

**Report of Spring and Seep  
Survey and Baseline  
Monitoring Activities in the  
Winter Quarters and Woods  
Canyon Areas at the  
Skyline Mine, 2006-2010**

31 January 2011

Canyon Fuel Company, LLC  
Skyline Mine  
Helper, Utah



**PETERSEN HYDROLOGIC, LLC**  
CONSULTANTS IN HYDROGEOLOGY

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**Summary of Spring and Seep Survey and  
Baseline Monitoring Activities in the  
Winter Quarters and Woods Canyons Areas at the  
Skyline Mine, 2006-2010**

**Introduction**

The Canyon Fuel Company, LLC Skyline Mine surface facilities are located in Eccles Canyon, approximately 3.5 miles southwest of the town of Scofield, Utah. In 2006, Petersen Hydrologic, LLC was commissioned by Canyon Fuel Company, LLC to perform a spring and seep survey in the Winter Quarters and Woods Canyon areas at the Skyline Mine. Subsequently, Petersen Hydrologic was also commissioned to perform baseline monitoring at selected springs and stream monitoring stations in the same area. Baseline monitoring activities continued through 2010. It should be noted that some of the baseline monitoring events at these locations were performed by Skyline Mine personnel. The project study area, which encompasses approximately 2.5 square miles, is shown on Plate 1. The purpose of this document is to present and summarize the results of the spring and seep survey and baseline hydrologic monitoring activities.

Including this introduction, this report contains the following sections:

- Introduction
- Methods of Study
- Climate
- Presentation of Data
- Groundwater and Surface Water Discharge and Chemical Compositions
- Supplemental Spring Identifications
- References Cited

### **Methods of Study**

The specific methods of study used to collect the spring and seep survey and baseline hydrologic monitoring data are described below.

#### *Discharge Measurements*

Discharge measurements for springs were typically performed using a calibrated container and a stopwatch. Generally, spring discharge measurements were performed by damming and diverting the spring discharge through a pipe. Using an appropriately sized container, time-to-fill measurements were typically performed at least 3 times at each location. An average time-to-fill value was used to calculate the reported discharge measurement. In a few instances where the discharge from a spring was diffuse and could not be collected for a time-to-fill measurement, or where the discharge rate was very low, discharge rates were estimated.

Discharge measurements on streams were typically performed using a Marsh-McBirney brand electromagnetic current velocity meter and wading rod.

#### *Discharge Temperature Measurements*

Temperature measurements were performed using a Taylor brand electronic digital thermometer. Discharge temperature measurements at springs were performed as close to the spring discharge locations as possible.

#### *Specific Conductance Measurements*

Specific conductance measurements were performed using an Extech brand model EC400 conductivity meter with automatic temperature compensation. The instrument was regularly calibrated using traceable ASTM conductivity standard solutions.

#### *pH Measurements*

pH Measurements were performed using an Oakton brand Acorn 6 model electronic pH meter with automatic temperature compensation, or an Oakton model pH Testr 30 with automatic temperature compensation. The instruments were regularly calibrated using traceable ASTM pH standard solutions.

#### *Water Quality Laboratory Measurements*

Water quality laboratory analyses were performed by SGS Minerals Services of Huntington, Utah and Chemtech-Ford Analytical Laboratories of Murray, Utah.

### *Spring and Seep Field Survey*

In conjunction with the spring and seep survey, existing reports and maps were obtained and reviewed. State and Federal data sources were queried for information regarding springs and seeps in the study area. Additionally, aerial imagery was evaluated to determine locations where the presence of springs or seeps was considered likely.

Each of the major surface-water drainages within the spring and seep survey area were traversed on foot. The upland areas intervening between adjacent surface-water drainages were also traversed in selected locations or inspected from locations where the presence or absence of springs and seeps could reasonably be determined. Identified spring and seep locations were determined using a hand-held Garmin brand GPS. Spring locations were recorded in the field using the UTM NAD 27 coordinate system. At each location, the discharge at the spring or seep was measured and field water quality parameters were measured (temperature, pH, and specific conductance).

### **Climate**

A plot of the Palmer Hydrologic Drought Index for Utah Region 4 (which includes the Skyline Mine area) is presented in Figure 1. The PHDI is a monthly value generated by the National Climatic Data Center (NCDC, 2011) that indicates wet and dry spells. The PHDI is calculated from several hydrologic parameters including precipitation, temperature,

evapotranspiration, soil water recharge, soil water loss, and runoff. Consequently, it is a useful tool for evaluating the relationship between climate and groundwater and surface water discharge data.

It is apparent in Figure 1 that in the few years immediately preceding the commencement of the spring and seep investigation, the region experienced widely varying climatic conditions. During the early 2000s, the region experienced a period of sustained moderate to severe drought. The region also experienced prolonged periods of wetness during the late 1990s and again during 2005 and early 2006. At the time the spring and seep survey was beginning in late 2006, the region was experiencing near-normal to moderately wet conditions. Climatic conditions during 2007 were characterized by moderate to severe drought. Beginning in early 2008, the region began a transition from the prevailing moderately wet conditions to drought conditions that began during the second half of 2008 and lasted throughout 2009. Beginning at the end of 2009, the region began a transition to wetter climatic conditions. Conditions during 2010 were mostly near-normal to moderately wet.

### **Presentation of Data**

Identified spring and seep locations are shown on Plate 1. Plate 1 also includes geologic information including bedrock lithologies and mapped faults in the area. Spring and seep site details, including spring and seep locations, geologic occurrence, and information on

usage of water at the spring are presented in Table 1. Discharge rate data for springs and seeps, together with measured field water-quality parameters, are presented in Table 2.

Results of laboratory water chemistry analyses for selected springs and seeps and also for stream monitoring sites are presented in Table 3. A plot of the Palmer Hydrologic Drought Index for Utah Region 4 is provided in Figure 1. Discharge hydrographs for selected spring and stream monitoring stations are provided in Figures 2 through 7, for monitoring sites NOG-21, NOG-16, NOG-17, CS-20, and CS-21, respectively. Stiff (1951) diagrams depicting the solute chemical composition of selected springs and surface waters are depicted on Plate 2. The analysis of Stiff diagrams is a useful technique to evaluate the geochemical type of a groundwater or surface-water. The shape of a Stiff diagram is a reflection of the geochemical composition of the water, while the overall size of the diagram is related to the total dissolved solids concentration. Laboratory reporting sheets are provided in the Appendix.

