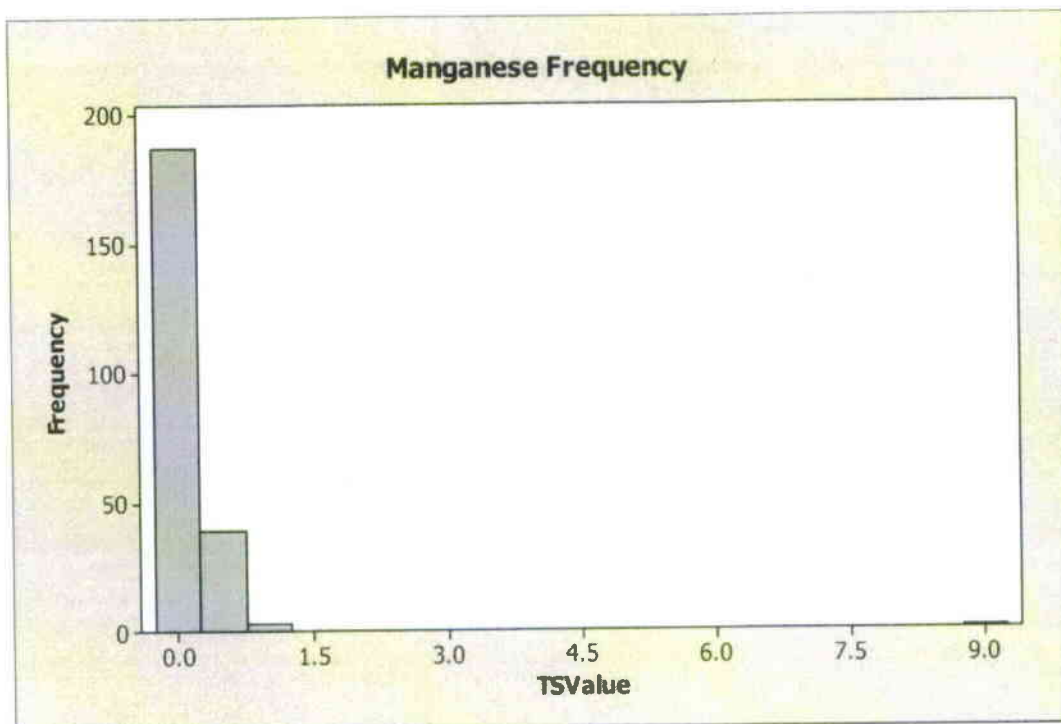
H = 175.09 DF = 19 P = 0.000 (adjusted for ties)











#### MANGANESE BY AQUIFER RESULTS

##### Kruskal-Wallis Test: TSValue versus Aquifer

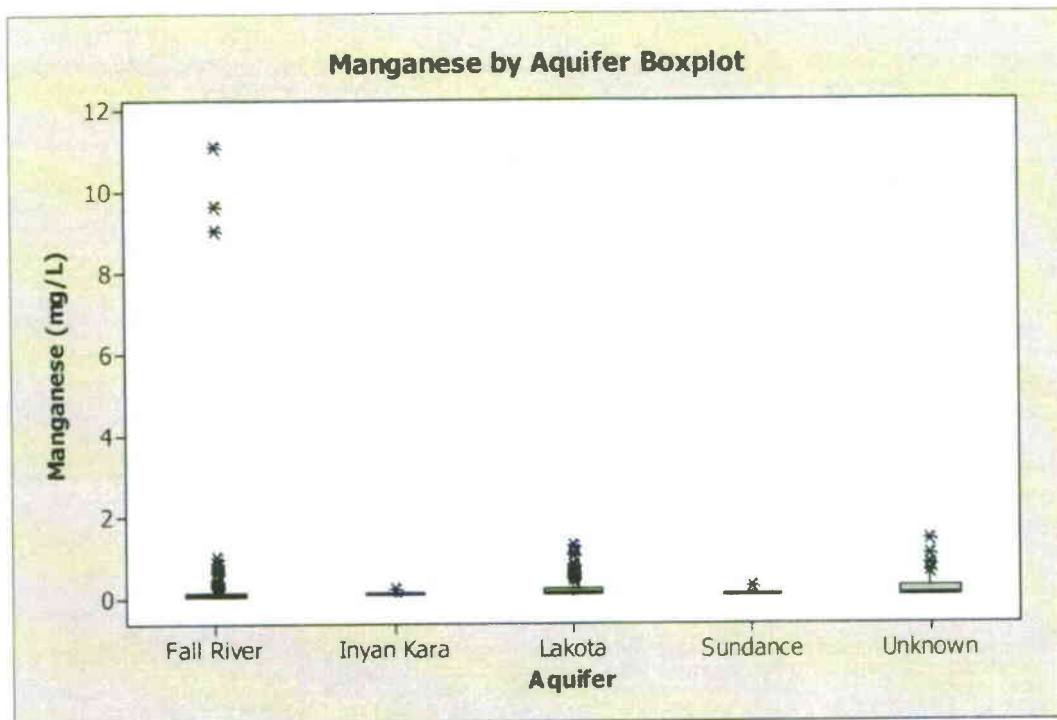
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.06000	194.4	-4.15
Inyan Kara	16	0.09000	217.3	-0.45
Lakota	217	0.12000	274.4	6.40
Sundance	16	0.05000	139.7	-2.81
Unknown	66	0.06000	202.9	-1.91
Overall	463		232.0	

H = 44.43 DF = 4 P = 0.000

H = 44.55 DF = 4 P = 0.000 (adjusted for ties)





## NITROGEN BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

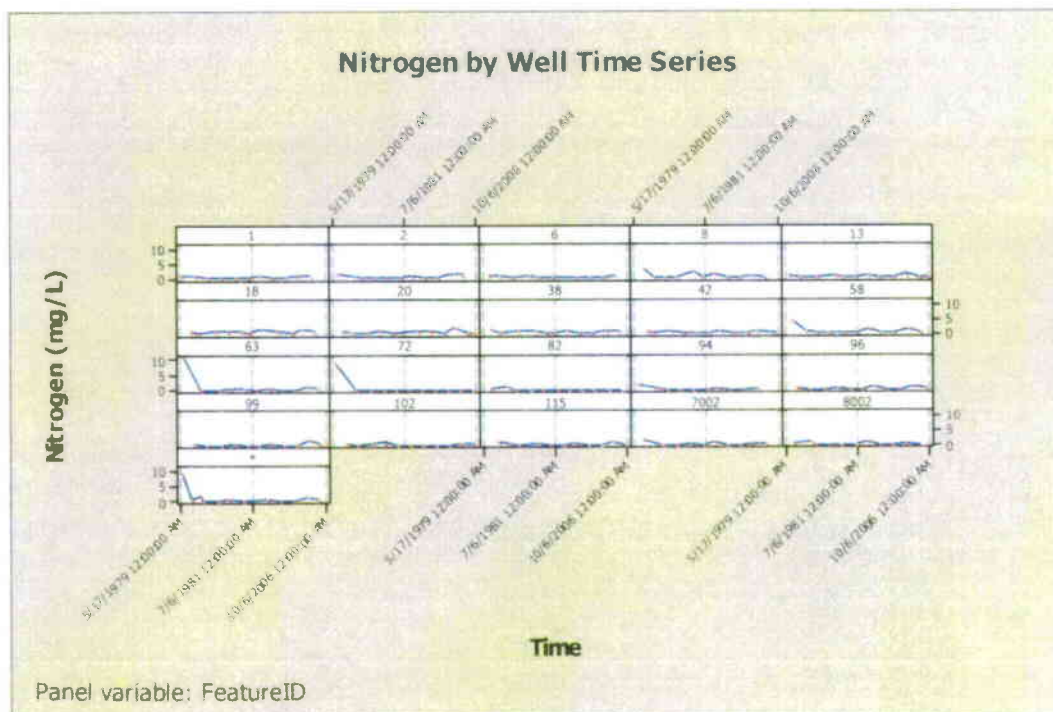
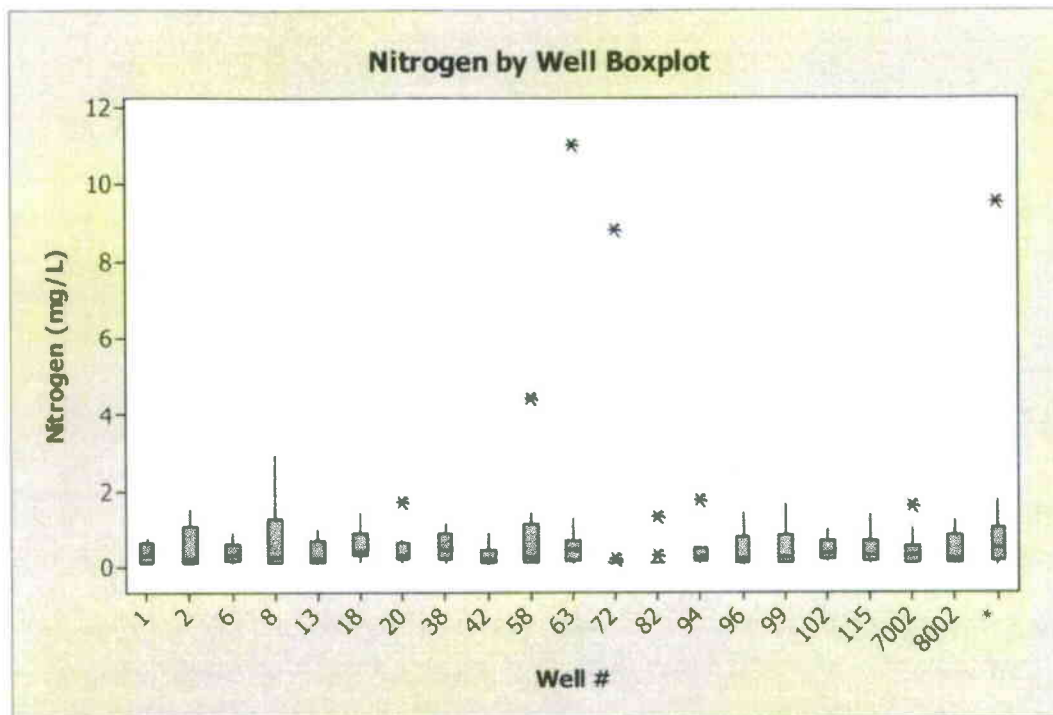
218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

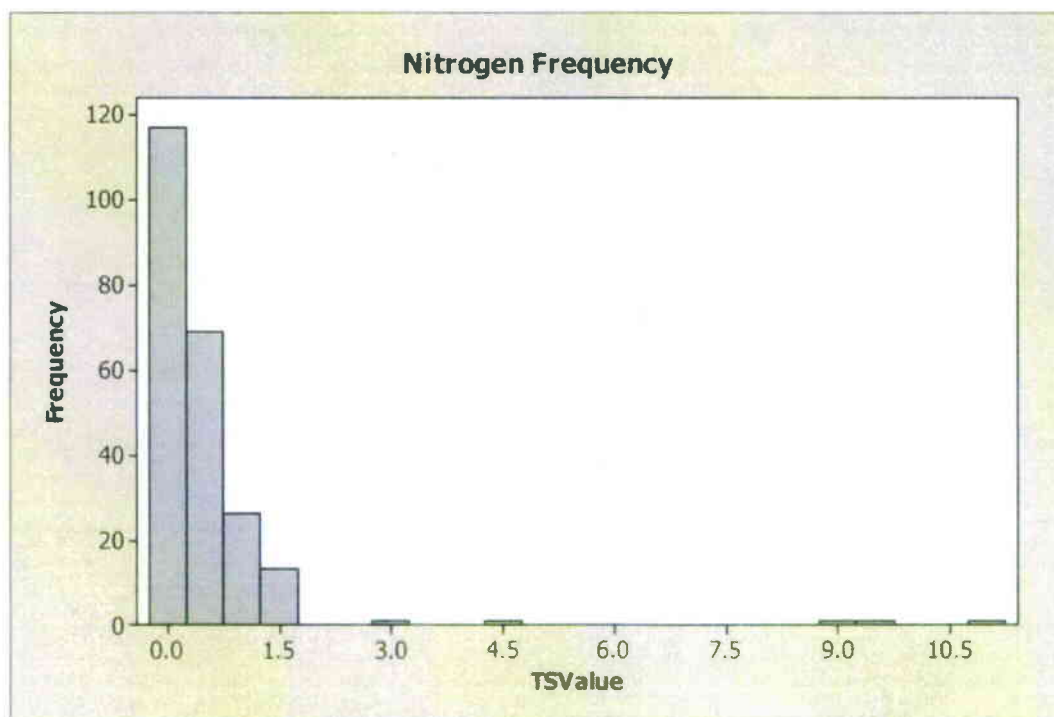
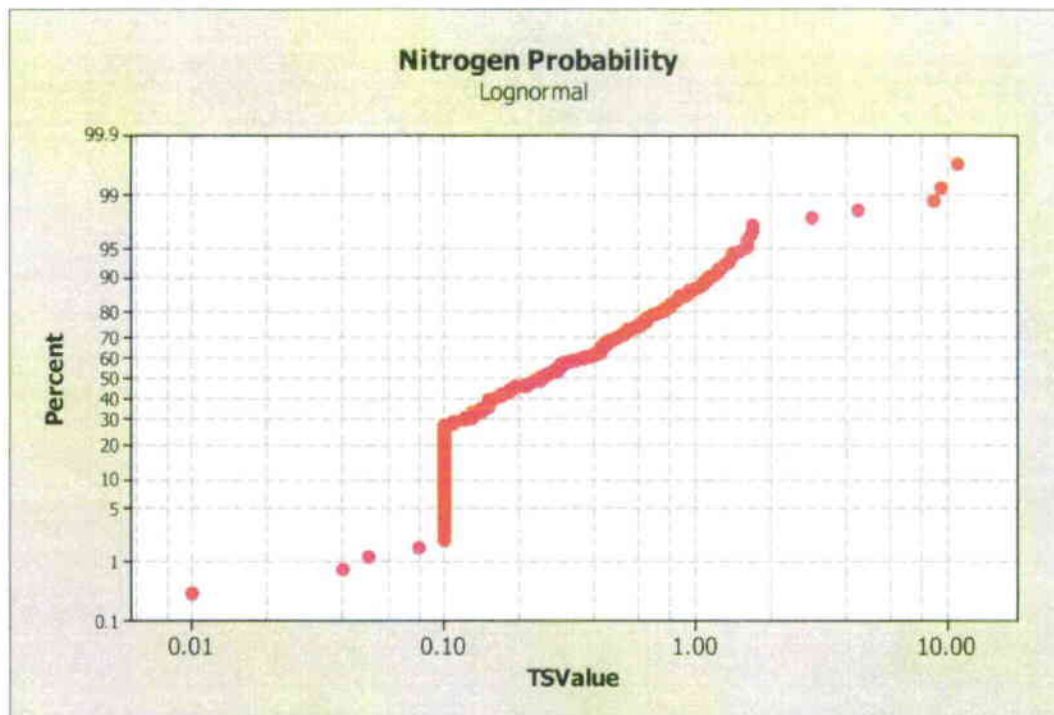
FeatureID	N	Median	Ave Rank	Z
1	11	0.2900	111.8	0.13
2	10	0.1800	112.4	0.15
6	10	0.2650	113.8	0.22
8	11	0.2400	120.6	0.60
13	12	0.1750	97.7	-0.67
18	11	0.3600	140.2	1.66
20	11	0.2900	124.0	0.78
38	11	0.4200	131.0	1.16
42	11	0.1700	92.0	-0.94
58	11	0.2100	112.6	0.17
63	11	0.4200	120.8	0.61
72	11	0.1000	56.0	-2.88
82	11	0.1000	57.3	-2.82
94	10	0.2300	109.8	0.02
96	11	0.1900	112.1	0.14
99	11	0.2300	117.3	0.42
102	11	0.3000	128.5	1.03
115	11	0.2600	115.5	0.32
7002	11	0.2900	113.7	0.23
8002	11	0.1700	104.6	-0.26
Overall	218		109.5	



H = 23.36 DF = 19 P = 0.222  
H = 23.89 DF = 19 P = 0.201 (adjusted for ties)









## NITROGEN BY AQUIFER RESULTS

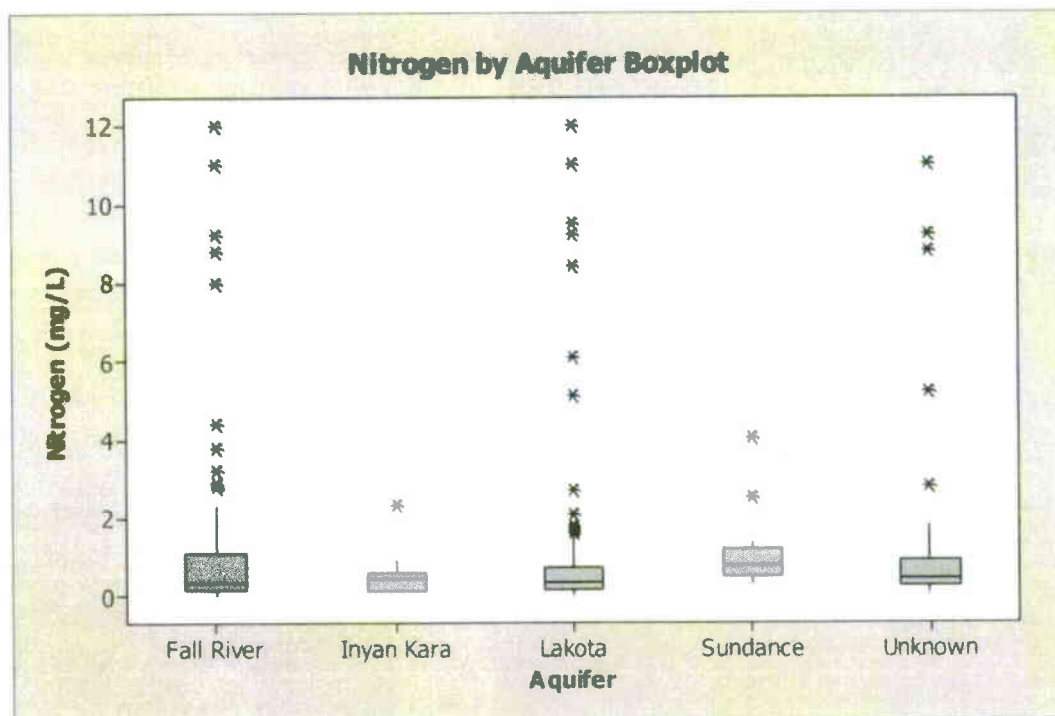
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.3350	230.9	-0.12
Inyan Kara	16	0.4050	213.9	-0.55
Lakota	217	0.3200	219.6	-1.88
Sundance	16	0.7750	331.6	3.03
Unknown	66	0.4150	255.6	1.55
Overall	463		232.0	

H = 13.09 DF = 4 P = 0.011

H = 13.16 DF = 4 P = 0.011 (adjusted for ties)