### **Groundwater and Surface-Water Discharge and Chemical Compositions**

Discharge hydrographs for three spring and two stream monitoring stations (Woods Canyon Creek and Winter Quarters Creek) are presented in Figures 2 through 6. Based on these hydrographs, it is apparent that both surface water discharge rates and groundwater discharge rates from springs clearly show seasonal variation and respond to climatic variability. The solute chemical compositions of sampled groundwaters and surface waters in the study area are of the calcium-bicarbonate or calcium-magnesium-bicarbonate chemical type (Plate 2; Table 3).



Surface waters in Winter Quarters Creek (as monitored at CS-20) are of the calcium-bicarbonate geochemical type with TDS concentrations averaging 232 mg/L. Surface waters monitored in Woods Canyon Creek (at CS-21) are also of the calcium-bicarbonate geochemical type with TDS concentrations averaging 263 mg/L. Surface waters in both Winter Quarters and Woods Canyon Creeks are moderately alkaline, with pH values averaging about 8.4 and ranging from 7.57 to 8.76. The average discharge rate monitored in Winter Quarters Creek is about 700 gpm. Discharge monitored in the creek has ranged from 108 to 3,100 gpm. Discharge rates in Woods Canyon Creek are typically somewhat less than those measured in Winter Quarters Creek. Discharge rates measured at CS-21 average about 380 gpm and range from 32.5 to 2,080 gpm.

Groundwater discharging from NOG-16 is of the calcium-bicarbonate geochemical type with a somewhat elevated magnesium concentration. TDS concentrations monitored at NOG-16 average 363 mg/L. Discharge at the spring has averaged about 7 gpm, ranging from 0.8 to 18.2 gpm. The pH levels in groundwater sampled at NOG-16 range from 7.04 to 7.75.

Groundwater discharging from NOG-17 is of the calcium-magnesium-bicarbonate geochemical type with an average TDS of 490 mg/L. Discharge from NOG-17 has averaged about 3.5 mg/L, ranging from 0.8 to 16.1 gpm. The pH levels in groundwater sampled at NOG-17 range from 7.15 to 7.56.

Groundwater discharging from NOG-21 is of the calcium-bicarbonate geochemical type with moderately elevated magnesium concentrations. TDS concentrations at NOG-21 have averaged 450 mg/L. Discharge from NOG-21 has ranged from 3.7 to 24.4 gpm, averaging about 9 gpm. The pH levels in groundwater sampled at NOG-21 range from 6.94 to 7.71.

### **Supplemental Spring and Seep Identifications**

Current mining plans at the Skyline Mine for areas near the northern extent of the spring and seep survey indicate mining panels extending a short distance north of the northern extent of the spring and seep survey. Accordingly, a search of available Utah State and Federal data sources was performed to determine whether previously identified springs might exist in these areas. Three springs located adjacent to the northern limits of the spring and seep survey area were identified in this investigation. These include springs NOG-32, NOG-33, and NOG-34. The locations and characteristics of these springs will be field verified during high-flow and low-flow conditions during the 2011 field season. It should be noted that these three springs occur in locations where the land surface is separated from the coal seam proposed for mining by more than about 850 feet. This suggests the likelihood that these springs would not be impacted by mining operations.

## References Cited

Stiff, A.H., Jr., 1951, The interpretation of chemical water analyses by means of patterns:  
Journal of Petroleum Techniques, Technical Note 84, p. 15-17.

NCDC, 2007, National Climatic Data Center, on-line values for the Palmer Hydrologic  
Drought Index, <http://www1.ncdc.noaa.gov/pub/data/cirs/drd964x.phdi.txt>