## SODIUM BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

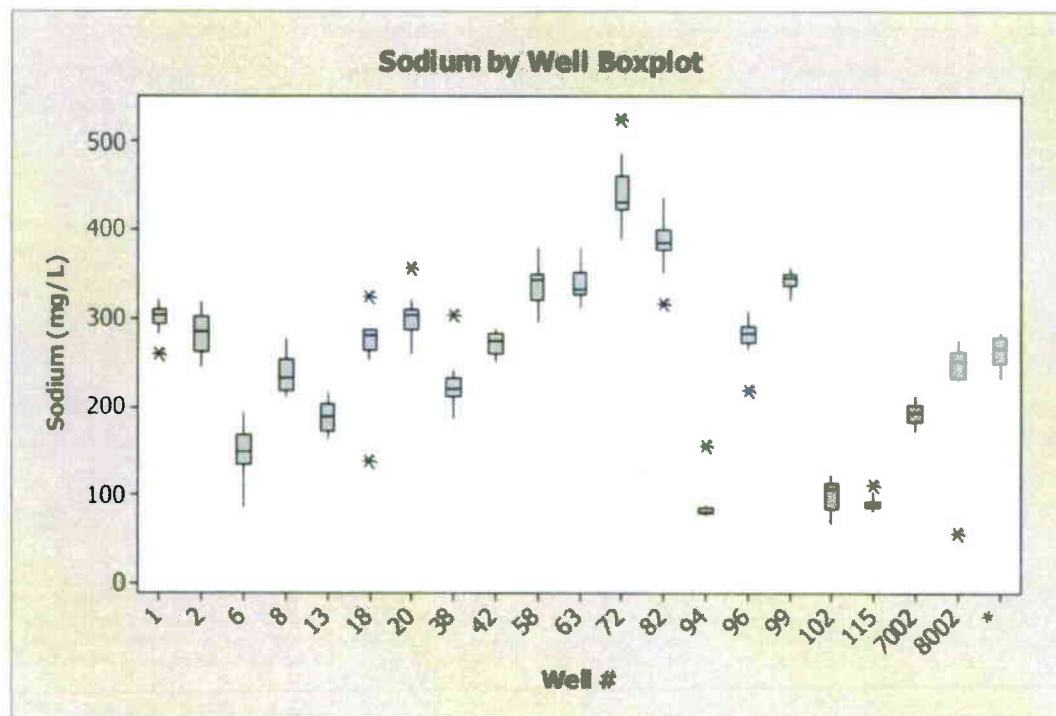
FeatureID	N	Median	Ave Rank	Z
1	11	304.00	145.1	1.92
2	10	284.00	127.0	0.90
6	10	147.50	39.2	-3.61



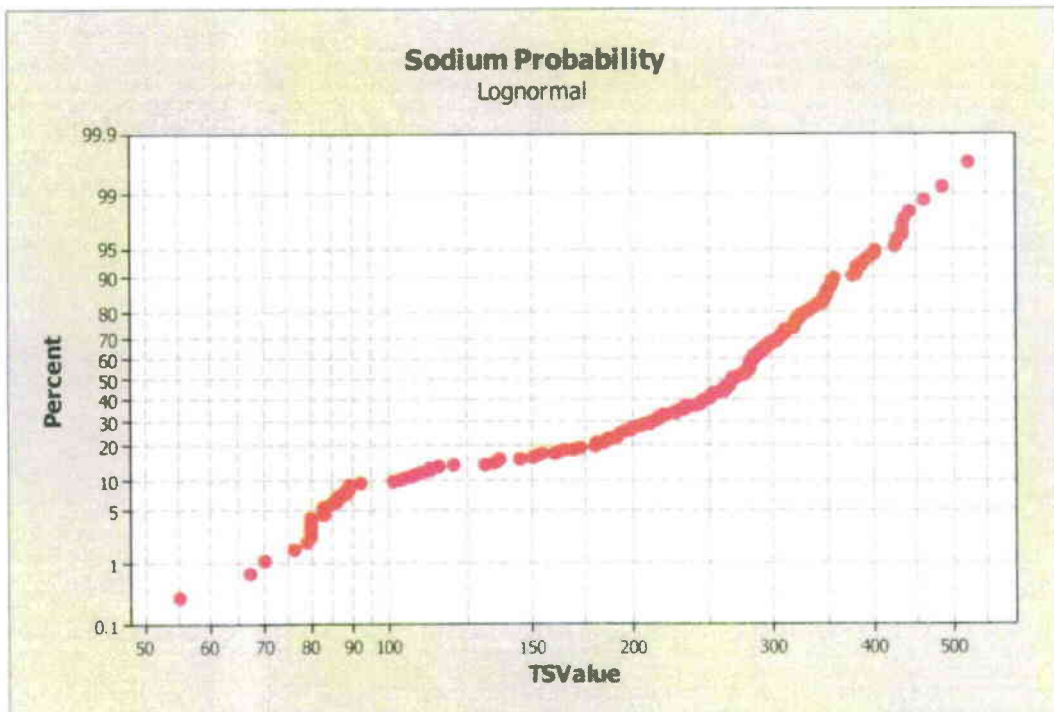
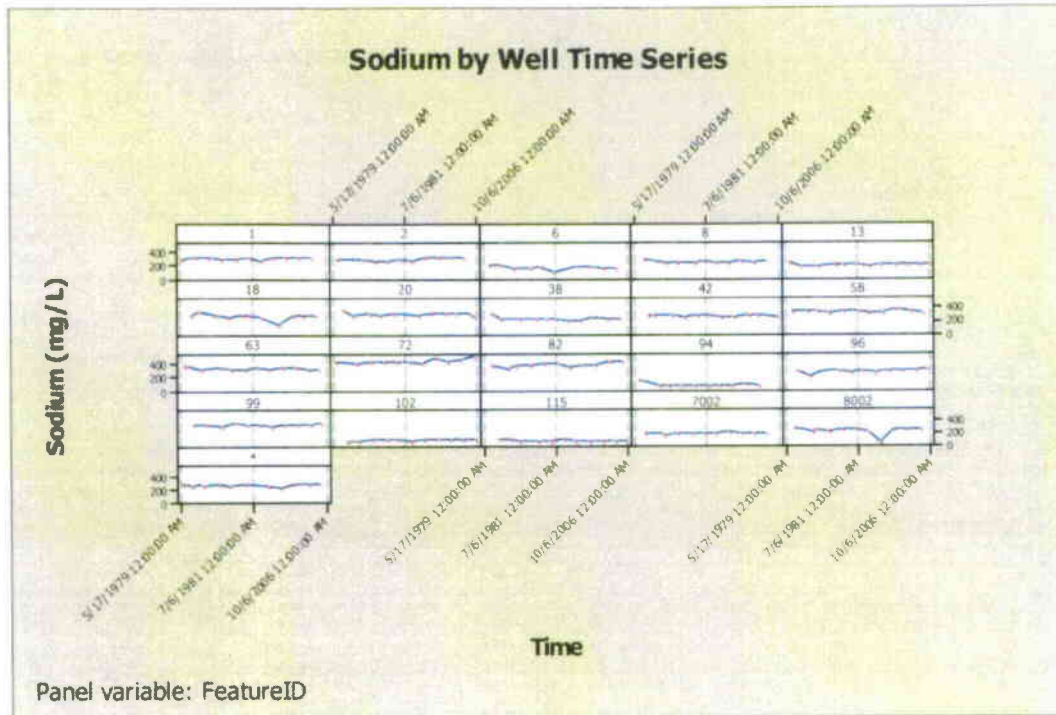
8	11	232.00	87.3	-1.20
13	12	188.00	55.6	-3.04
18	11	280.00	116.3	0.37
20	11	303.00	146.5	2.00
38	11	220.00	80.7	-1.56
42	11	274.00	113.7	0.23
58	11	343.00	176.1	3.60
63	11	333.00	179.5	3.77
72	11	432.00	211.5	5.50
82	11	386.00	199.1	4.83
94	10	80.00	12.7	-4.97
96	11	283.00	125.2	0.85
99	11	346.00	181.9	3.91
102	11	107.00	22.6	-4.69
115	11	89.00	19.1	-4.88
7002	11	192.00	56.4	-2.87
8002	11	250.00	85.9	-1.27
Overall	218		109.5	

H = 201.40 DF = 19 P = 0.000

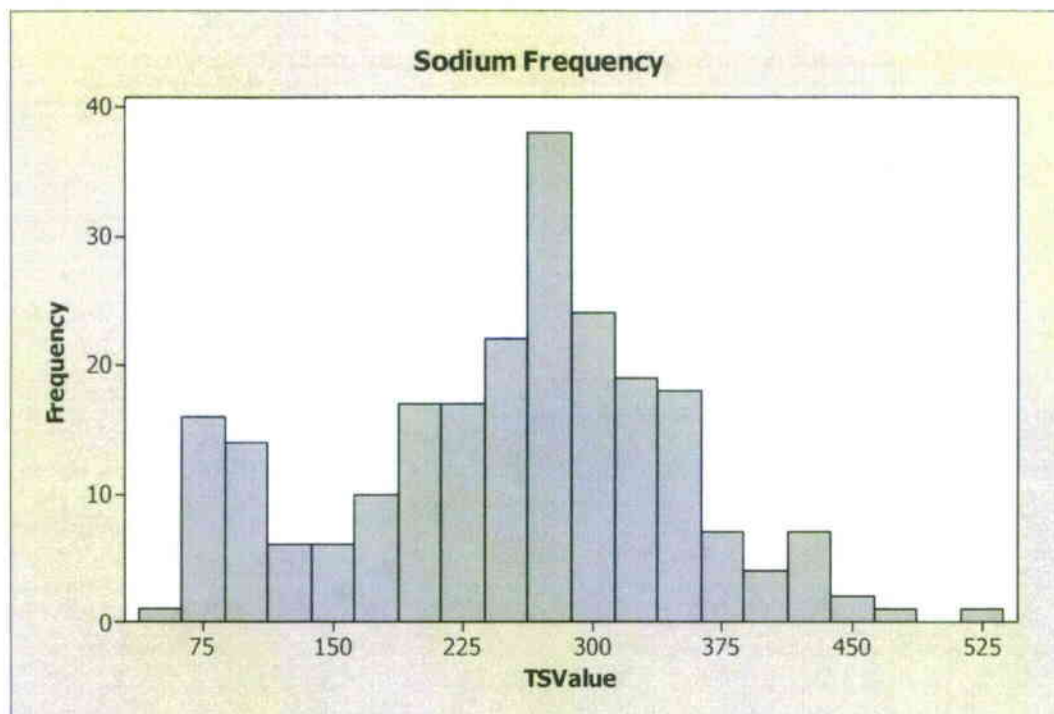
H = 201.42 DF = 19 P = 0.000 (adjusted for ties)











## SODIUM BY AQUIFER RESULTS

### Kruskal-Wallis Test: TSValue versus Aquifer

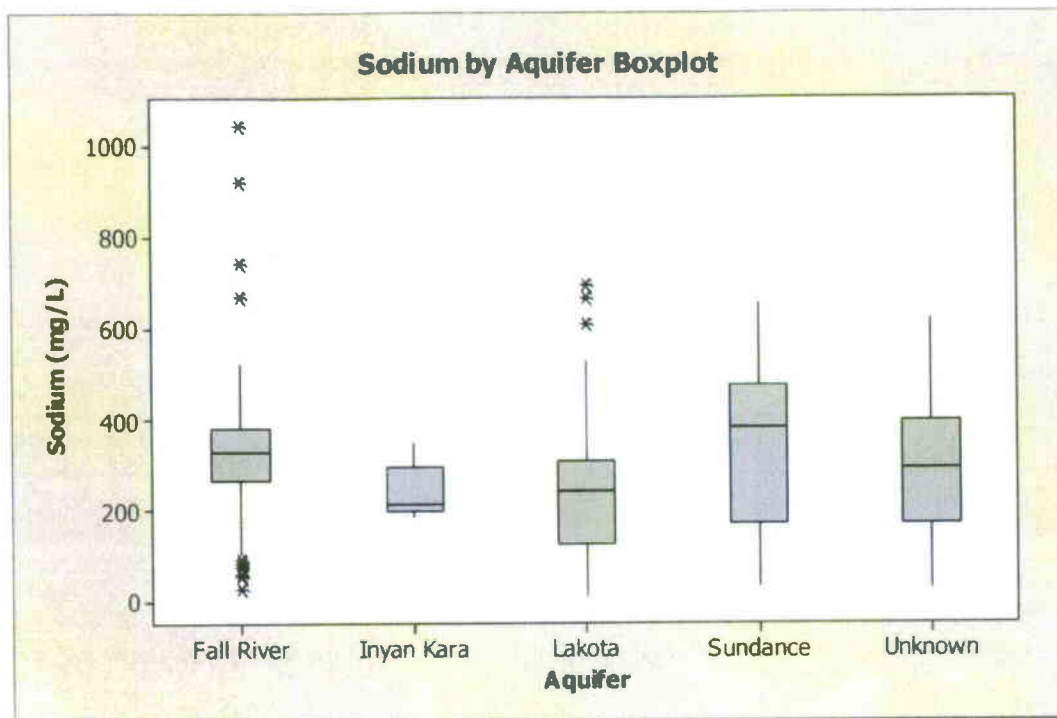
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	325.5	291.4	6.55
Inyan Kara	16	212.5	186.8	-1.37
Lakota	217	240.0	188.0	-6.64
Sundance	16	379.0	287.0	1.67
Unknown	66	290.0	240.9	0.59
Overall	463		232.0	

H = 57.49 DF = 4 P = 0.000

H = 57.49 DF = 4 P = 0.000 (adjusted for ties)





### LEAD BY WELL RESULTS

#### Kruskal-Wallis Test: TSValue versus FeatureID

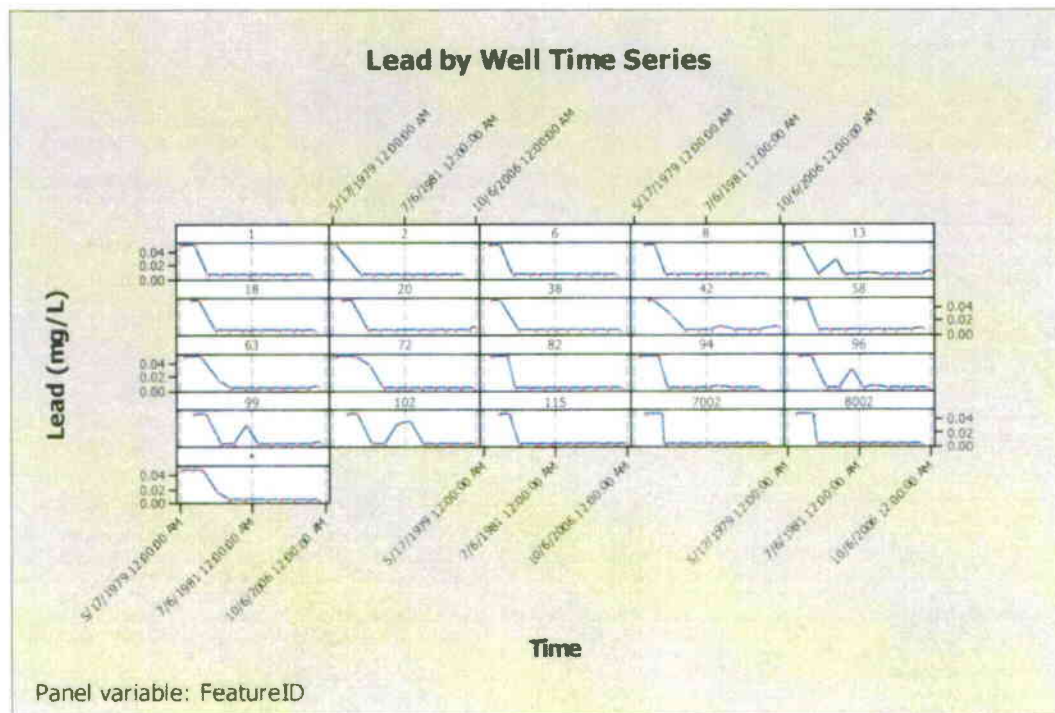
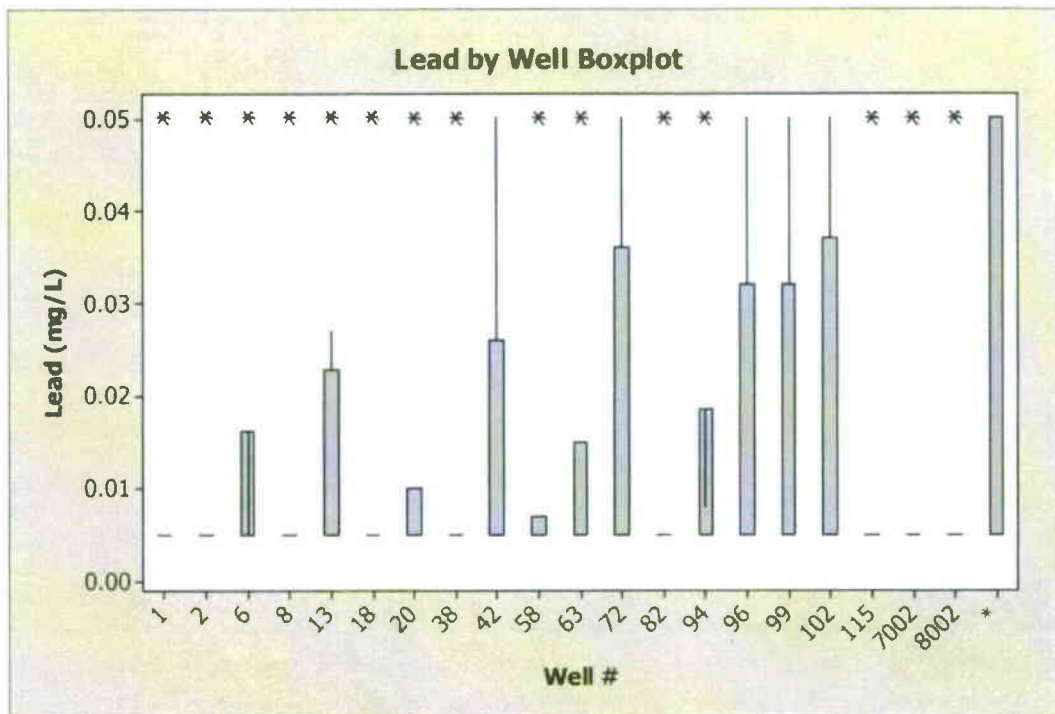
218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