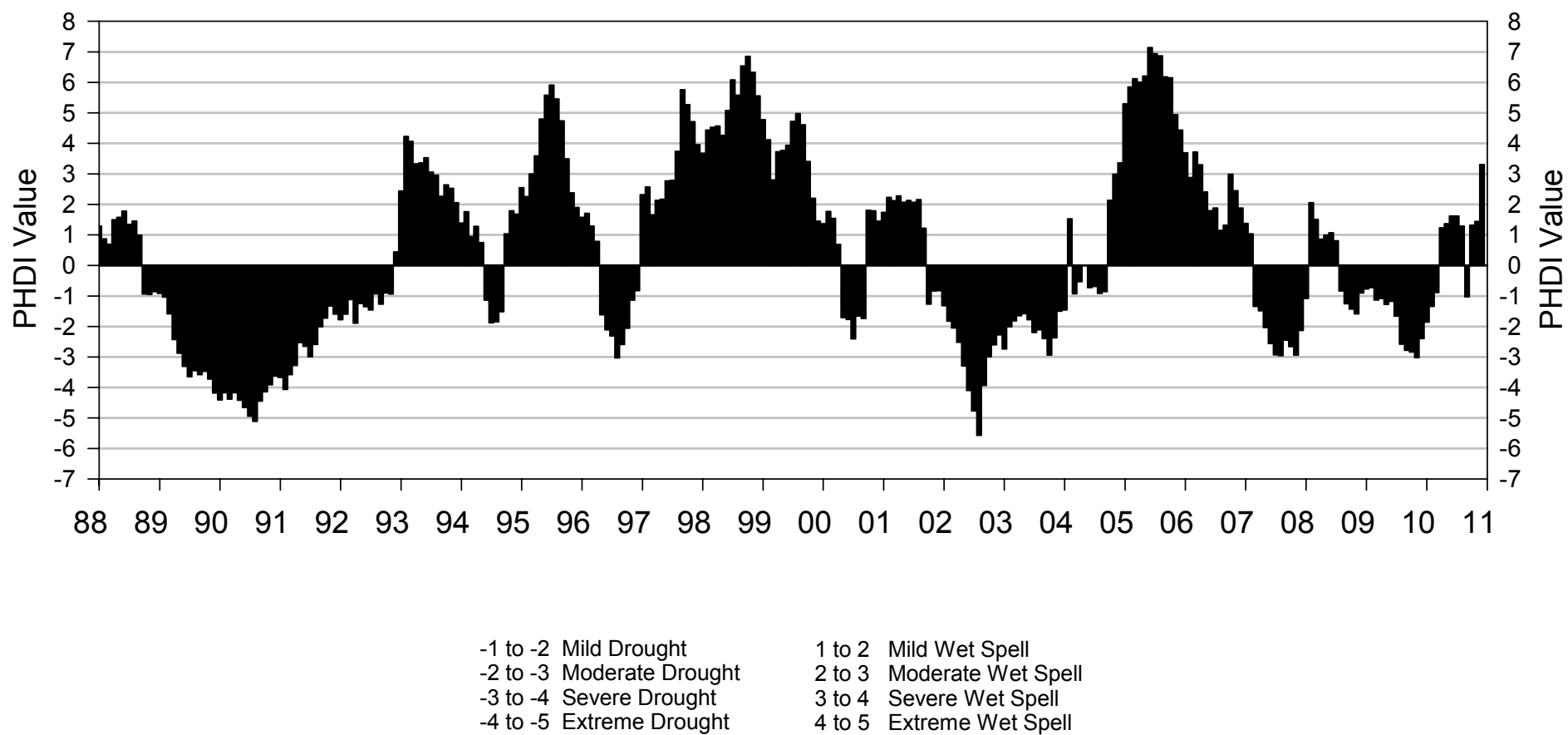


Figure 1 Plot of Palmer Hydrologic Drought Index for Utah Region 4.

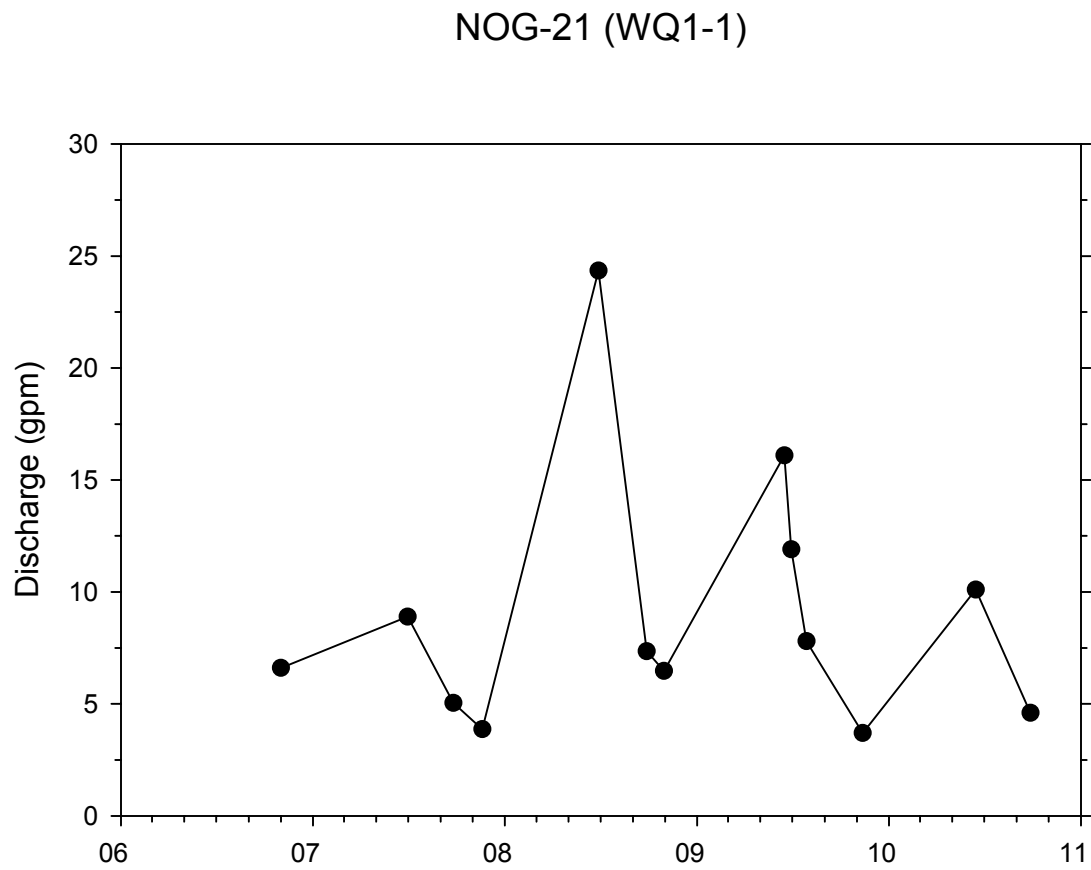


Figure 2 Discharge hydrograph for spring NOG-21 (WQ1-1).

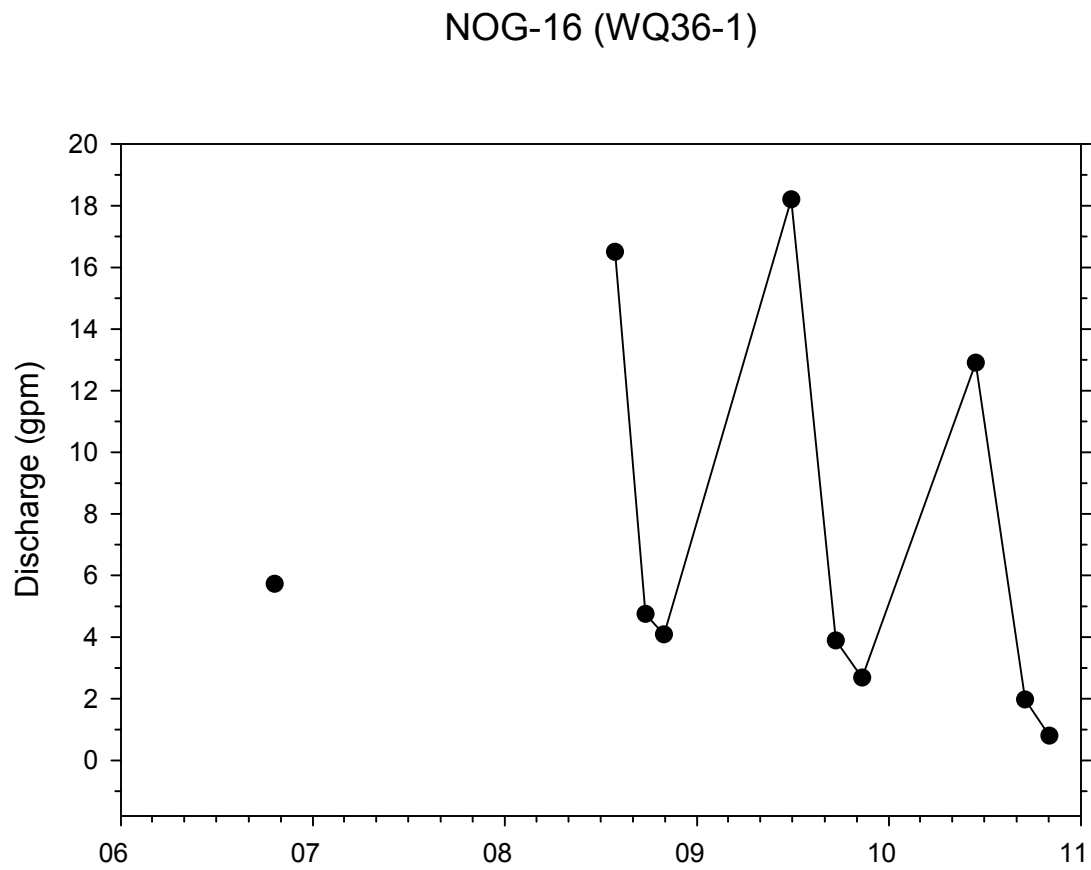


Figure 3 Discharge hydrograph for spring NOG-16 (WQ36-1).

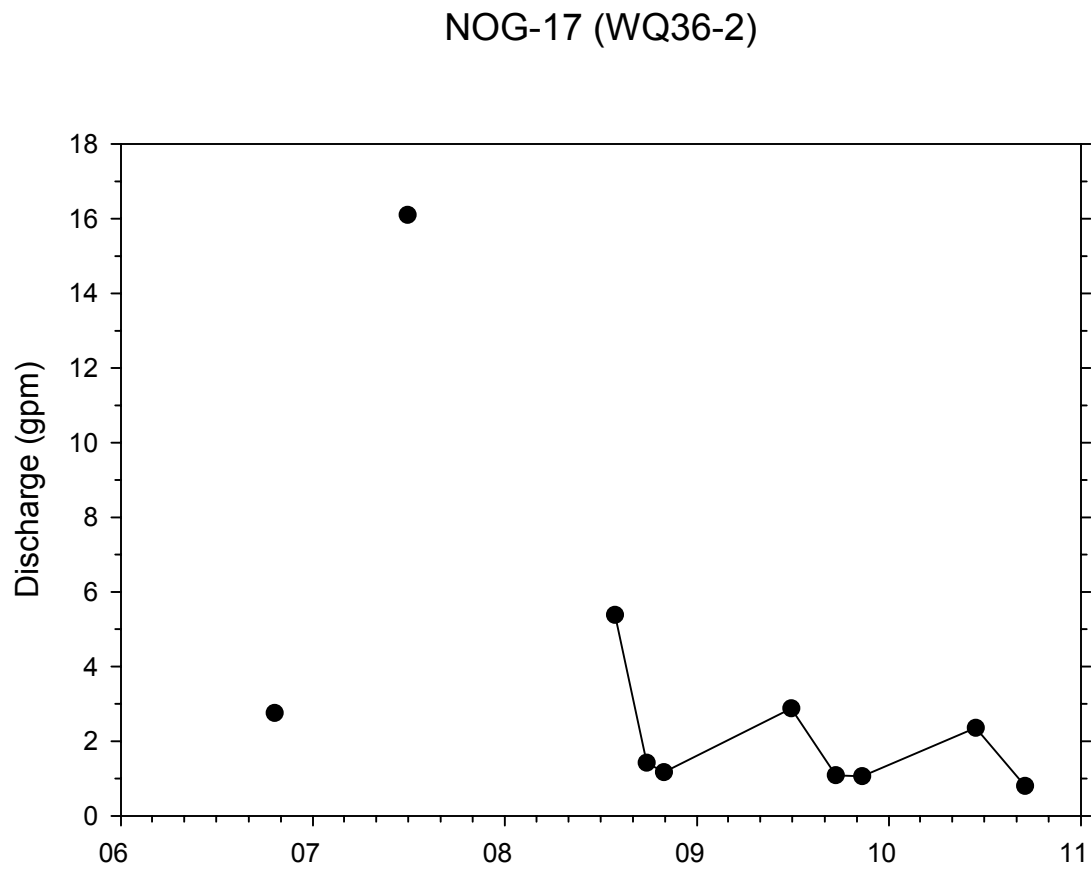


Figure 4 Discharge hydrograph for spring NOG-17 (WQ36-2).