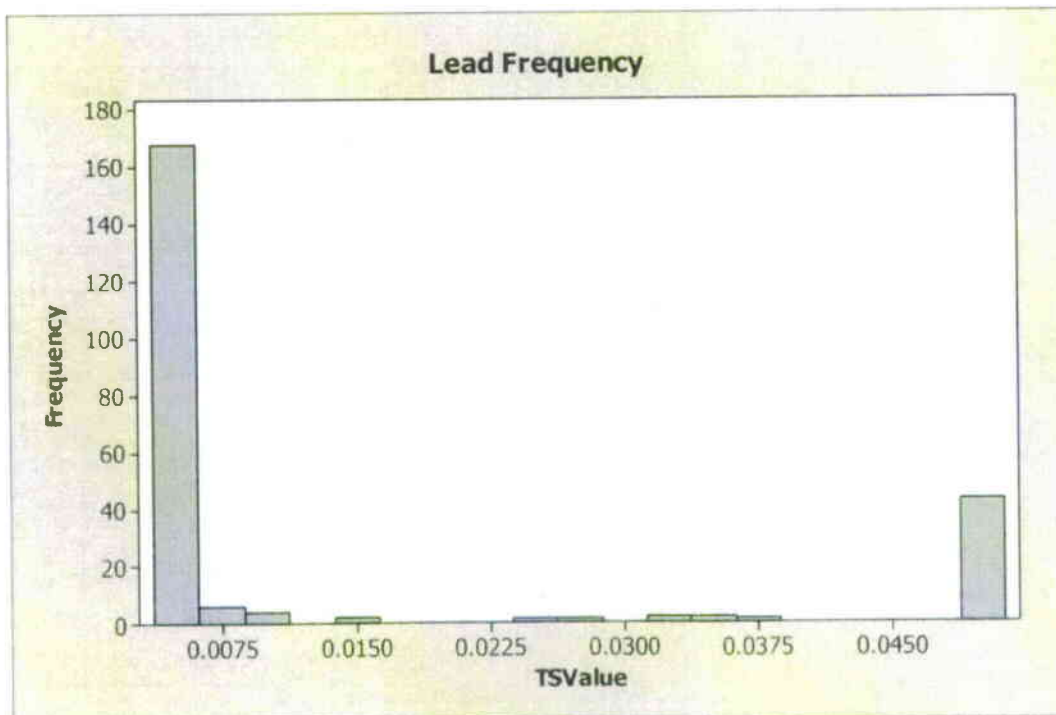
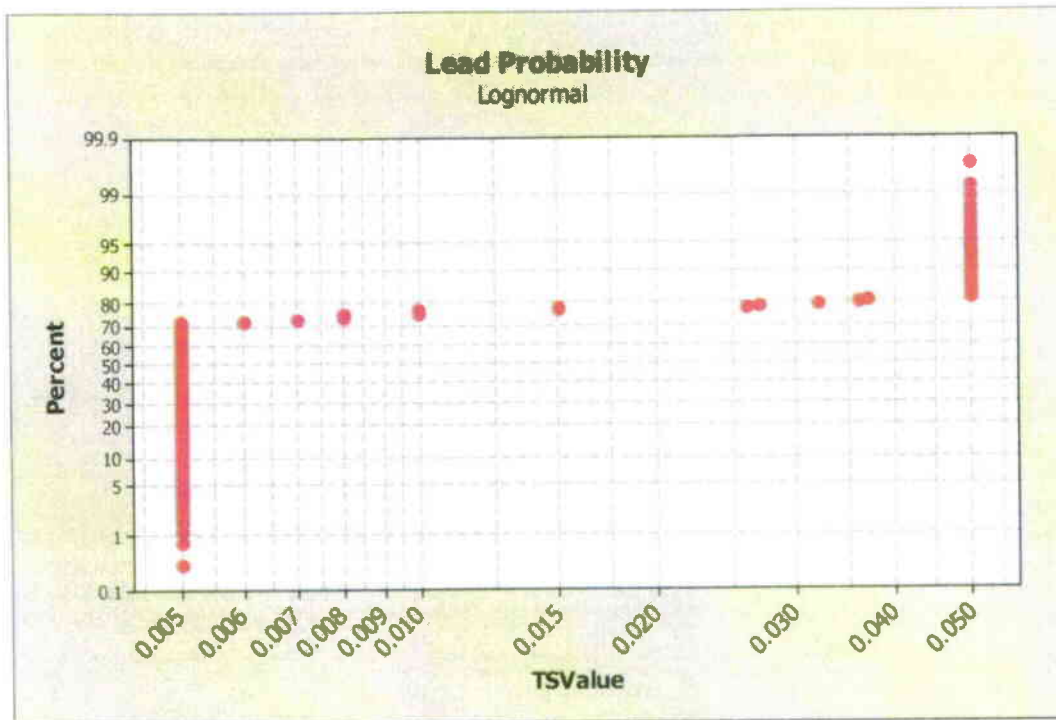
FeatureID	N	Median	Ave Rank	Z
1	11	0.005000	102.0	-0.40
2	10	0.005000	92.4	-0.88
6	10	0.005000	104.2	-0.27
8	11	0.005000	102.0	-0.40
13	12	0.005000	122.5	0.74
18	11	0.005000	102.0	-0.40
20	11	0.005000	117.5	0.43
38	11	0.005000	102.0	-0.40
42	11	0.005000	126.6	0.92
58	11	0.005000	109.5	0.00
63	11	0.005000	117.8	0.45
72	11	0.005000	110.9	0.07
82	11	0.005000	102.0	-0.40
94	10	0.005000	112.7	0.16
96	11	0.005000	118.4	0.48
99	11	0.005000	118.4	0.48
102	11	0.005000	119.8	0.56
115	11	0.005000	102.0	-0.40
7002	11	0.005000	102.0	-0.40
8002	11	0.005000	102.0	-0.40
Overall	218		109.5	



$N = 4.49$   $DF = 19$   $P = 1.000$   
 $N = 7.50$   $DF = 19$   $P = 0.991$  (adjusted for ties)









## LEAD BY AQUIFER RESULTS

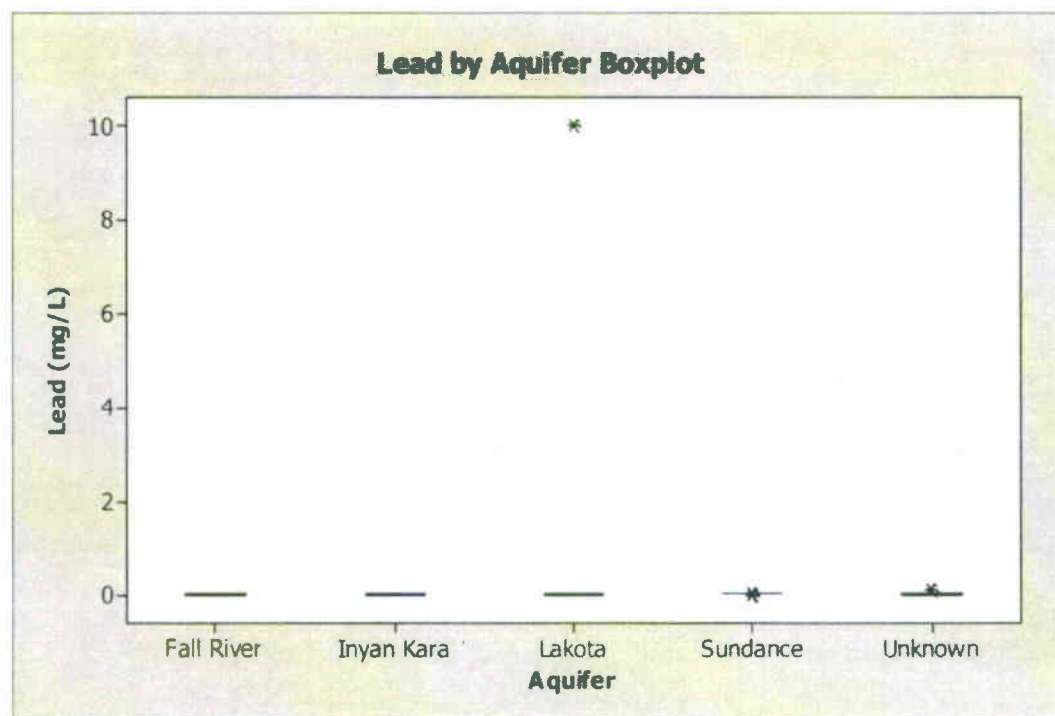
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.040500	233.2	0.13
Inyan Kara	16	0.023500	227.1	-0.15
Lakota	217	0.005000	206.7	-3.82
Sundance	16	0.050000	328.5	2.94
Unknown	66	0.050000	290.3	3.83
Overall	463		232.0	

H = 28.68 DF = 4 P = 0.000

H = 35.65 DF = 4 P = 0.000 (adjusted for ties)



## pH BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

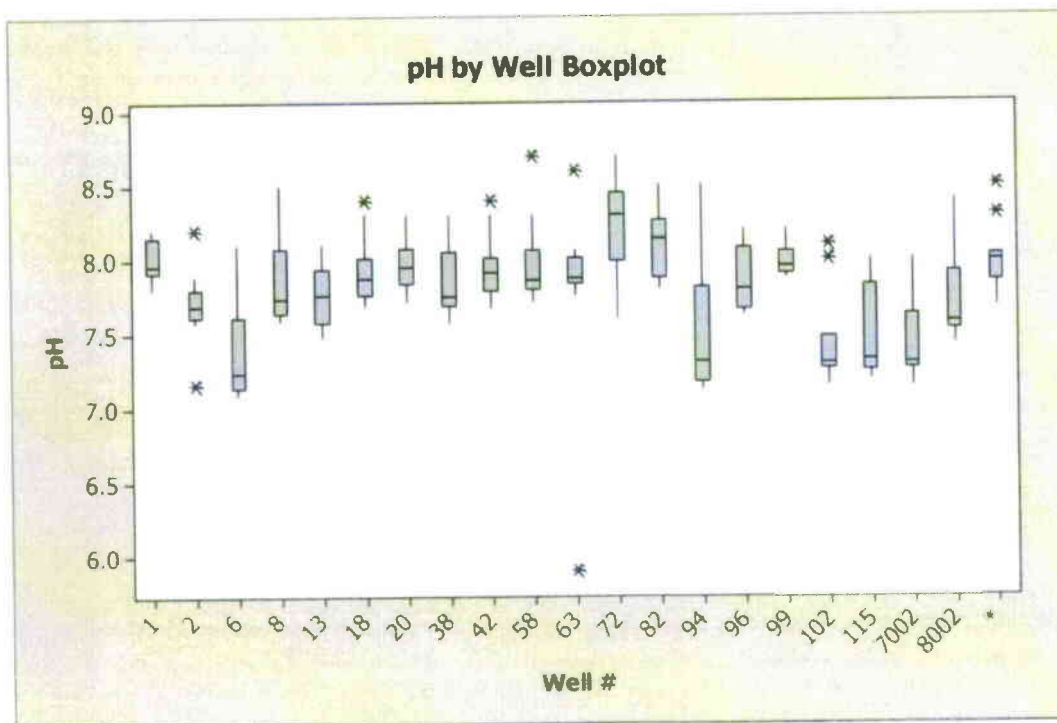
Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	7.960	149.5	2.16
2	10	7.690	83.2	-1.35
6	10	7.240	40.2	-3.56

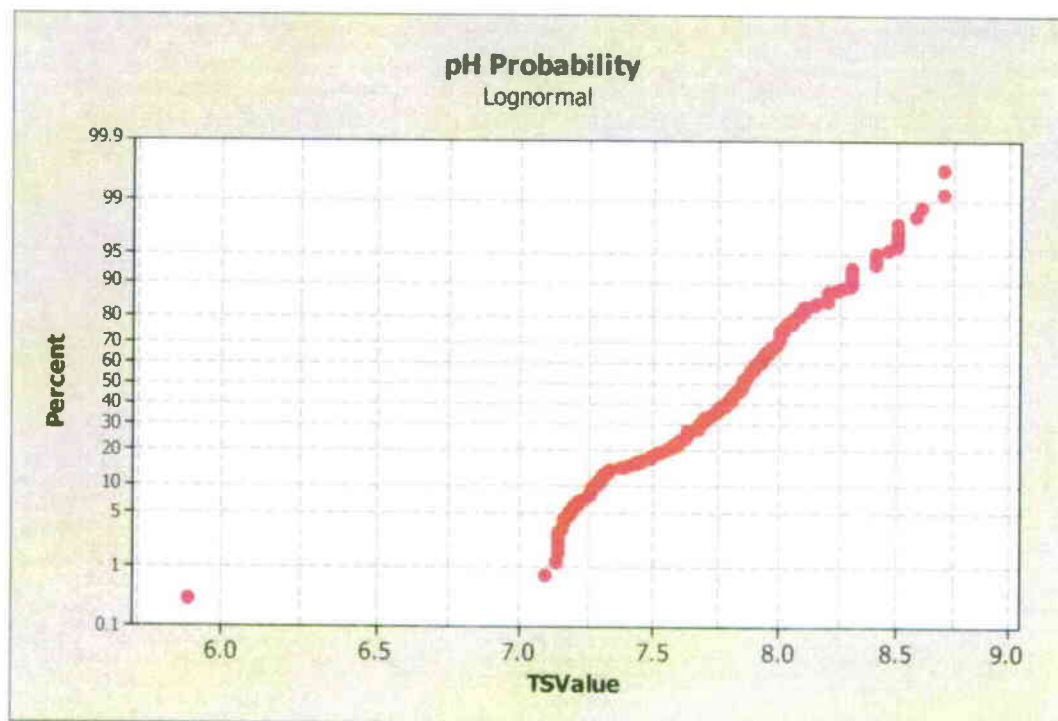
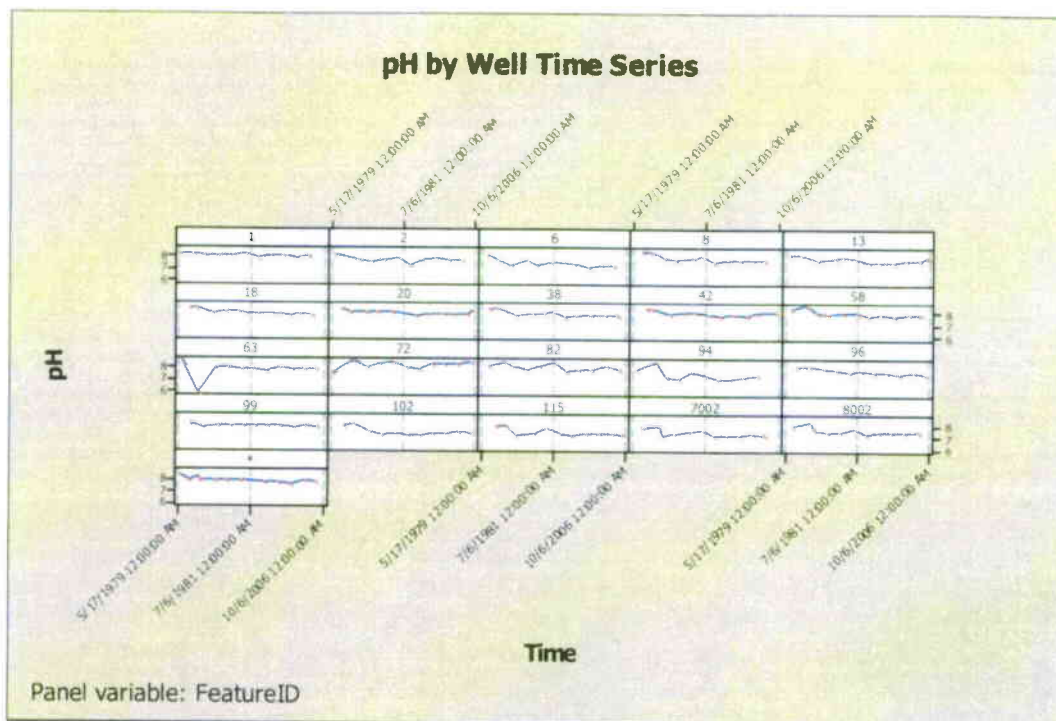


8	11	7.740	110.5	0.05
13	12	7.770	101.4	-0.46
18	11	7.880	131.3	1.17
20	11	7.950	142.6	1.79
38	11	7.750	114.8	0.29
42	11	7.920	136.0	1.43
58	11	7.870	137.3	1.50
63	11	7.880	126.3	0.91
72	11	8.300	176.7	3.63
82	11	8.140	163.3	2.90
94	10	7.310	56.4	-2.73
96	11	7.800	115.3	0.31
99	11	7.950	154.5	2.43
102	11	7.300	52.5	-3.07
115	11	7.320	57.7	-2.79
7002	11	7.300	47.4	-3.35
8002	11	7.570	86.3	-1.58
Overall	218		109.5	

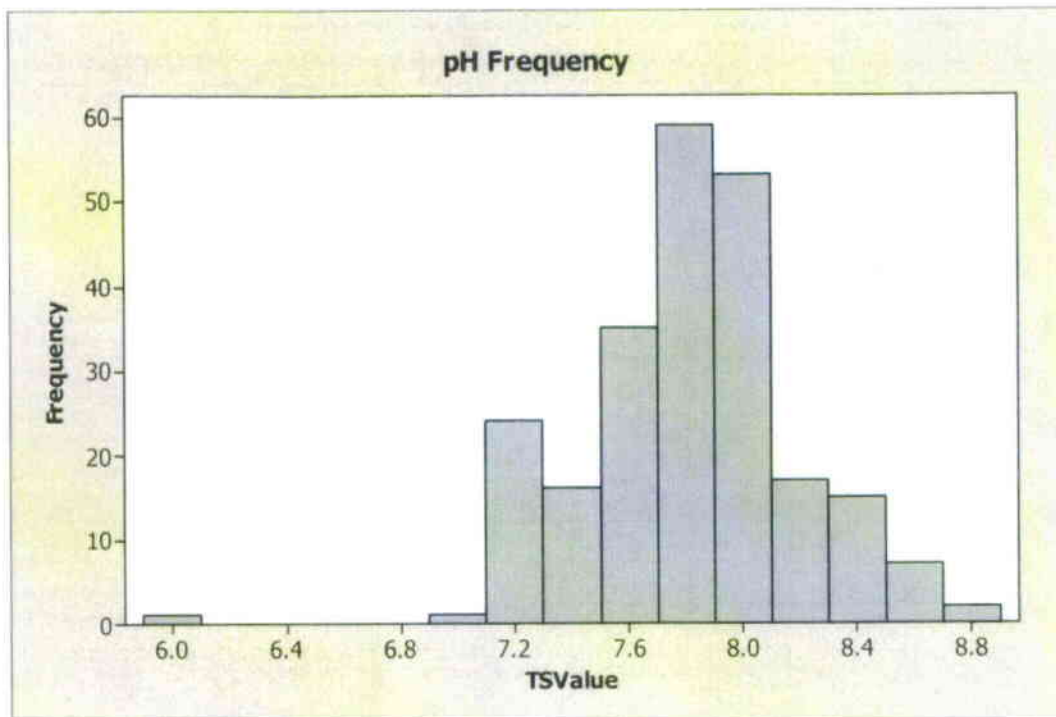
H = 90.41 DF = 19 P = 0.000  
H = 90.44 DF = 19 P = 0.000 (adjusted for ties)











### pH BY AQUIFER RESULTS

#### Kruskal-Wallis Test: TSValue versus Aquifer

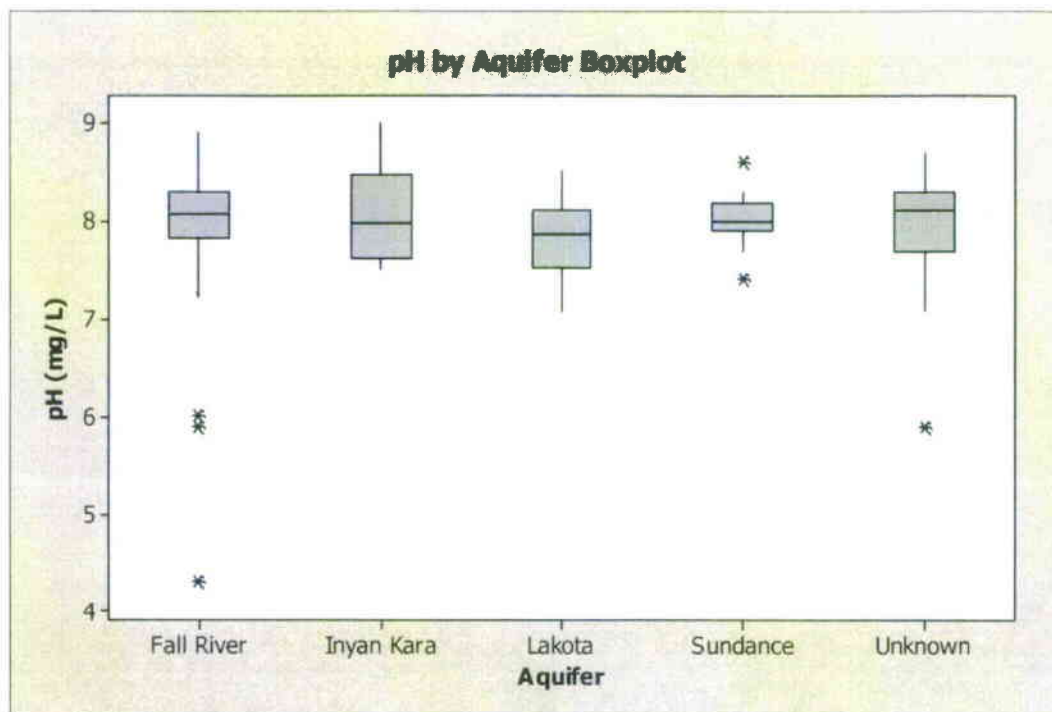
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	8.065	272.5	4.47
Inyan Kara	16	7.985	260.8	0.88
Lakota	217	7.860	193.1	-5.88
Sundance	16	8.000	263.2	0.95
Unknown	66	8.100	254.5	1.48
Overall	463		232.0	

H = 35.42 DF = 4 P = 0.000

H = 35.49 DF = 4 P = 0.000 (adjusted for ties)





## PHOSPHATE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

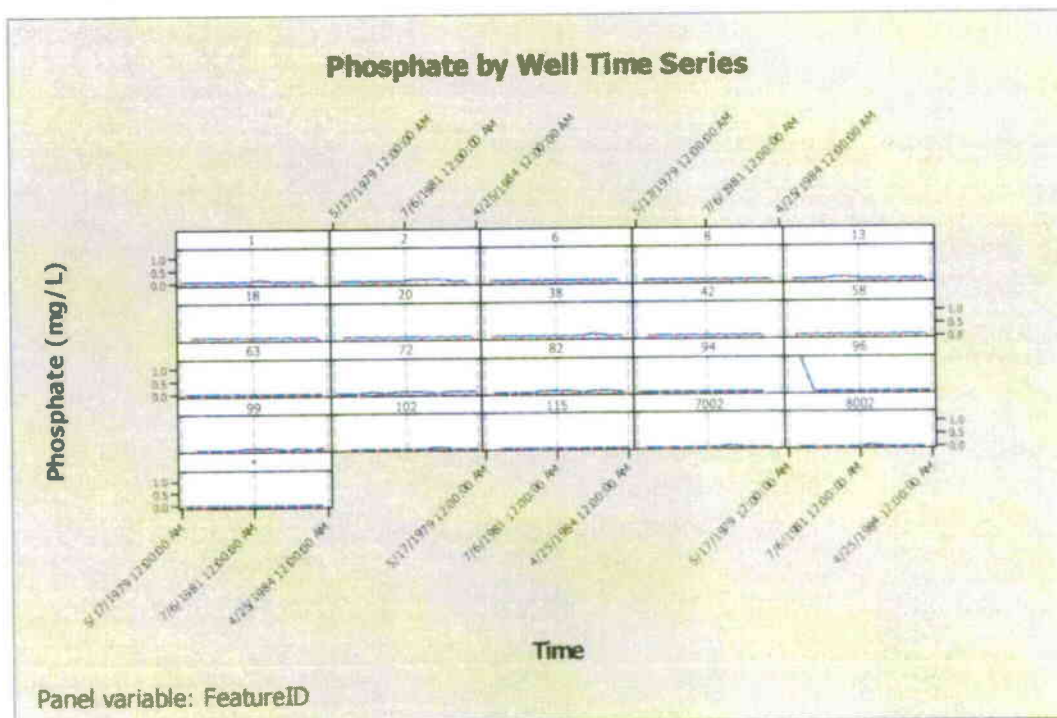
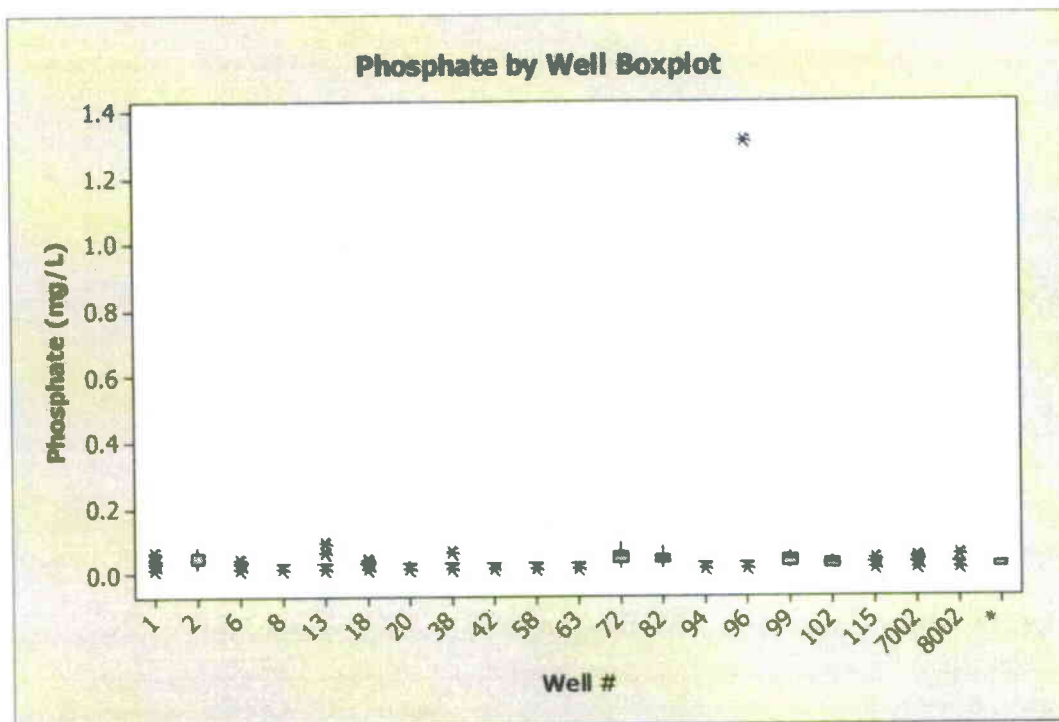
215 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

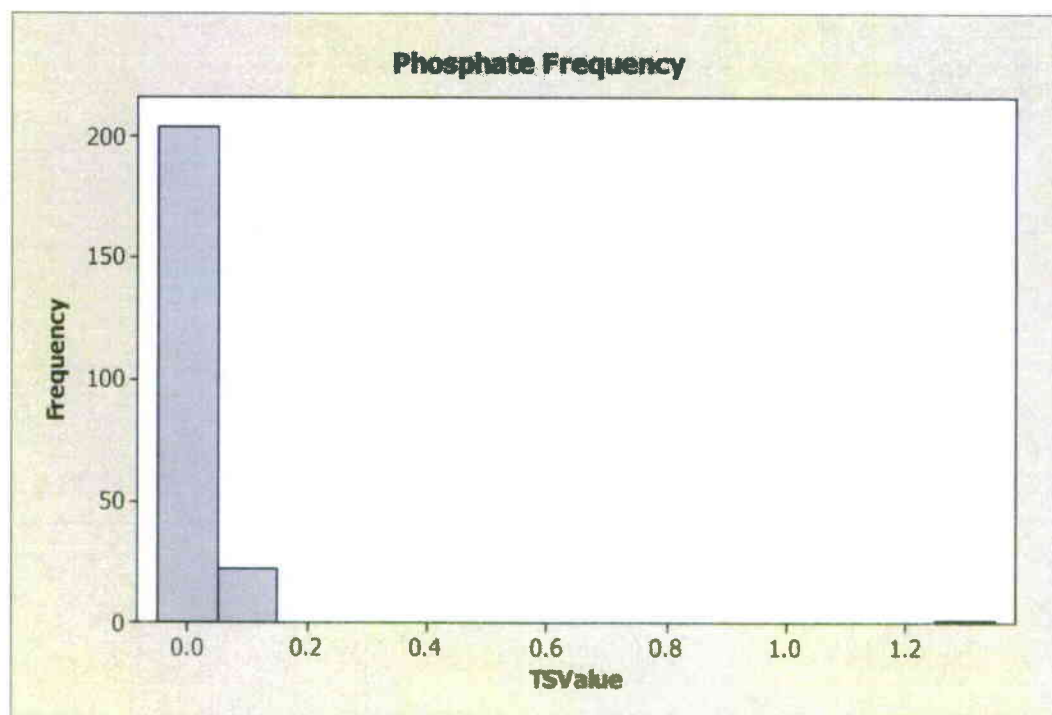
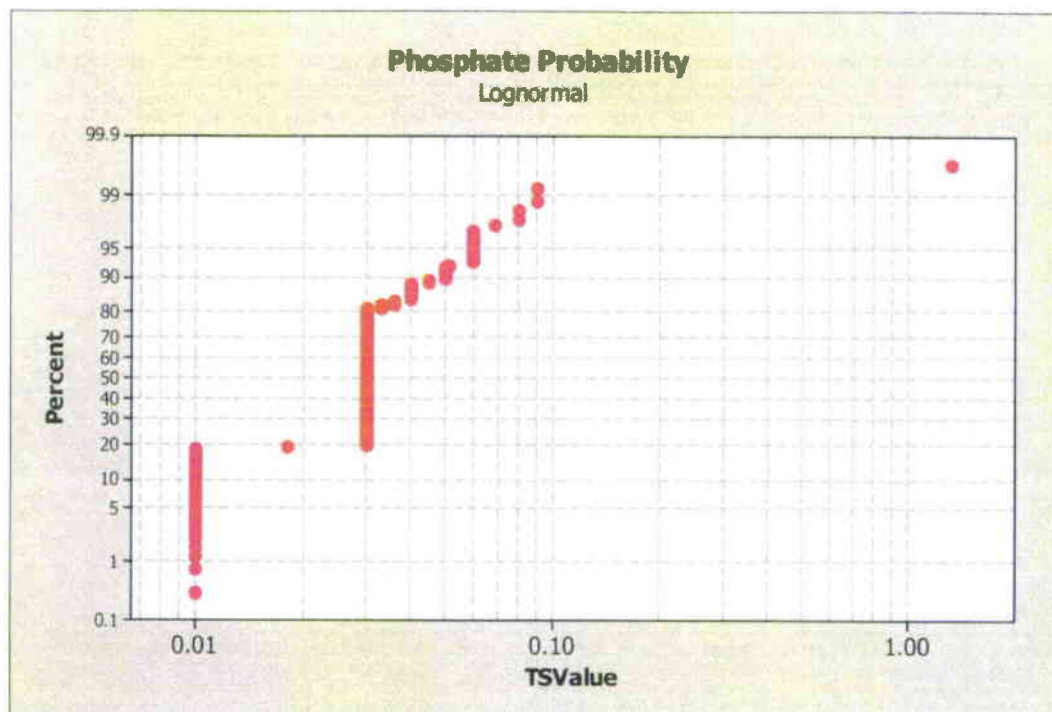
FeatureID	N	Median	Ave Rank	Z
1	11	0.03000	107.1	-0.05
2	10	0.03000	136.6	1.49
6	10	0.03000	105.4	-0.14
8	11	0.03000	91.2	-0.92
13	11	0.03000	109.7	0.09
18	11	0.03000	104.5	-0.19
20	10	0.03000	96.4	-0.60
38	11	0.03000	100.0	-0.44
42	10	0.03000	89.6	-0.96
58	11	0.03000	91.2	-0.92
63	11	0.03000	91.2	-0.92
72	11	0.05000	157.1	2.69
82	11	0.03600	138.2	1.65
94	10	0.03000	89.6	-0.96
96	11	0.03000	101.0	-0.38
99	11	0.04000	140.5	1.78
102	11	0.03000	105.1	-0.16
115	11	0.03000	98.3	-0.53
7002	11	0.03000	106.0	-0.11
8002	11	0.03000	99.2	-0.48
Overall	215		108.0	



H = 19.99 DF = 19 P = 0.395  
H = 26.41 DF = 19 P = 0.119 (adjusted for ties)









## PHOSPHATE BY AQUIFER RESULTS

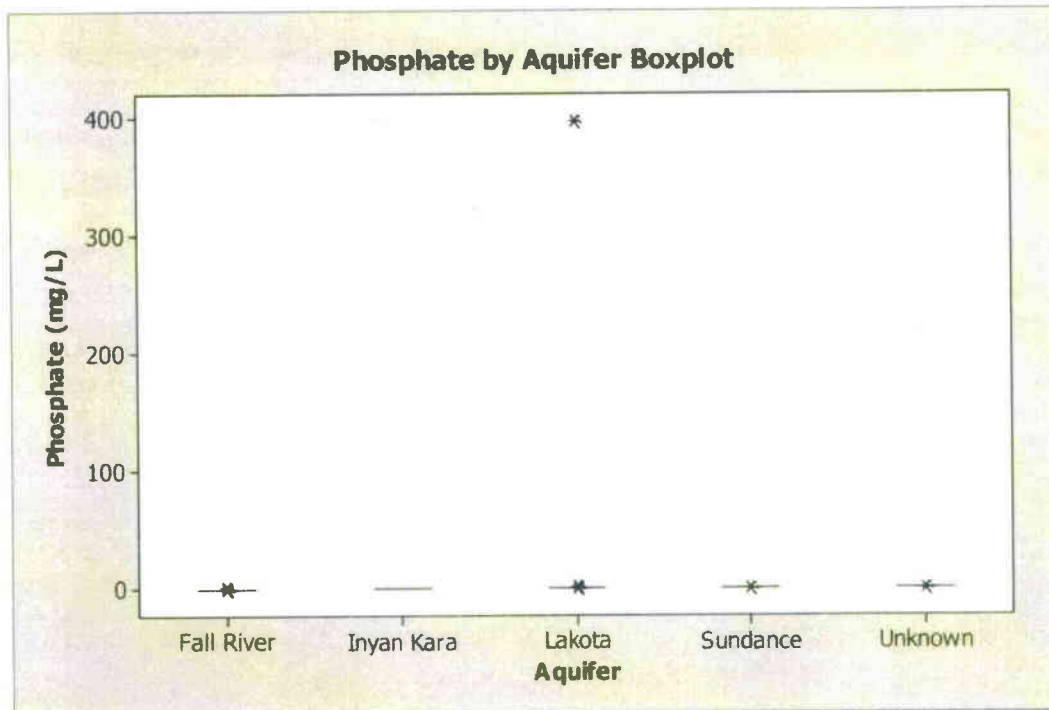
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	146	0.02800	231.5	0.23
Inyan Kara	16	0.03000	229.3	-0.01
Lakota	214	0.03000	253.8	3.69
Sundance	16	0.01000	127.3	-3.14
Unknown	66	0.01000	170.9	-3.89
Overall	458		229.5	

H = 29.76 DF = 4 P = 0.000

H = 35.34 DF = 4 P = 0.000 (adjusted for ties)



## SILICONE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

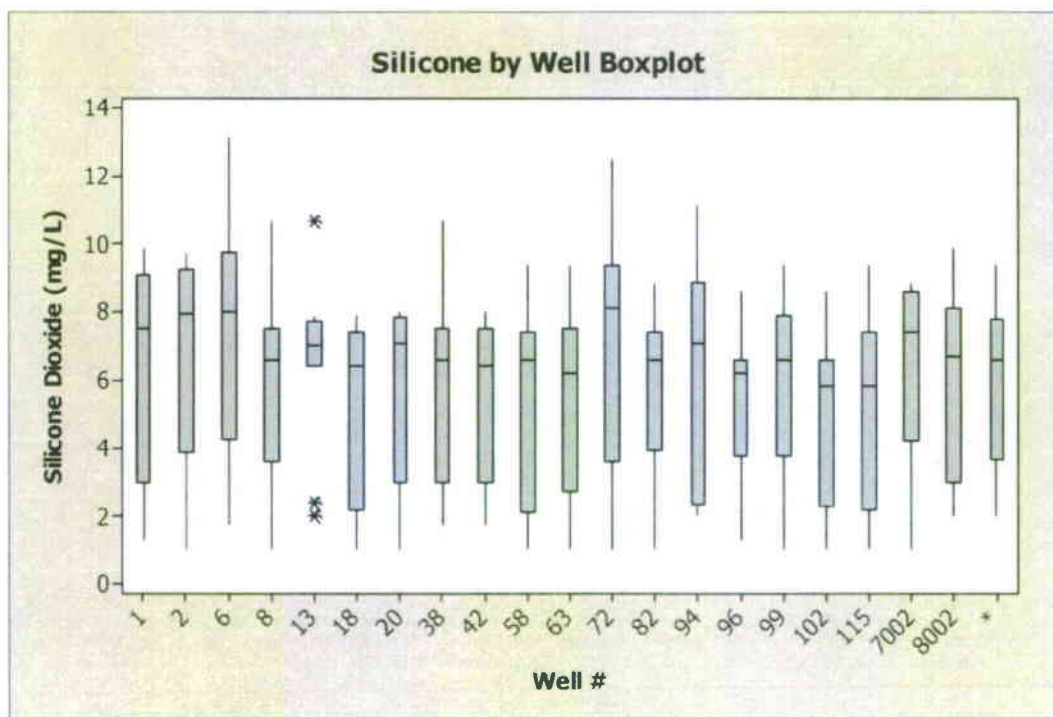
FeatureID	N	Median	Ave Rank	Z
1	11	7.500	122.9	0.72
2	10	7.950	131.9	1.15
6	10	8.000	143.7	1.75