### CS-20 (Winter Quarters Creek)

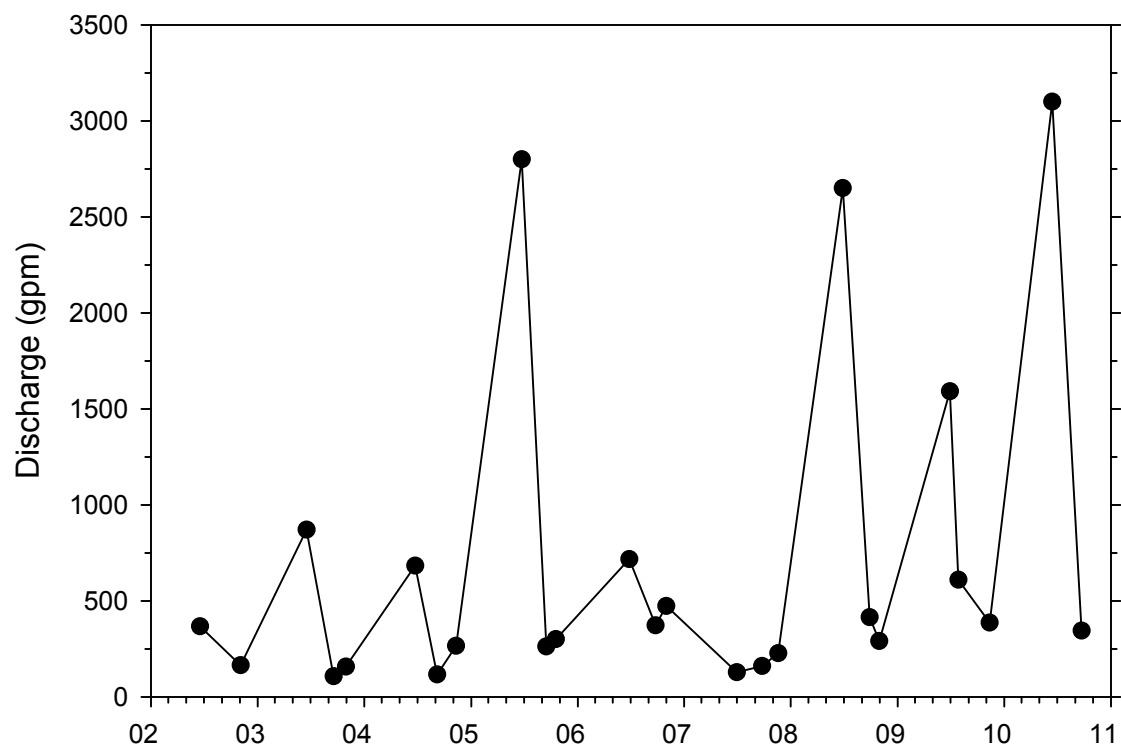


Figure 5 Discharge hydrograph for CS-20 (Winter Quarters Creek).



CS-21 (Woods Canyon Creek)

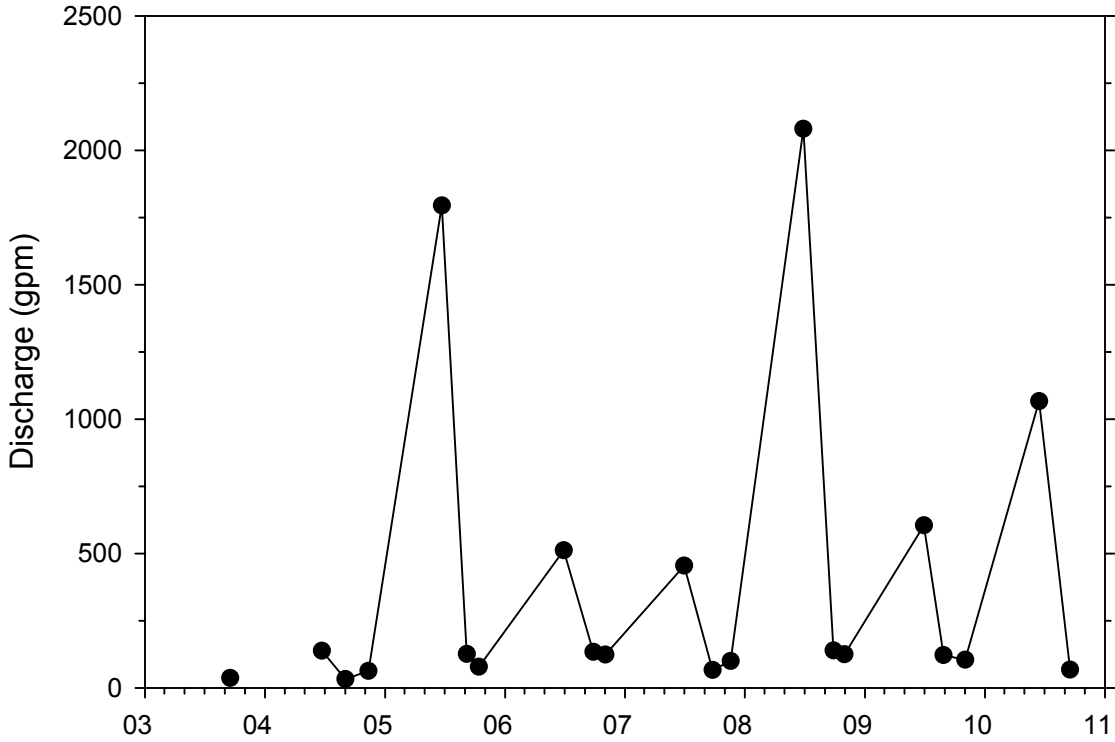


Figure 6 Discharge hydrograph for CS-21 (Woods Canyon Creek).

**Table 1 Spring and seep site details.**

| Site    | Alternate ID                | Spring location      |          | Geologic occurrence          | Use                              | Developed |
|---------|-----------------------------|----------------------|----------|------------------------------|----------------------------------|-----------|
|         |                             | UTM, Zone 12, NAD 27 |          |                              |                                  |           |
| NOG-1   |                             | 482430               | 4396443  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-1A  |                             | 482412               | 4396442  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-2   |                             | 482290               | 4396422  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-3   |                             | 482226               | 4396429  | Blackhawk Formation          | None apparent                    | No        |
| NOG-4   |                             | 482158               | 4396422  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-5   |                             | 482112               | 4396449  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-6   | Winter Quarters Mine portal | 483787               | 4396441  | Blackhawk Formation          | None apparent, flows to creek    | No        |
| NOG-10  |                             | 482943               | 4397929  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-11  |                             | 482659               | 4398206  | Blackhawk Formation/alluvium | None apparent                    | No        |
| NOG-12  |                             | 482499               | 4398177  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-13  |                             | 482489               | 4398177  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-14  |                             | 482324               | 4398112  | Blackhawk Formation/alluvium | None apparent                    | No        |
| NOG-15  |                             | 482260               | 4397906  | Blackhawk Formation          | None apparent                    | No        |
| NOG-16  |                             | 482285               | 4397917  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-17  | WQ36-2                      | 482591               | 4398258  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-18  |                             | 483000               | 4398162  | Blackhawk Formation/alluvium | None apparent                    | No        |
| NOG-19  |                             | 483058               | 4398135  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-20  |                             | 483068               | 4398135  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-21  | WQ1-1                       | 483028               | 4396395  | Blackhawk Formation          | Wildlife                         | No        |
| NOG-22  |                             | 482998               | 4396209  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-23  |                             | 483003               | 4396189  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-24  |                             | 482443               | 4395825  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-25  |                             | 482749               | 4396260  | Blackhawk Formation/alluvium | Wildlife, flows to adjacent pond | No        |
| NOG-26  |                             | 482676               | 4396027  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-27  |                             | 482654               | 4395989  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-28  |                             | 482656               | 4395004  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-28A |                             | 4823623              | 4395986  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-29  |                             | 482682               | 4395995  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-30  |                             | 482613               | 4395944  | Blackhawk Formation          | Wildlife, flows to creek         | No        |
| NOG-31  | NOG-24X                     | 482982               | 4396337  | Blackhawk Formation          | None apparent                    | No        |
| NOG-32  | Ledge Spring                | 482281               | 4399743  | Blackhawk Formation          | Wildlife, stockwatering          |           |
| NOG-33  |                             | 481903               | 4399058  | Blackhawk Formation          | Wildlife, stockwatering          |           |
| NOG-34  |                             | 481564               | 43399121 | Blackhawk Formation          | Wildlife, stockwatering          |           |

**Table 2 Discharge and field water quality parameters for springs and seeps.**

|        | Date      | Q         | T    | pH   | Cond |
|--------|-----------|-----------|------|------|------|
| NOG-1  | 14-Aug-06 | seep      | 13.9 | 7.06 | 638  |
| NOG-1  | 30-Jun-07 | seep      | ---  | ---  | ---  |
| NOG-1  | 29-Jul-08 | seep      | 19.0 | 7.59 | 605  |
| NOG-1A | 14-Aug-06 | seep      | 13.9 | 6.80 | 655  |
| NOG-1A | 30-Jun-07 | seep      | ---  | ---  | ---  |
| NOG-1A | 29-Jul-08 | seep      | ---  | ---  | ---  |
| NOG-2  | 14-Aug-06 | 0.94      | 5.5  | 7.09 | 554  |
| NOG-2  | 30-Jun-07 | 0.69      | 5.9  | 7.49 | 544  |
| NOG-2  | 29-Jul-08 | 1.24      | 4.8  | 7.63 | 551  |
| NOG-3  | 14-Aug-06 | damp soil | ---  | ---  | ---  |
| NOG-3  | 30-Jun-07 | damp soil | ---  | ---  | ---  |
| NOG-3  | 29-Jul-10 | seep      | ---  | ---  | ---  |
| NOG-4  | 14-Aug-06 | seep      | 11.4 | 7.42 | 491  |
| NOG-4  | 30-Jun-07 | seep      | 22.6 | 7.35 | 603  |
| NOG-4  | 29-Jul-08 | seep      | 11.7 | 7.93 | 517  |
| NOG-5  | 14-Aug-06 | seep      | 12.9 | 7.05 | 1056 |
| NOG-5  | 30-Jun-07 | seep      | 12.4 | 7.38 | 857  |
| NOG-5  | 29-Jul-08 | seep      | 14.1 | 7.47 | 854  |
| NOG-6  | 14-Aug-06 | 16.74     | 9.0  | 6.88 | 1278 |
| NOG-6  | 17-Sep-08 | 4.63      | 8.5  | 6.65 | 1285 |
| NOG-10 | 20-Oct-06 | 3.22      | 4.5  | 7.20 | 564  |
| NOG-10 | 30-Jun-07 | 1.80      | 4.4  | 7.35 | 620  |
| NOG-10 | 29-Jul-08 | 6.98      | 4.5  | 7.29 | 611  |
| NOG-11 | 20-Oct-06 | damp soil | ---  | ---  | ---  |
| NOG-11 | 30-Jun-07 | Dry       | ---  | ---  | ---  |
| NOG-11 | 29-Jul-08 | damp      | ---  | ---  | ---  |
| NOG-12 | 20-Oct-06 | 3.94      | 4.4  | 7.17 | 551  |
| NOG-12 | 30-Jun-07 | 3.92      | 4.3  | 7.47 | 579  |
| NOG-12 | 29-Jul-08 | 5.40      | 4.3  | 7.42 | 549  |
| NOG-13 | 20-Oct-06 | 4.82      | 4.2  | 7.09 | 563  |
| NOG-13 | 30-Jun-07 | 3.71      | 4.2  | 7.47 | 588  |
| NOG-13 | 29-Jul-08 | 14.7      | 4.0  | 7.43 | 553  |
| NOG-14 | 20-Oct-06 | seep      | 1.9  | 7.35 | 571  |
| NOG-14 | 30-Jun-07 | <0.1      | 5.9  | 7.65 | 542  |
| NOG-14 | 29-Jul-08 | <0.5      | 5.8  | 7.5  | 510  |
| NOG-15 | 20-Oct-06 | 0.14      | 4.3  | 7.74 | 545  |