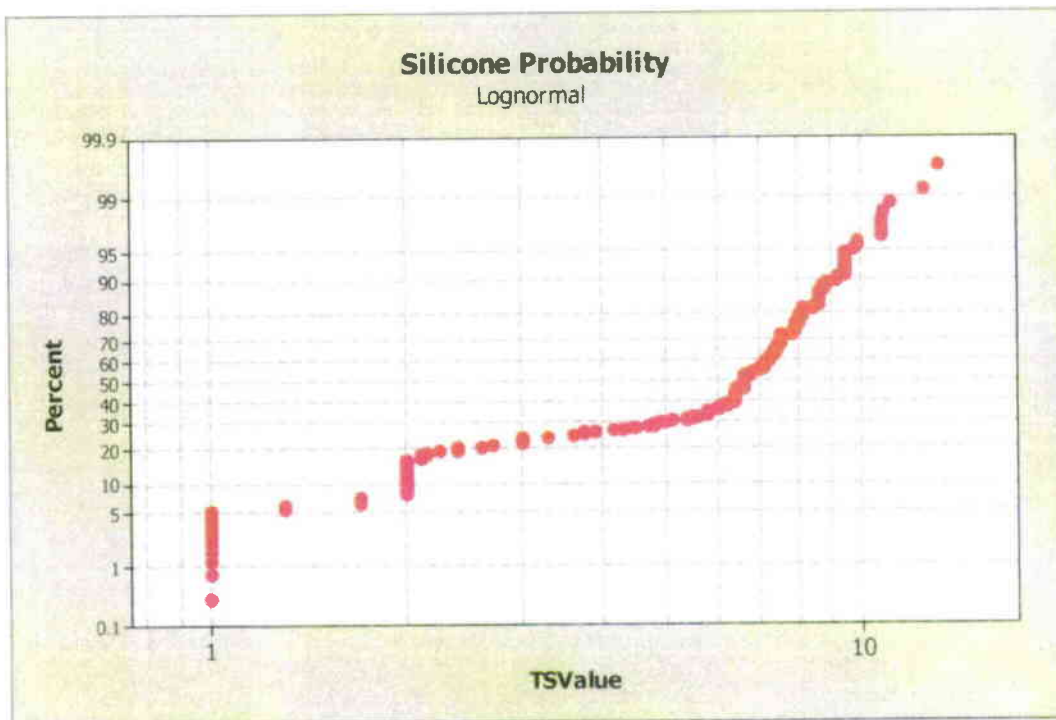
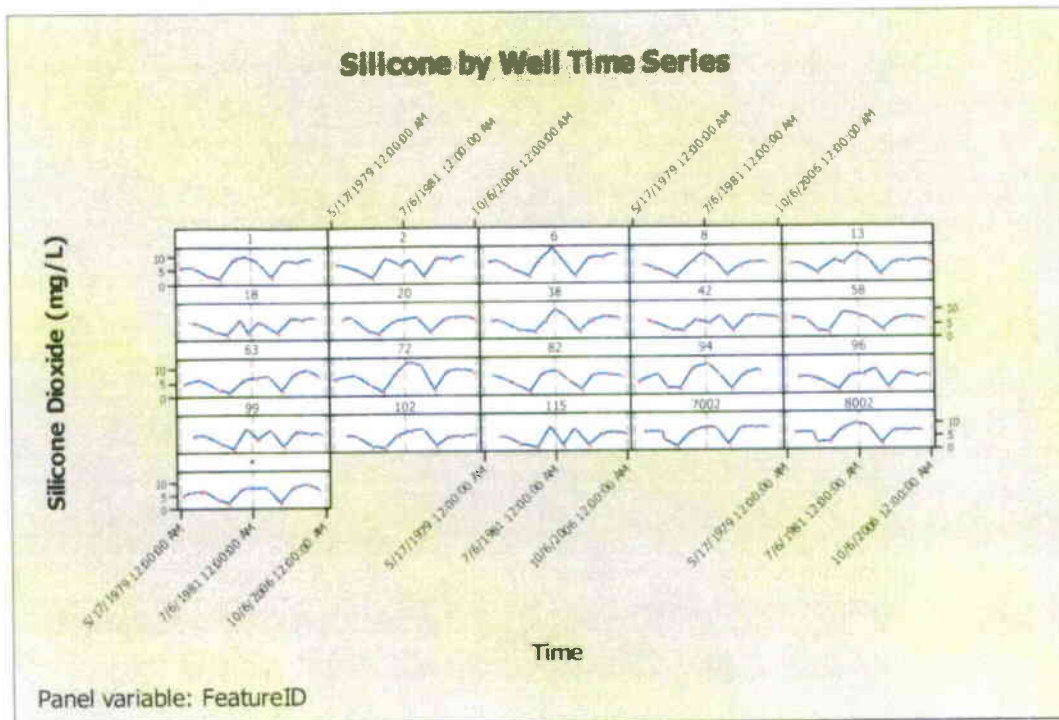
8	11	6.600	103.0	-0.35
13	12	7.050	122.0	0.70
18	11	6.400	90.5	-1.03
20	11	7.100	111.9	0.13
38	11	6.600	105.2	-0.23
42	11	6.400	95.0	-0.78
58	11	6.590	101.0	-0.46
63	11	6.200	96.5	-0.70
72	11	8.100	134.7	1.36
82	11	6.590	100.4	-0.49
94	10	7.100	118.9	0.48
96	11	6.200	88.4	-1.14
99	11	6.600	105.6	-0.21
102	11	5.800	86.8	-1.23
115	11	5.800	90.0	-1.05
7002	11	7.400	132.1	1.22
8002	11	6.700	114.4	0.26
Overall	218		109.5	

H = 15.03 DF = 19 P = 0.721

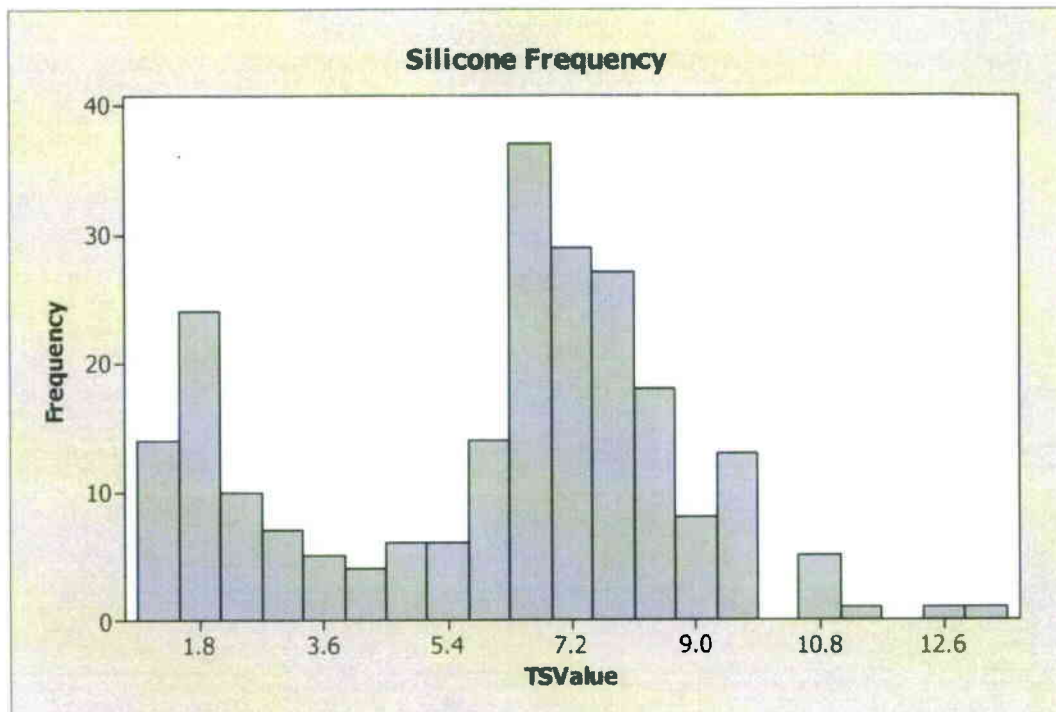
H = 15.05 DF = 19 P = 0.719 (adjusted for ties)











#### SILICONE BY AQUIFER RESULTS

##### Kruskal-Wallis Test: TSValue versus Aquifer

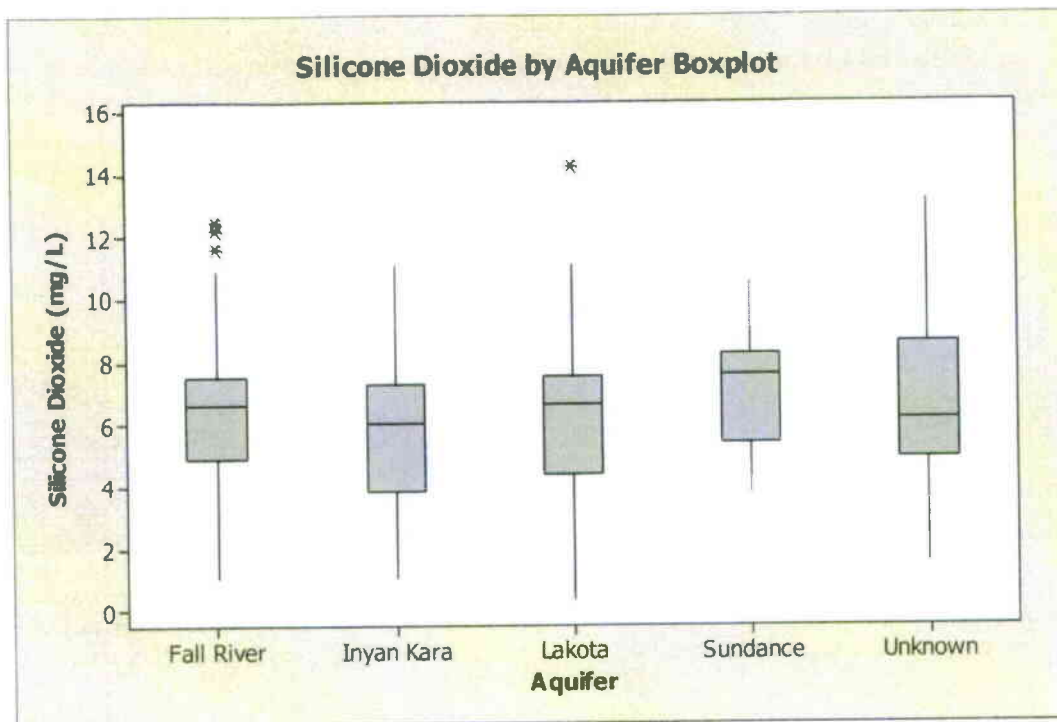
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	6.600	233.5	0.17
Inyan Kara	16	6.000	202.7	-0.89
Lakota	217	6.600	227.2	-0.73
Sundance	16	7.600	296.7	1.97
Unknown	66	6.150	235.9	0.26
Overall	463		232.0	

H = 4.86 DF = 4 P = 0.301

H = 4.87 DF = 4 P = 0.301 (adjusted for ties)





## SULFATE BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

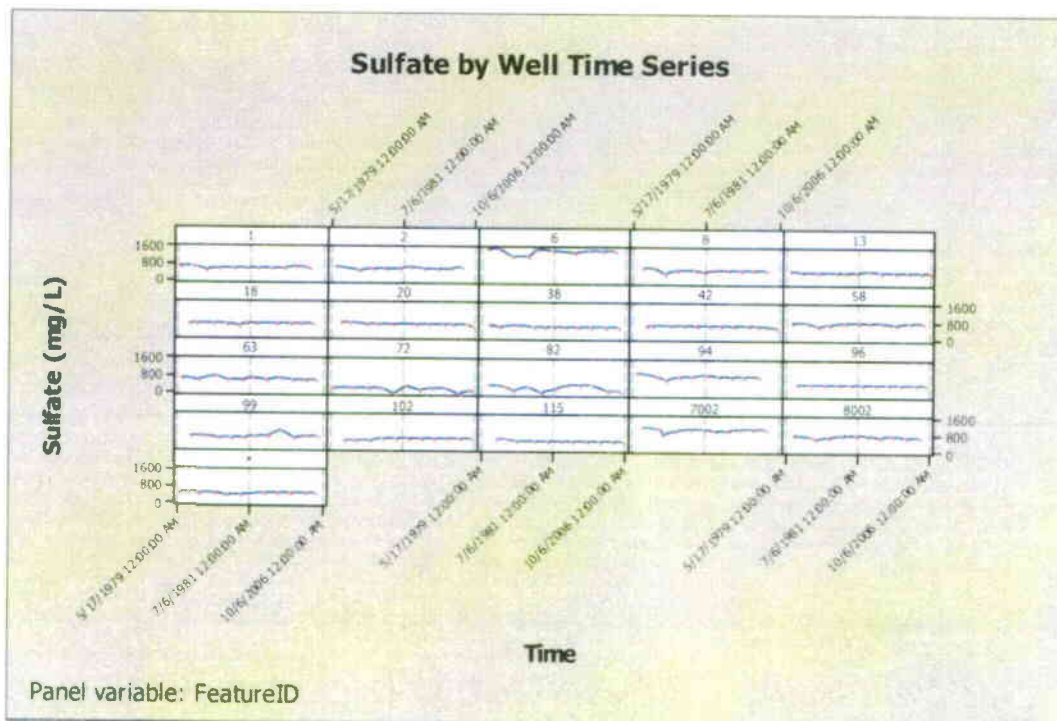
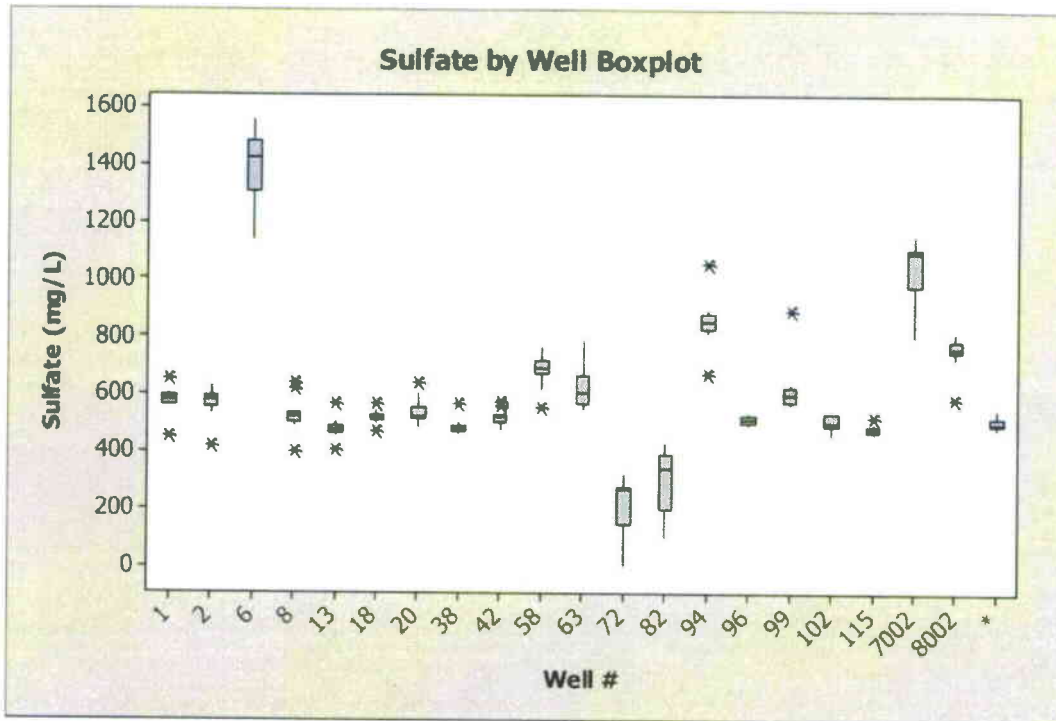
218 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

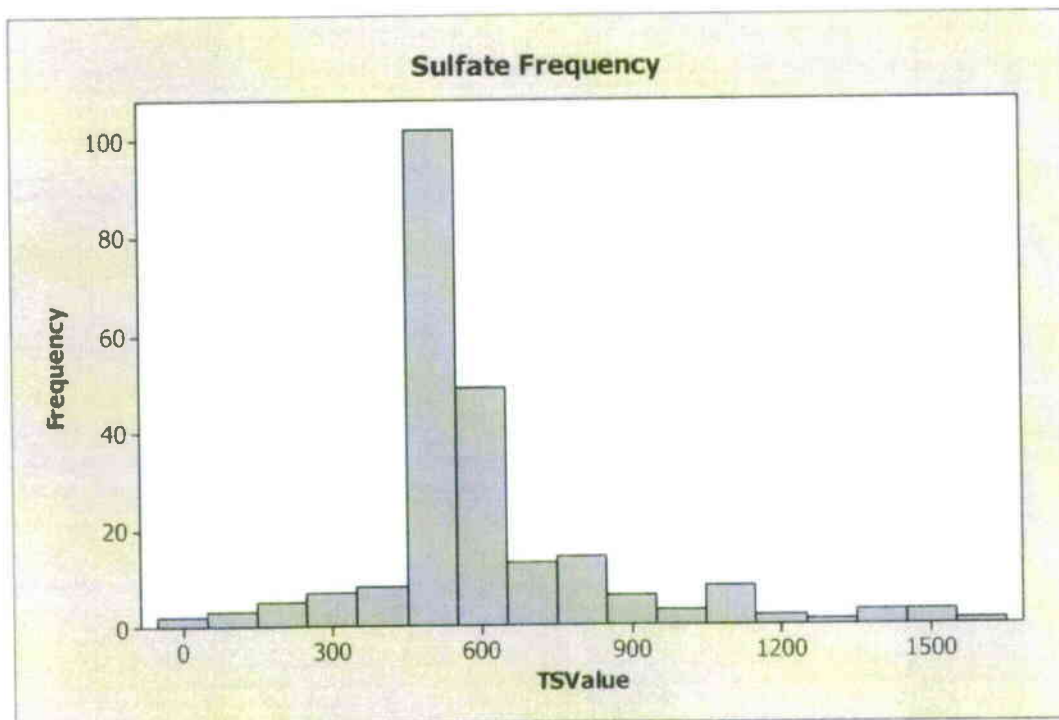
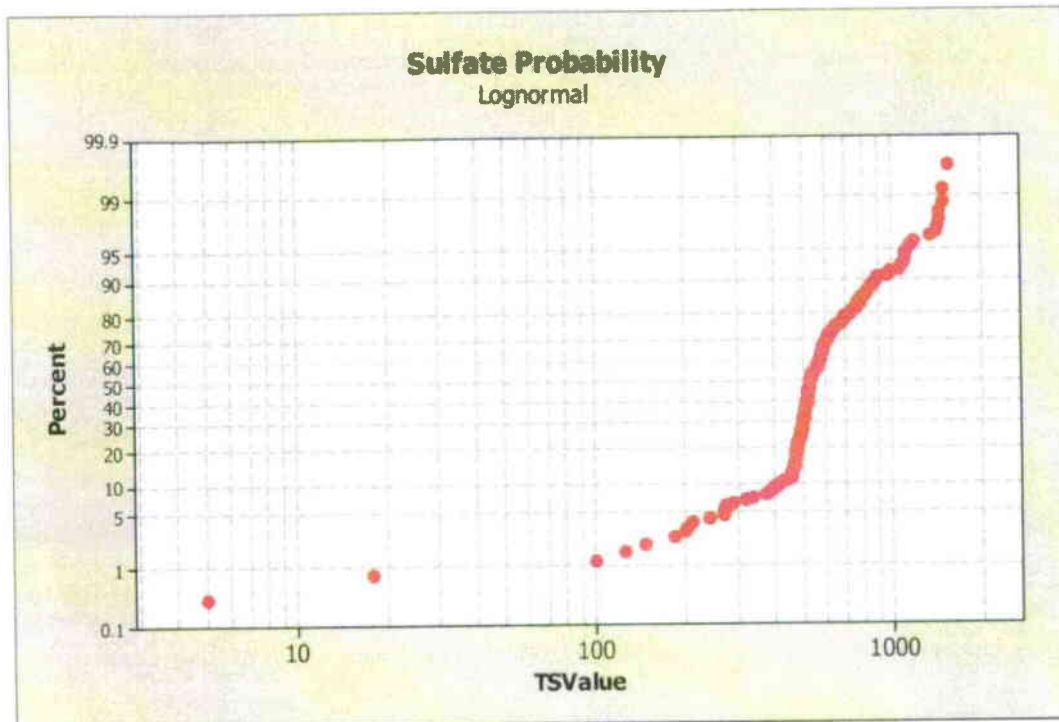
FeatureID	N	Median	Ave Rank	Z
1	11	578.0	127.6	0.98
2	10	577.0	124.6	0.78
6	10	1425.0	213.4	5.33
8	11	520.0	95.0	-0.78
13	12	476.0	48.9	-3.43
18	11	520.0	88.7	-1.12
20	11	524.0	101.1	-0.45
38	11	480.0	52.7	-3.06
42	11	520.0	89.0	-1.11
58	11	693.0	165.7	3.03
63	11	608.0	148.0	2.08
72	11	270.0	9.5	-5.40
82	11	340.0	14.1	-5.15
94	10	851.0	190.7	4.17
96	11	516.0	86.5	-1.24
99	11	600.0	150.5	2.21
102	11	505.0	76.2	-1.80
115	11	479.0	51.7	-3.12
7002	11	1090.0	201.7	4.98
8002	11	760.0	178.1	3.70
Overall	218		109.5	