|                 | Date      | Q         | T    | pH   | Cond |
|-----------------|-----------|-----------|------|------|------|
| NOG-15          | 30-Jun-07 | 6.76      | 4.4  | 7.56 | 566  |
| NOG-15          | 29-Jul-08 | 1.75      | 6.4  | 7.92 | 548  |
| NOG-16          | 20-Oct-06 | 5.73      | 3.8  | 7.75 | 513  |
| NOG-16 (WQ36-1) | 29-Jul-08 | 16.5      | 4.6  | 7.28 | 555  |
| NOG-16 (WQ36-1) | 25-Sep-08 | 4.75      | 5.1  | 7.27 | 566  |
| NOG-16 (WQ36-1) | 30-Oct-08 | 4.08      | 5.3  | 7.09 | 574  |
| NOG-16 (WQ36-1) | 29-Jun-09 | 18.2      | 4.6  | 7.10 | 591  |
| NOG-16 (WQ36-1) | 22-Sep-09 | 3.89      | 5.7  | 7.04 | 581  |
| NOG-16 (WQ36-1) | 11-Nov-09 | 2.68      | 5.6  | 7.09 | 589  |
| NOG-16 (WQ36-1) | 15-Jun-10 | 12.9      | 3.9  | 7.38 | 499  |
| NOG-16 (WQ36-1) | 17-Sep-10 | 1.97      |      |      |      |
| NOG-17 (WQ36-2) | 20-Oct-06 | 2.75      | 8.1  | 7.56 | 743  |
| NOG-17 (WQ36-2) | 30-Jun-07 | 16.10     | 7.2  | 7.29 | 782  |
| NOG-17 (WQ36-2) | 29-Jul-08 | 5.38      | 7.2  | 7.38 | 756  |
| NOG-17 (WQ36-2) | 27-Sep-08 | 1.42      | 8.4  | 7.28 | 753  |
| NOG-17 (WQ36-2) | 30-Oct-08 | 1.17      | 8.7  | 7.22 | 762  |
| NOG-17 (WQ36-2) | 29-Jun-09 | 2.88      | 7.2  | 7.15 | 763  |
| NOG-17 (WQ36-2) | 22-Sep-09 | 1.09      | 8.9  | 7.19 | 785  |
| NOG-17 (WQ36-2) | 11-Nov-09 | 1.06      | 8.7  | 7.29 | 781  |
| NOG-17 (WQ36-2) | 15-Jun-10 | 2.36      | 3.8  | 7.43 | 610  |
| NOG-17 (WQ36-2) | 17-Sep-10 | 0.80      | 8.9  | 7.51 | 775  |
| NOG-18          | 20-Oct-06 | <0.25     | 4.3  | 7.46 | 527  |
| NOG-18          | 30-Jun-07 | Dry       | ---  | ---  | ---  |
| NOG-18          | 29-Jul-08 | damp soil | ---  | ---  | ---  |
| NOG-19          | 20-Oct-06 | 1.55      | 5.1  | 7.28 | 579  |
| NOG-19          | 30-Jun-07 | 1.87      | 11.6 | 7.54 | 605  |
| NOG-19          | 29-Jul-08 | 11.0      | 4.9  | 7.46 | 582  |
| NOG-20          | 20-Oct-06 | 4.97      | 6.3  | 7.23 | 585  |
| NOG-20          | 30-Jun-07 | 0.66      | 7.4  | 7.87 | 615  |
| NOG-20          | 29-Jul-08 | 5.86      | 5.4  | 7.71 | 567  |
| NOG-21 (WQ1-1)  | 1-Nov-06  | 6.61      | 6.1  | 7.45 | 725  |
| NOG-21 (WQ1-1)  | 30-Jun-07 | 8.89      | 4.9  | 7.23 | 714  |
| NOG-21 (WQ1-1)  | 25-Sep-07 | 5.04      | 6.8  | 7.71 | 653  |
| NOG-21 (WQ1-1)  | 19-Nov-07 | 3.87      | 6.2  | 7.26 | 669  |
| NOG-21 (WQ1-1)  | 27-Jun-08 | 24.4      | 5.5  | 7.23 | 697  |
| NOG-21 (WQ1-1)  | 27-Sep-08 | 7.35      | 6.5  | 7.12 | 738  |
| NOG-21 (WQ1-1)  | 30-Oct-08 | 6.47      | 6.4  | 7.12 | 737  |
| NOG-21 (WQ1-1)  | 29-Jun-09 | 11.9      | 5.1  | 7.09 | 747  |
| NOG-22          | 1-Nov-06  | 4.60      | 5.4  | 7.01 | 726  |
| NOG-22          | 30-Jun-07 | 5.86      | 5.3  | 7.23 | 721  |
| NOG-23          | 1-Nov-06  | 1.26      | 1.4  | 7.08 | 706  |
| NOG-23          | 30-Jun-07 | 3.28      | 7.3  | 7.19 | 675  |

|         | Date      | Q         | T    | pH   | Cond |
|---------|-----------|-----------|------|------|------|
| NOG-24  | 3-Nov-06  | 5.36      | 4.9  | 7.28 | 554  |
| NOG-24  | 30-Jun-07 | 6.94      | 5.4  | 7.28 | 566  |
| NOG-24  | 29-Jul-08 | 14.9      | 5.3  | 7.45 | 555  |
| NOG-25  | 3-Nov-06  | 1.190     | 4.8  | 7.25 | 587  |
| NOG-25  | 30-Jun-07 | 0.340     | 6.7  | 7.54 | 590  |
| NOG-25  | 29-Jul-08 | 1.680     | 5.5  | 7.47 | 599  |
| NOG-26  | 3-Nov-06  | 1.42      | 5.0  | 7.25 | 566  |
| NOG-26  | 30-Jun-07 | 2.01      | 6.3  | 7.52 | 595  |
| NOG-27  | 3-Nov-06  | 0.39      | 3.8  | 7.07 | 606  |
| NOG-27  | 30-Jun-07 | 1.21      | 5.6  | 7.38 | 618  |
| NOG-27  | 29-Jul-08 | 1.60      | 5.6  | 7.52 | 629  |
| NOG-28  | 3-Nov-06  | 0.88      | 3.5  | 7.62 | 589  |
| NOG-28  | 30-Jun-07 | 0.74      | 9.7  | 7.92 | 568  |
| NOG-28  | 29-Jul-08 | 1.18      | 5.9  | 7.43 | 625  |
| NOG-28A | 30-Jun-07 | Damp soil | ---  | ---  | ---  |
| NOG-28A | 29-Jul-08 | 1.41      | 6.8  | 7.30 | 644  |
| NOG-29  | 3-Nov-06  | 0.27      | 3.9  | 7.56 | 595  |
| NOG-29  | 30-Jun-07 | 0.56      | 6.7  | 7.36 | 629  |
| NOG-29  | 29-Jul-08 | 0.82      | 7.2  | 7.27 | 643  |
| NOG-30  | 3-Nov-06  | 0.55      | 5.4  | 7.05 | 609  |
| NOG-30  | 30-Jun-07 | 0.55      | 5.4  | 7.38 | 613  |
| NOG-30  | 29-Jul-08 | 0.88      | 5.8  | 7.47 | 619  |
| NOG-31  | 1-Nov-06  | seep      | ---  | ---  | ---  |
| NOG-31  | 30-Jun-07 | seep      | 10.2 | 7.52 | 629  |

Table 3 Discharge and field water quality parameters for inventoried springs and stream monitoring sites.