H = 188.97 DF = 19 P = 0.000  
H = 189.01 DF = 19 P = 0.000 (adjusted for ties)









## SULFATE BY AQUIFER RESULTS

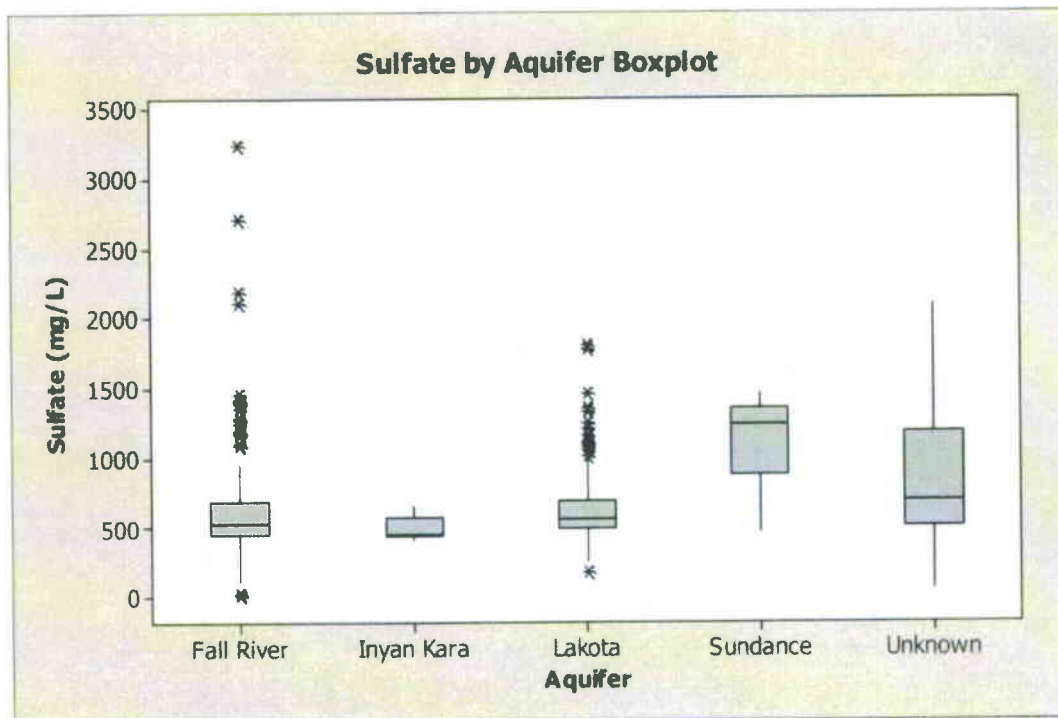
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	530.0	210.2	-2.40
Inyan Kara	16	449.0	142.5	-2.72
Lakota	217	556.0	226.9	-0.78
Sundance	16	1225.0	385.0	4.66
Unknown	66	685.0	282.3	3.30
Overall	463		232.0	

H = 41.65 DF = 4 P = 0.000

H = 41.65 DF = 4 P = 0.000 (adjusted for ties)



## TDS BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

218 cases were used

12 cases contained missing values

Kruskal-Wallis Test on TSValue

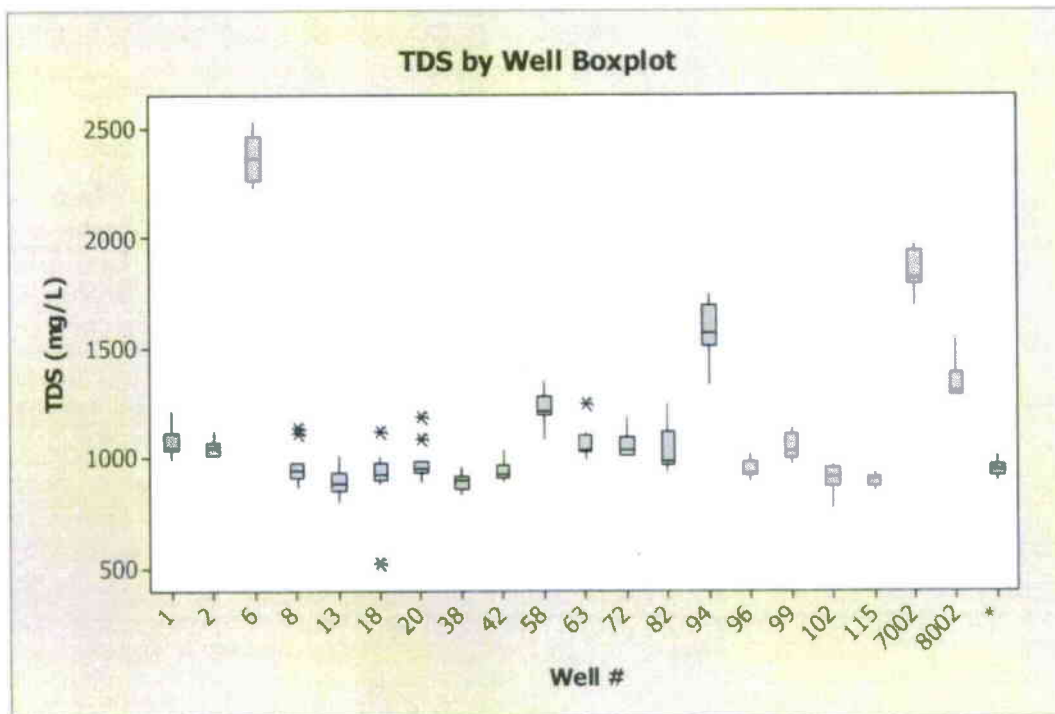
FeatureID	N	Median	Ave Rank	Z
1	11	1038.0	135.3	1.39
2	10	1038.5	128.5	0.98
6	10	2363.5	213.5	5.34



8	11	942.0	76.8	-1.76
13	12	878.0	33.6	-4.29
18	11	922.0	60.5	-2.65
20	11	950.0	82.3	-1.47
38	11	900.0	34.6	-4.04
42	11	920.0	63.8	-2.47
58	11	1210.0	168.4	3.18
63	11	1030.0	129.4	1.07
72	11	1034.0	129.7	1.09
82	11	984.0	112.6	0.17
94	10	1564.0	191.6	4.21
96	11	934.0	68.7	-2.20
99	11	1032.0	126.5	0.92
102	11	912.0	43.4	-3.57
115	11	902.0	31.7	-4.20
7002	11	1820.0	202.8	5.04
8002	11	1304.0	181.8	3.90
Overall	218		109.5	

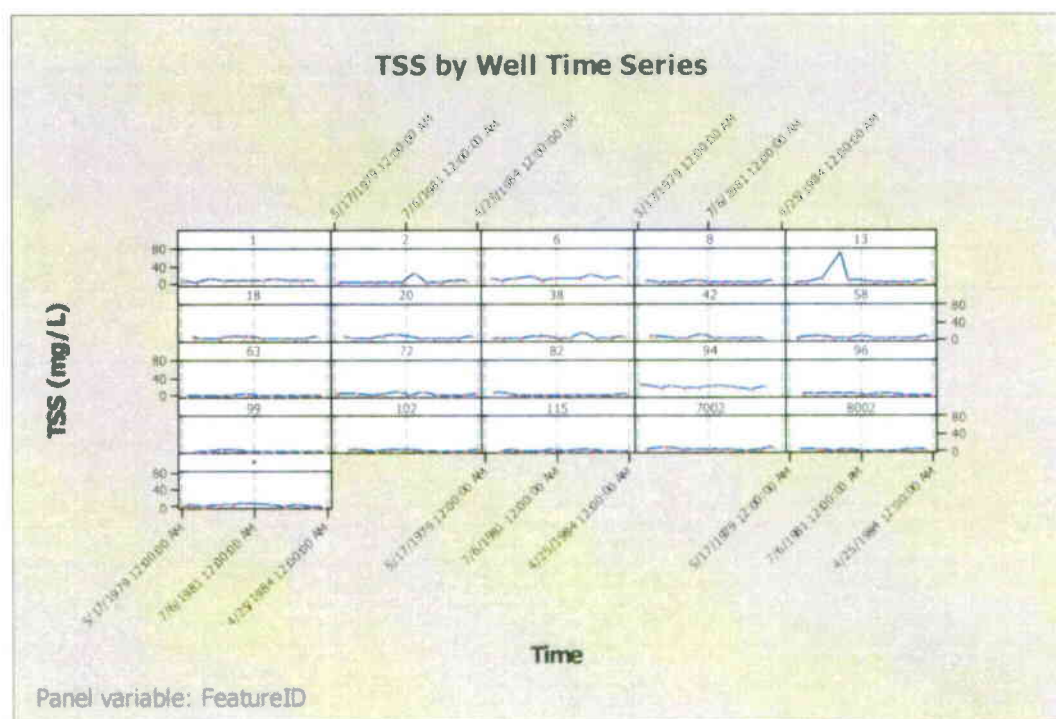
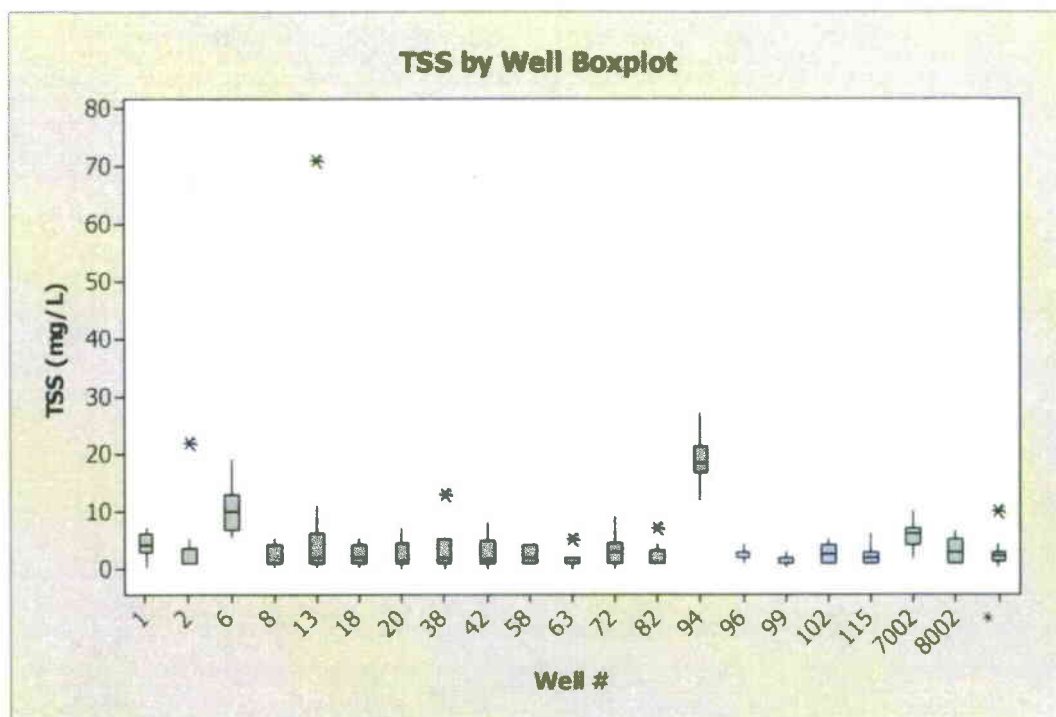
H = 181.76 DF = 19 P = 0.000

H = 181.77 DF = 19 P = 0.000 (adjusted for ties)

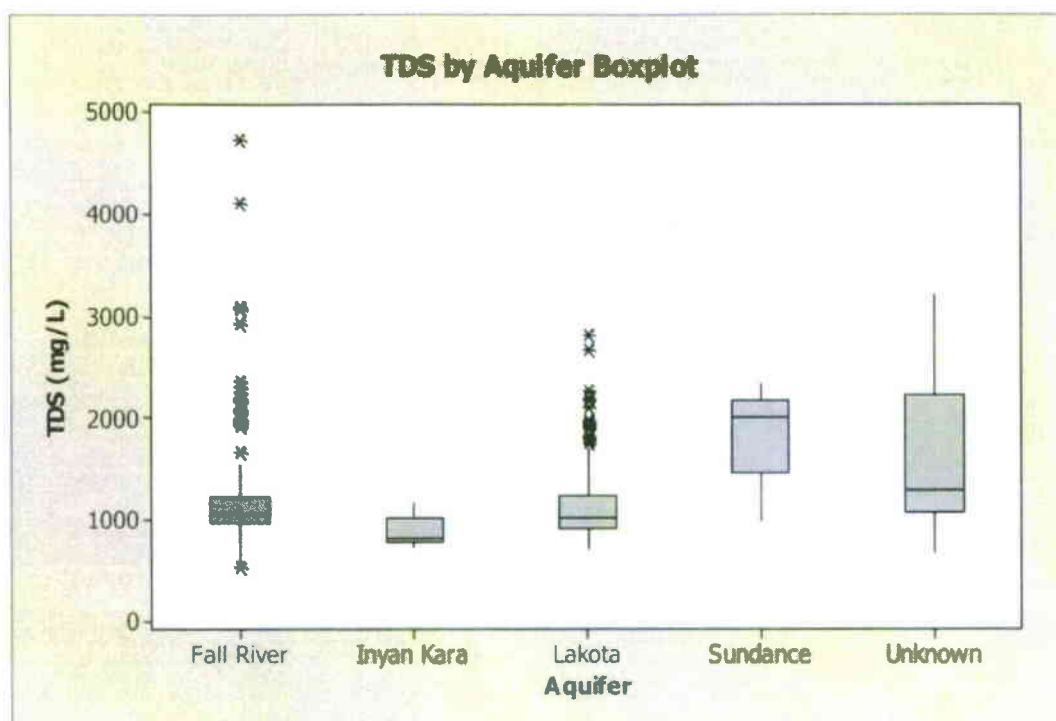




H = 78.26 DF = 19 P = 0.000  
H = 80.29 DF = 19 P = 0.000 (adjusted for ties)







## TSS BY WELL RESULTS

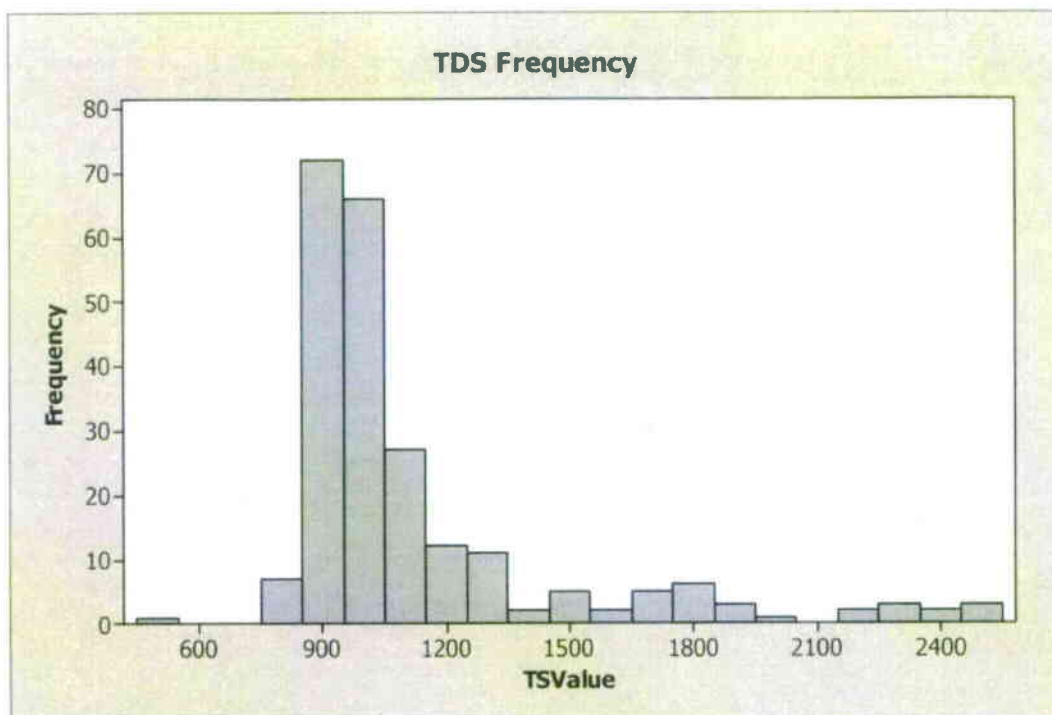
### Kruskal-Wallis Test: TSValue versus FeatureID

215 cases were used  
12 cases contained missing values

#### Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	4.000	143.3	1.93
2	10	1.000	85.2	-1.19
6	10	10.000	193.3	4.44
8	11	1.000	81.6	-1.44
13	11	2.000	111.8	0.21
18	11	2.000	100.5	-0.41
20	10	1.300	92.0	-0.83
38	11	2.000	97.8	-0.56
42	10	1.500	89.7	-0.96
58	11	2.000	92.0	-0.88
63	11	1.000	64.2	-2.40
72	11	2.800	103.0	-0.27
82	11	1.000	84.7	-1.28
94	10	18.500	207.8	5.19
96	11	3.000	107.7	-0.01
99	11	1.000	62.0	-2.52
102	11	2.400	100.6	-0.41
115	11	2.000	83.7	-1.33
7002	11	6.000	165.0	3.12
8002	11	2.800	105.8	-0.12
Overall	215		108.0	





## **TDS BY AQUIFER RESULTS**

### **Kruskal-Wallis Test: TSVale versus Aquifer**

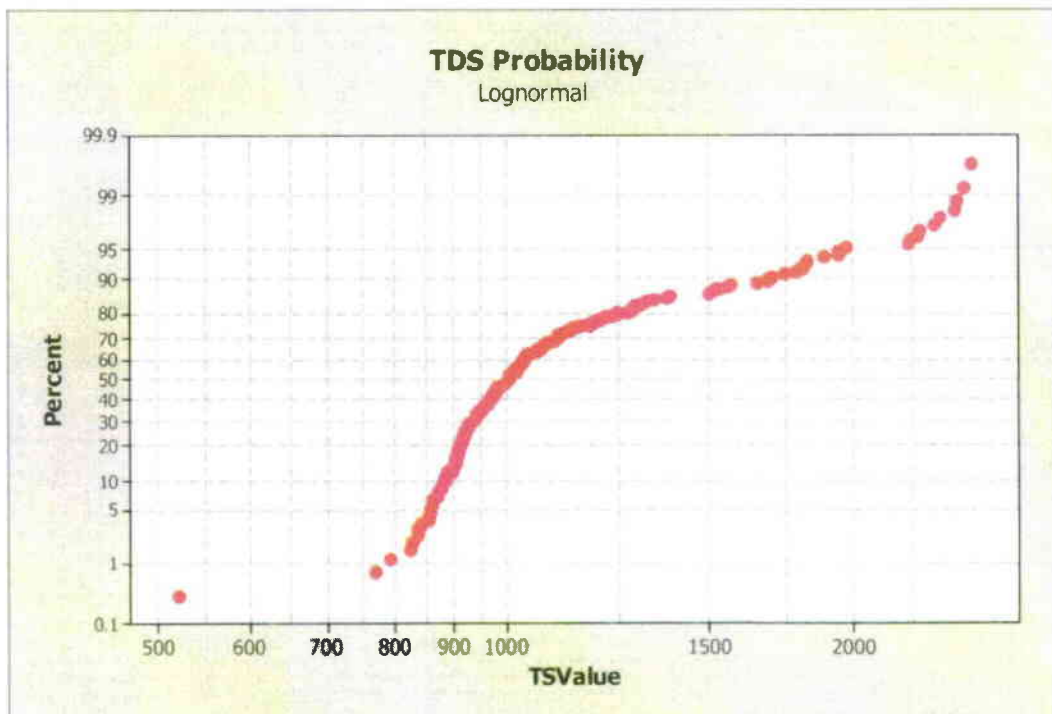
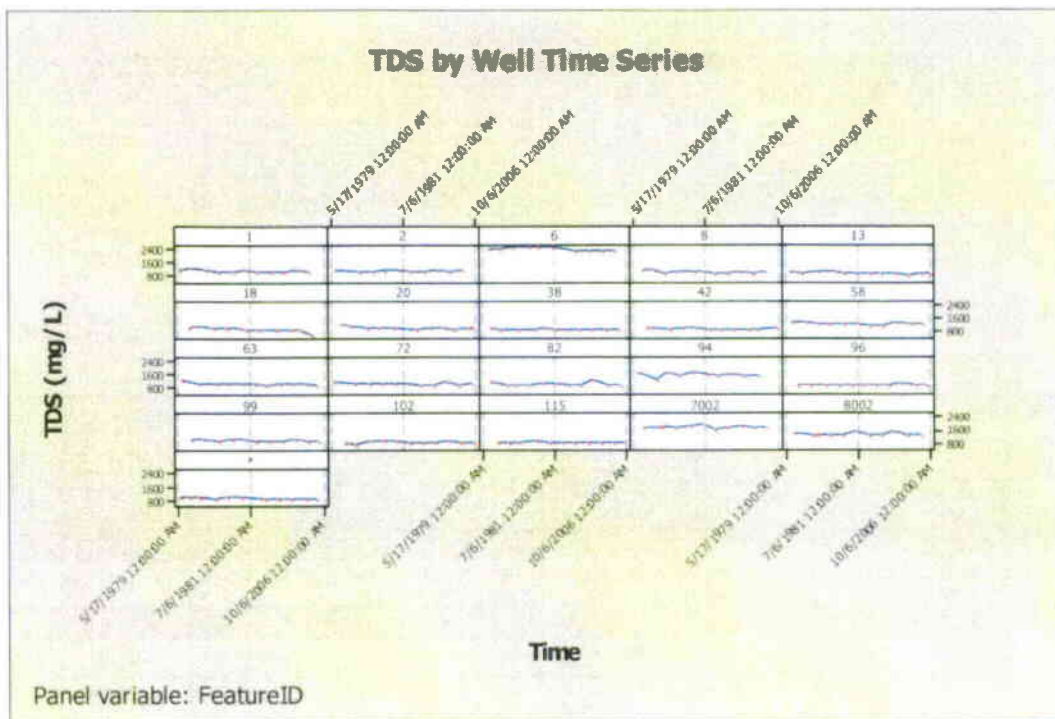
Kruskal-Wallis Test on TSVale

Aquifer	N	Median	Ave Rank	Z
Fall River	148	1043.0	233.4	0.15
Inyan Kara	16	811.5	94.2	-4.19
Lakota	217	1020.0	207.3	-3.73
Sundance	16	1997.0	381.3	4.54
Unknown	66	1296.5	307.4	4.94
Overall	463		232.0	

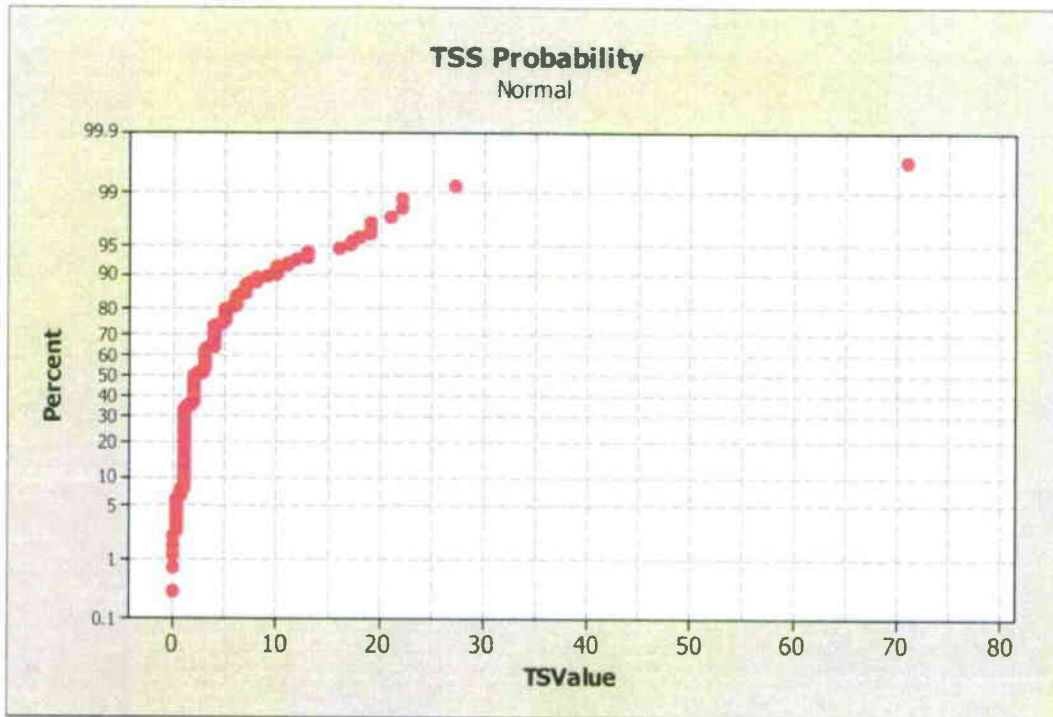
H = 65.26 DF = 4 P = 0.000

H = 65.26 DF = 4 P = 0.000 (adjusted for ties)

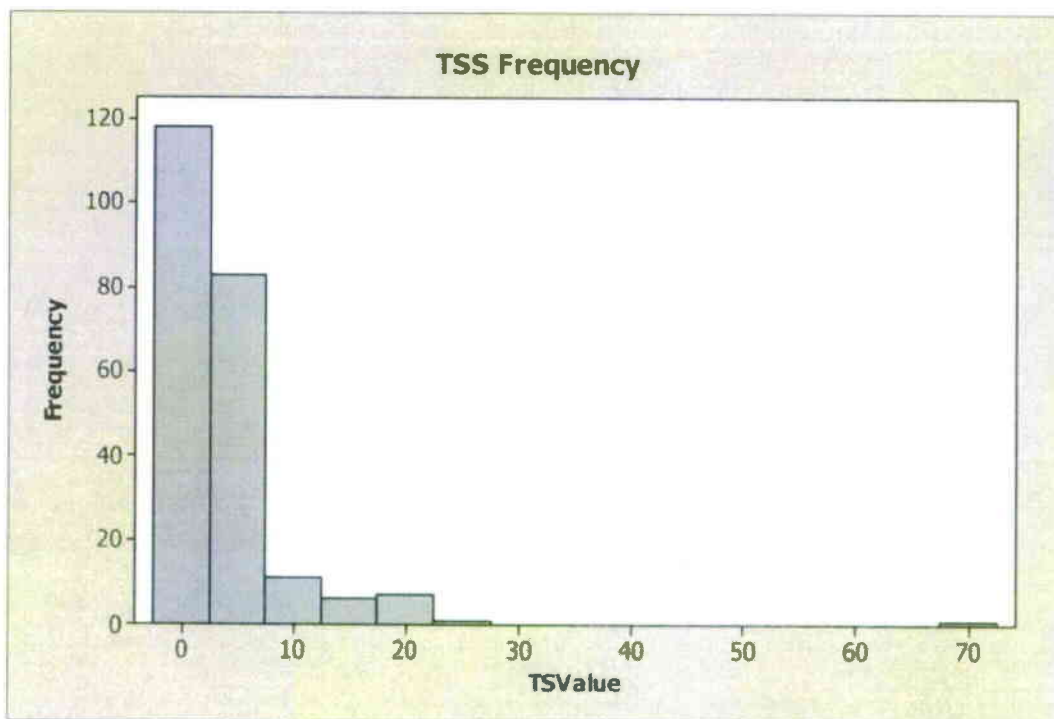








**NOTE:** Normal probability used due to Values  $\leq 0$





## TSS BY AQUIFER RESULTS

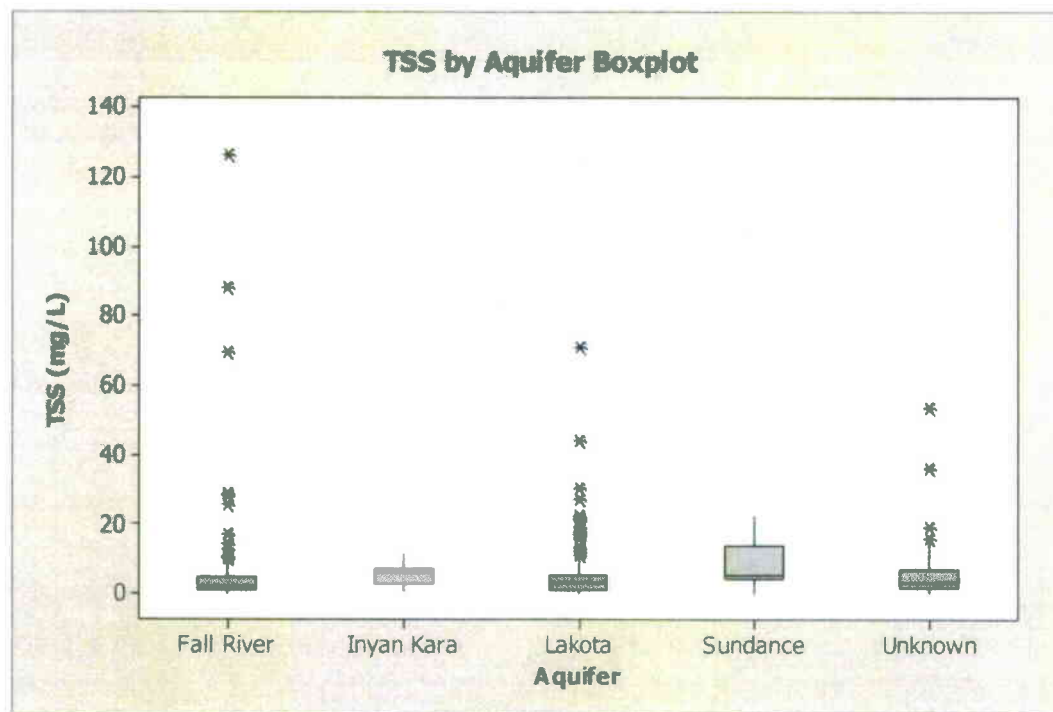
### Kruskal-Wallis Test: TSValue versus Aquifer

Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	146	2.200	210.1	-2.15
Inyan Kara	16	5.500	298.0	2.11
Lakota	214	2.800	224.7	-0.73
Sundance	16	5.200	330.7	3.11
Unknown	66	3.100	247.0	1.16
Overall	458		229.5	

H = 18.23 DF = 4 P = 0.001

H = 18.36 DF = 4 P = 0.001 (adjusted for ties)



## ZINC BY WELL RESULTS

### Kruskal-Wallis Test: TSValue versus FeatureID

208 cases were used

12 cases contained missing values

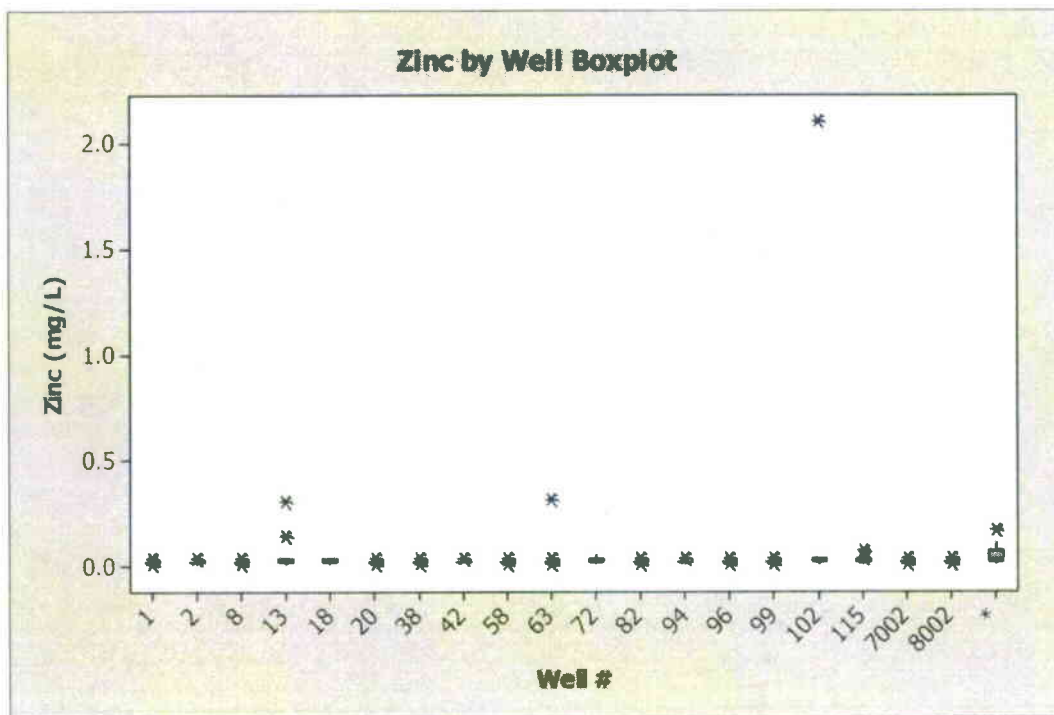
Kruskal-Wallis Test on TSValue

FeatureID	N	Median	Ave Rank	Z
1	11	0.01000	97.9	-0.37
2	10	0.01000	98.0	-0.35
8	11	0.01000	97.9	-0.37

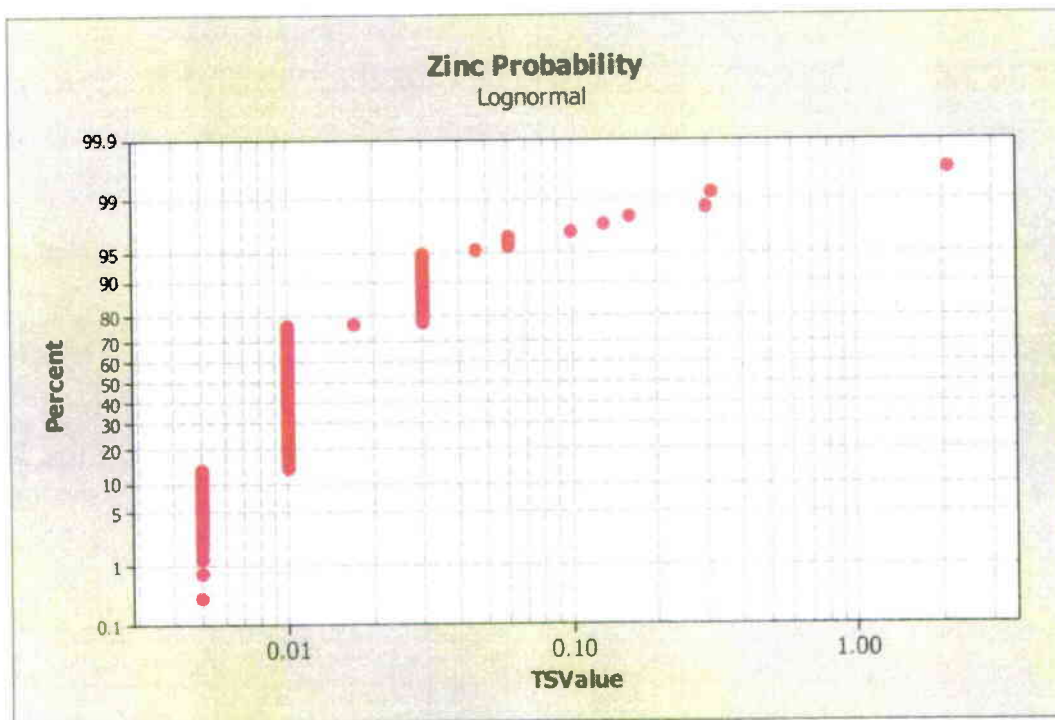
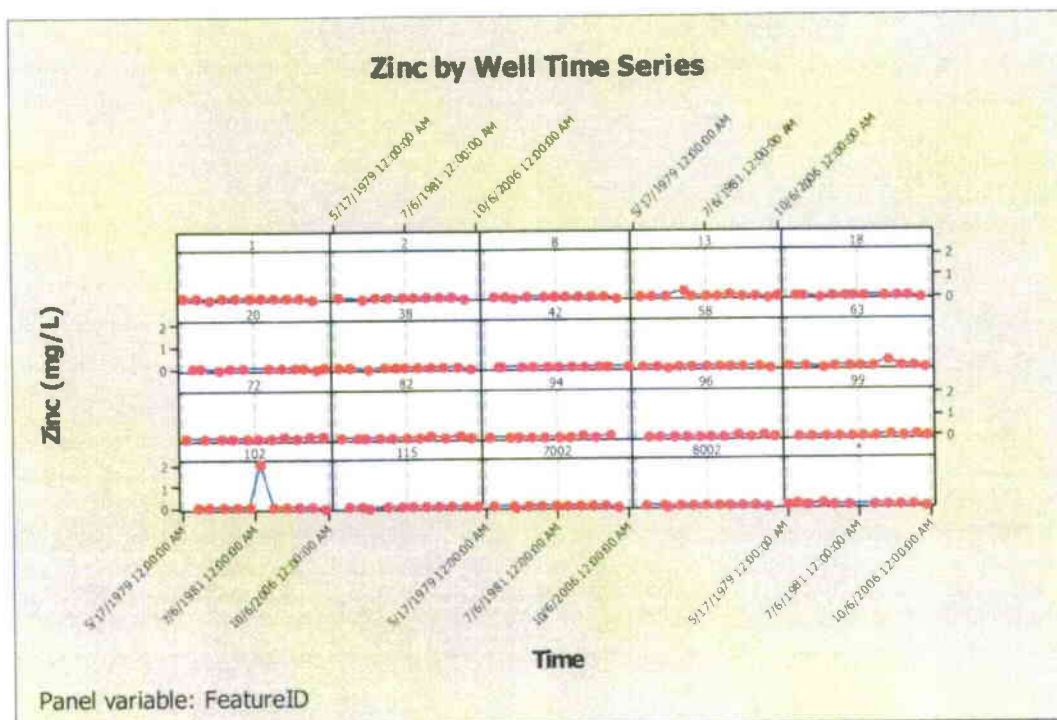


13	12	0.01000	122.8	1.08
18	11	0.01000	105.8	0.07
20	11	0.01000	97.9	-0.37
38	11	0.01000	97.9	-0.37
42	11	0.01000	112.8	0.47
58	11	0.01000	97.9	-0.37
63	11	0.01000	100.0	-0.25
72	11	0.01000	115.0	0.59
82	11	0.01000	97.9	-0.37
94	10	0.01000	106.2	0.09
96	11	0.01000	105.4	0.05
99	11	0.01000	105.4	0.05
102	11	0.01000	115.5	0.62
115	11	0.01000	113.4	0.50
7002	11	0.01000	97.9	-0.37
8002	11	0.01000	97.9	-0.37
Overall	208		104.5	

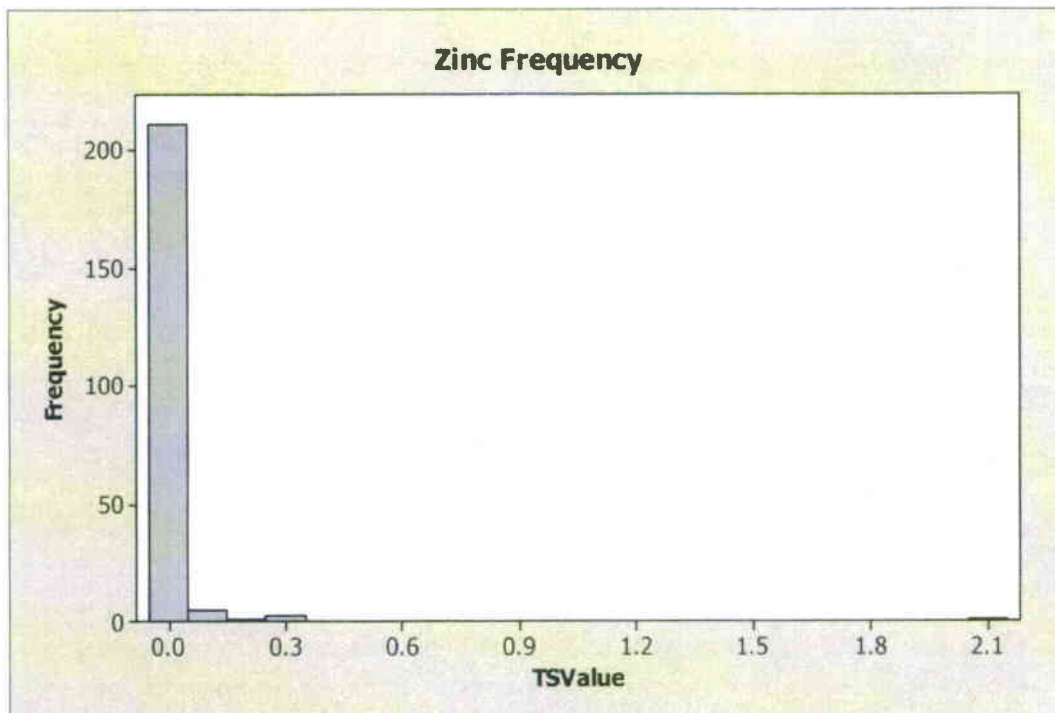
H = 3.50 DF = 18 P = 1.000  
H = 4.88 DF = 18 P = 0.999 (adjusted for ties)











#### ZINC BY AQUIFER RESULTS

##### Kruskal-Wallis Test: TSValue versus Aquifer

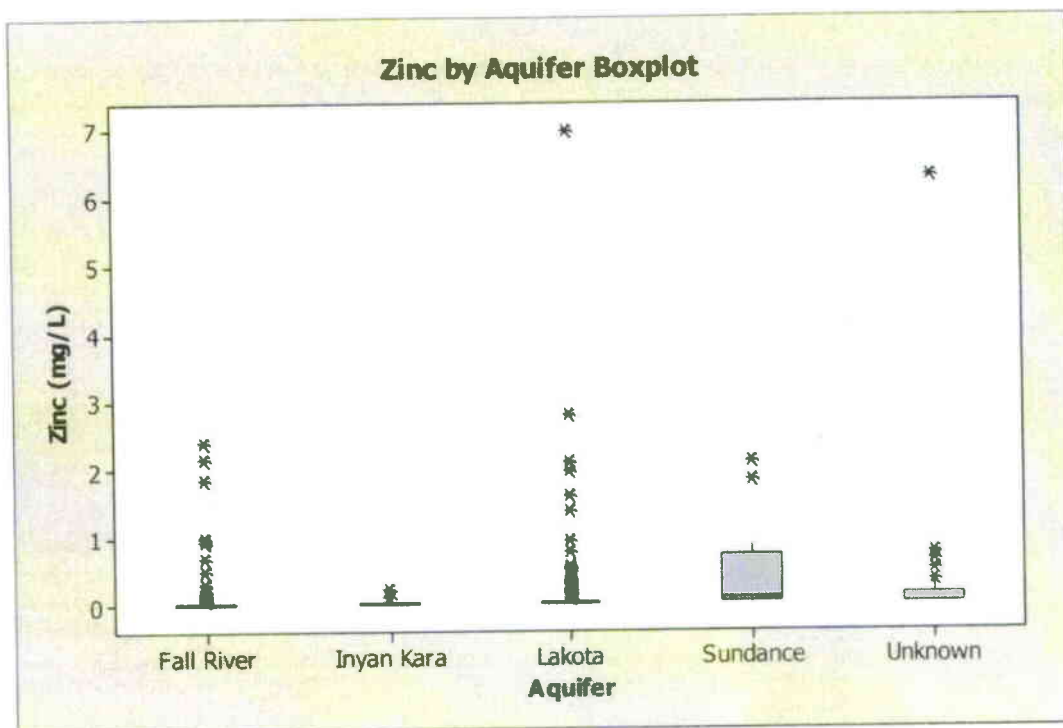
Kruskal-Wallis Test on TSValue

Aquifer	N	Median	Ave Rank	Z
Fall River	148	0.01000	216.2	-1.64
Inyan Kara	16	0.01000	208.8	-0.68
Lakota	216	0.01000	224.2	-1.03
Sundance	16	0.09500	348.9	3.60
Unknown	65	0.01000	263.6	2.13
Overall	461		231.0	

H = 19.25 DF = 4 P = 0.001

H = 23.46 DF = 4 P = 0.000 (adjusted for ties)





### Cluster Analysis of Observations: C2, C3, C4, C5, C6, C7, C8, C9, ...

Euclidean Distance, Complete Linkage  
Amalgamation Steps

Step	Number of clusters	Similarity level	Distance level	Clusters joined	New cluster	Number of obs. in new cluster
1	4	90.1252	184.11	1	3	2
2	3	77.2327	424.48	1	2	3
3	2	57.7638	787.46	1	5	4
4	1	0.0000	1864.42	1	4	5

Final Partition  
Number of clusters: 2

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	4	335336	246.580	411.272
Cluster2	1	0	0.000	0.000

Cluster Centroids

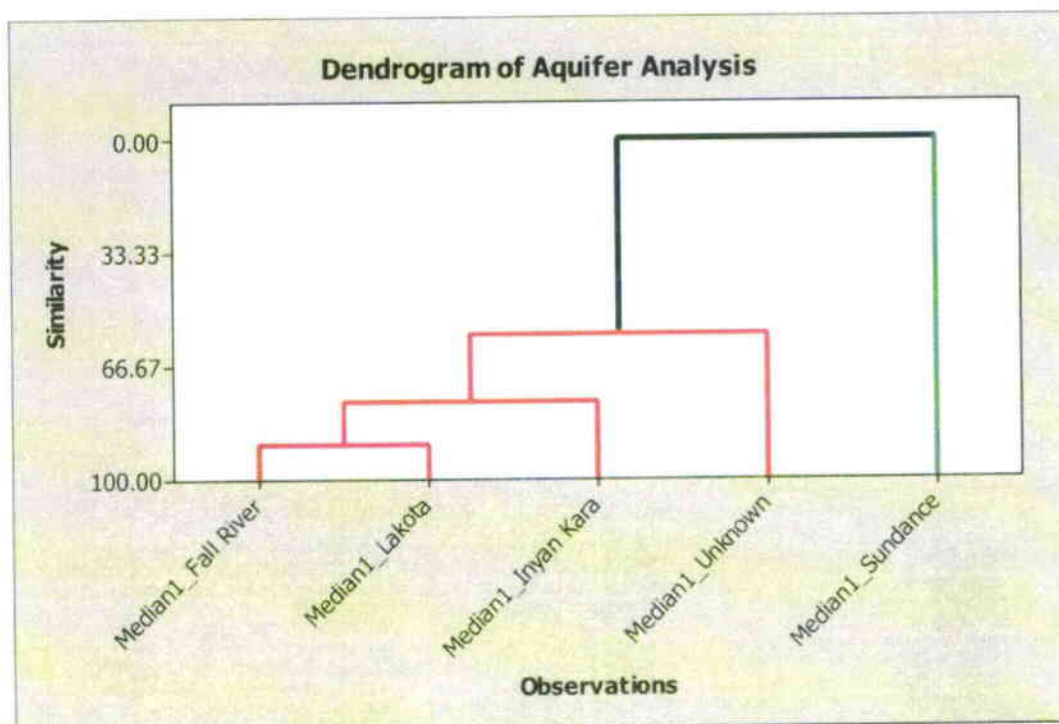
Variable	Cluster1	Cluster2	Grand centroid
C2	197.25	210.00	199.80



C3	0.01	0.01	0.01
C4	1.00	1.00	1.00
C5	202.75	225.00	207.20
C6	57.25	144.00	74.60
C7	0.00	0.00	0.00
C8	12.88	22.00	14.70
C9	1451.88	2250.00	1611.50
C10	1.18	2.10	1.36
C11	232.25	710.50	327.90
C12	11.18	15.50	12.04
C13	21.49	84.50	34.09
C14	0.08	0.05	0.08
C15	0.37	0.78	0.45
C16	267.00	379.00	289.40
C17	0.03	0.05	0.03
C18	8.00	8.00	8.00
C19	0.02	0.01	0.02
C20	8.96	0.58	7.28
C21	0.01	0.01	0.01
C22	6.34	7.60	6.59
C23	555.00	1225.00	689.00
C24	1042.75	1997.00	1233.60
C26	3.40	5.20	3.76
C27	0.05	0.05	0.05
C28	0.01	0.10	0.03

#### Distances Between Cluster Centroids

	Cluster1	Cluster2
Cluster1	0.00	1500.03
Cluster2	1500.03	0.00

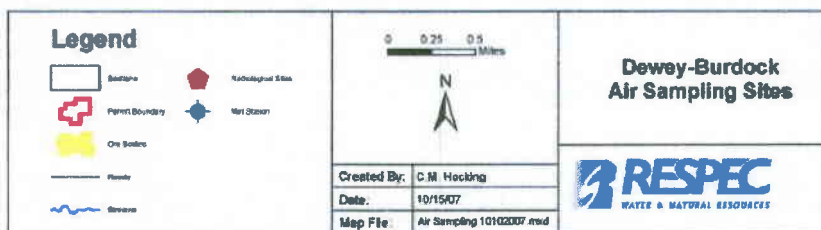
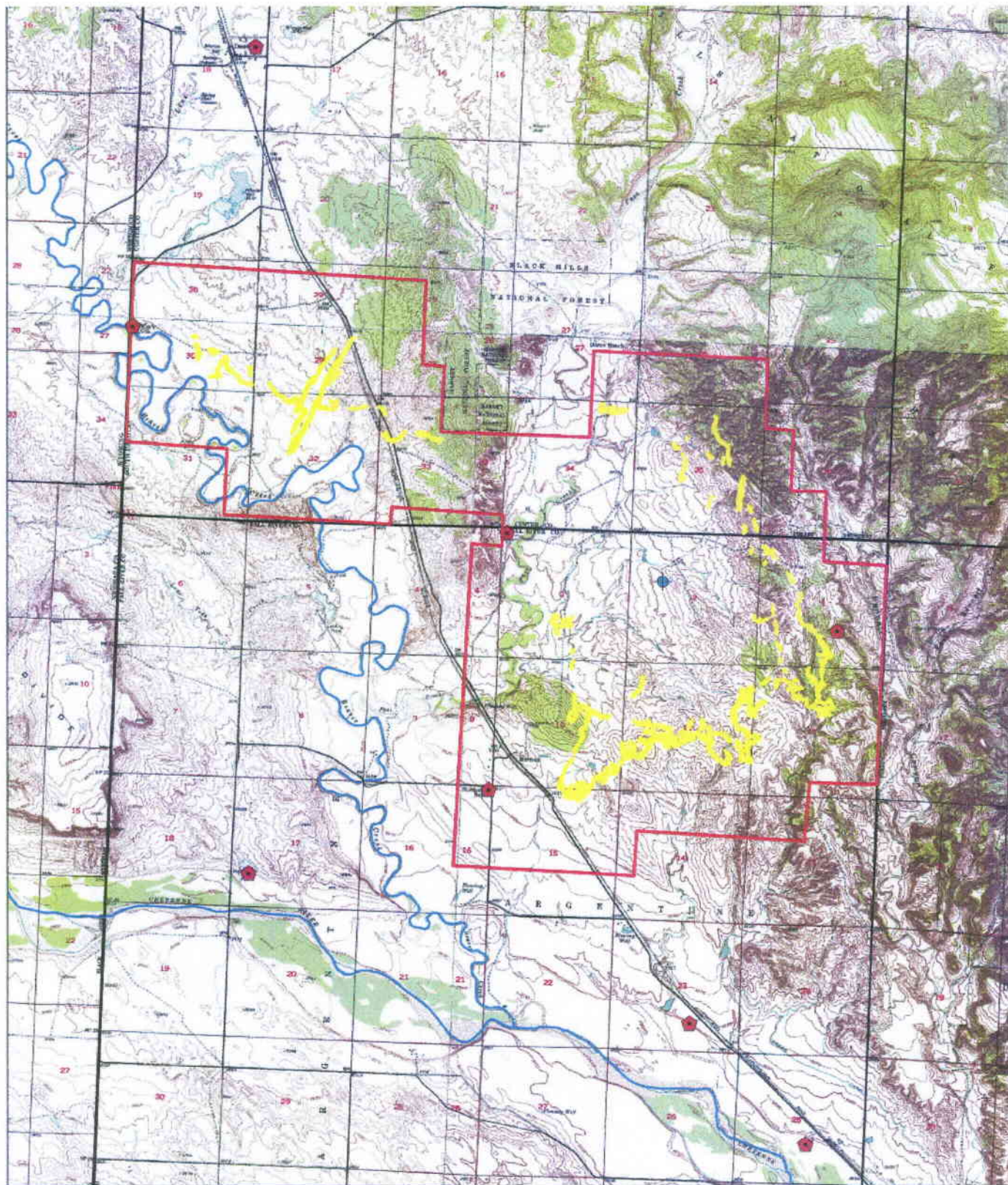




*Powertech  
(USA), Inc.  
Pre-Permit*

Baseline Sampling Plan  
11/07

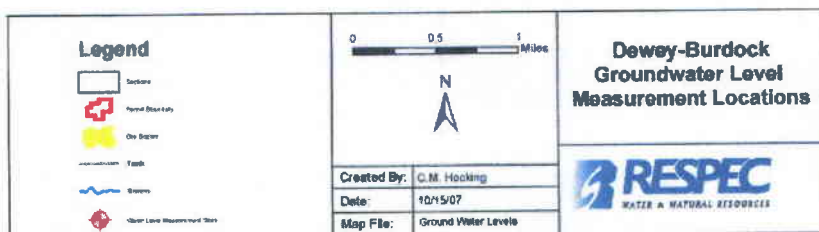
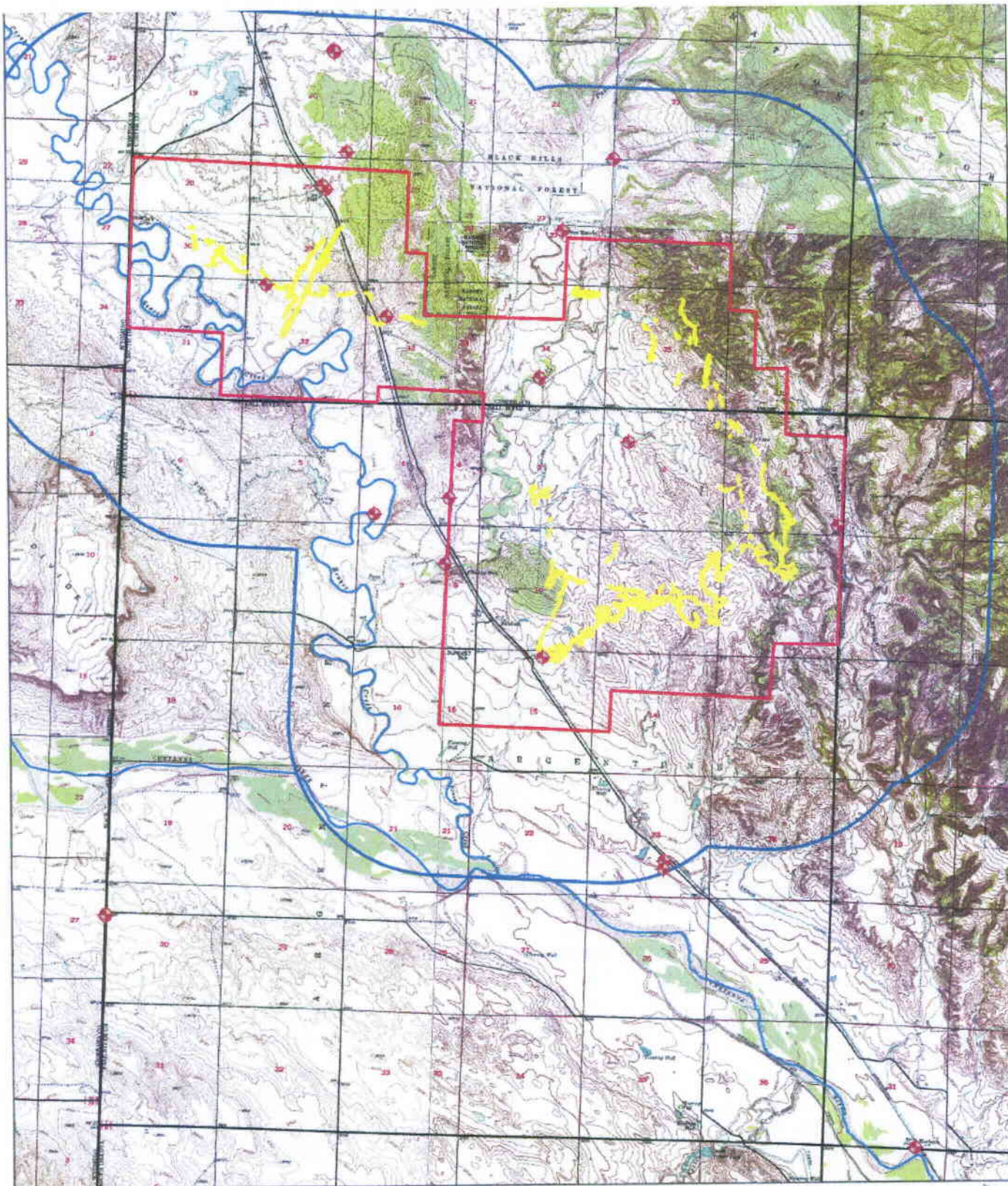




Powertech  
Base line

RECEIVED  
10/15/2007  
AIRSAMPLING PROGRAM





PowerTech  
Baseline

RECEIVED  
NOV 13 2007  
MONTANA RESPEC PROJECT