|                 | Date      | Discharge<br>(gpm) | T<br>(°C) | pH   | Cond<br>(µS/cm) | TDS<br>(mg/L) | TSS<br>(mg/L) | Ca<br>(mg/L) | Mg<br>(mg/L) | Na<br>(mg/L) | K<br>(mg/L) | HCO <sub>3</sub><br>(mg/L <sub>eqCO3</sub> ) | CO <sub>3</sub><br>(mg/L <sub>eqCO3</sub> ) | SO <sub>4</sub><br>(mg/L) | Cl<br>(mg/L) | Fe (t)<br>(mg/L) | Fe (d)<br>(mg/L) | Mn (t)<br>(mg/L) | Mn (d)<br>(mg/L) | Ba<br>(mg/L) | B<br>(mg/L) | Cu<br>(mg/L) | Pb<br>(mg/L) | NO2+NO3<br>(mg/L) | T-Phos.<br>(mg/L) | Acidity<br>(mg/L) | Alkalinity<br>(mg/L <sub>eqCO3</sub> ) | Hardness<br>(mg/L <sub>eqCO3</sub> ) | Cations<br>(meq/L) | Anions<br>(meq/L) | Balance<br>(%) |     |
|-----------------|-----------|--------------------|-----------|------|-----------------|---------------|---------------|--------------|--------------|--------------|-------------|--|---|---------------------------|--------------|------------------|------------------|------------------|------------------|--------------|-------------|--------------|--------------|-------------------|-------------------|-------------------|--|--------------------------------------|--------------------|-------------------|----------------|-----|
| NOG-16 (WQ36-1) | 20-Oct-06 | 5.73               | 3.8       | 7.75 | 513             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-16 (WQ36-1) | 29-Jul-08 | 16.5               | 4.6       | 7.28 | 555             | 346           | 42            | 98.03        | 18.7         | 4.05         | 1.42        | 284  | <5  | 15                        | 7            | 0.57             | <0.03            | 0.02             | 0.003            | 0.016        | 0.02        | <0.01        | <0.01        | <0.01             | 1.74              | <0.05             | 21                                     | 284                                  | 322                | 6.6               | 6.2            | 3.5 |
| NOG-16 (WQ36-1) | 25-Sep-08 | 4.75               | 5.1       | 7.27 | 566             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-16 (WQ36-1) | 30-Oct-08 | 4.08               | 5.3       | 7.09 | 574             | 320           | 9             | 98.67        | 18.73        | 4.18         | 1.43        | 292  | <5  | 17                        | 8            | 0.06             | <0.03            | 0.003            | <0.002           | 0.015        | 0.02        | <0.01        | <0.01        | 2.76              | <0.05             |                   | 282                                    | 324                                  | 6.7                | 6.4               | 2.1            |     |
| NOG-16 (WQ36-1) | 29-Jun-09 | 18.2               | 4.6       | 7.10 | 591             | 339           | 13            | 100.97       | 18.85        | 4.03         | 1.42        | 285  | <5  | 16                        | 7            | <0.05            | <0.03            | <0.002           | <0.002           |              |             |              |              | 1.2               | <0.05             | 12                | 285                                    | 330                                  | 6.8                | 6.2               | 4.4            |     |
| NOG-16 (WQ36-1) | 22-Sep-09 | 3.89               | 5.7       | 7.04 | 581             | 363           | 76            | 100.69       | 19.6         | 4.53         | 1.51        | 307  | <5  | 16                        | 8            | 0.53             | <0.03            | 0.014            |                  |              |             |              |              | 0.57              | <0.05             |                   | 307                                    | 332                                  | 6.8                | 6.7               | 1.26           |     |
| NOG-16 (WQ36-1) | 11-Nov-09 | 2.68               | 5.6       | 7.09 | 589             | 350           | 10            | 103.22       | 19.96        | 4.29         | 1.59        | 308  | <5  | 17                        | 8            | <0.05            | <0.03            | <0.002           | <0.002           |              |             |              |              | 0.62              | <0.05             |                   | 308                                    | 340                                  | 7.02               | 6.73              | 2.14           |     |
| NOG-16 (WQ36-1) | 15-Jun-10 | 12.9               | 3.9       | 7.38 | 499             | 335           | 9             | 92.98        | 17.26        | 4.09         | 1.34        | 289  | <5  | 16                        | 7            | <0.05            | <0.03            | <0.002           | <0.002           | 0.015        | 0.02        | <0.01        | <0.01        | 0.61              | <0.05             | 17                | 289                                    | 303                                  | 6.27               | 6.31              | -0.26          |     |
| NOG-16 (WQ36-1) | 17-Sep-10 | 1.97               |           |      |                 |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-16 (WQ36-1) | 02-Nov-10 | 0.8                | 5.0       | 7.31 | 606             | 341           | 8             | 90           | 18           | 4.5          | 1.8         | 232  | <1  | 18                        | 7            | 0.07             | <0.02            | 0.005            | <0.005           | 0.017        | <0.05       | <0.005       | 0.02         | 0.6               | 0.02              |                   | 190                                    | 299                                  | 6.2                | 4.3               | 17             |     |
| NOG-17 (WQ36-2) | 20-Oct-06 | 2.75               | 8.1       | 7.56 | 743             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-17 (WQ36-2) | 30-Jun-07 | 16.10              | 7.2       | 7.29 | 782             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-17 (WQ36-2) | 29-Jul-08 | 5.38               | 7.2       | 7.38 | 756             | 490           | 35            | 105.08       | 32.05        | 19.2         | 2.36        | 317  | <5  | 57                        | 36           | 0.28             | <0.03            | 0.004            | <0.002           | 0.027        | 0.04        | <0.01        | <0.01        | 0.9               | <0.05             | 20                | 317                                    | 394                                  | 8.8                | 8.5               | 1.4            |     |
| NOG-17 (WQ36-2) | 27-Sep-08 | 1.42               | 8.4       | 7.28 | 753             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-17 (WQ36-2) | 30-Oct-08 | 1.17               | 8.7       | 7.22 | 762             | 439           | 25            | 104.19       | 32.37        | 19.25        | 2.48        | 318  | <5  | 58                        | 36           | 0.18             | <0.03            | 0.019            |                  | 0.026        | 0.04        | 0.01         | <0.01        | 3.22              | <0.05             |                   | 318                                    | 393                                  | 8.8                | 8.6               | 1.1            |     |
| NOG-17 (WQ36-2) | 29-Jun-09 | 2.88               | 7.2       | 7.15 | 763             | 468           | 6             | 109.45       | 34.51        | 19.85        | 2.55        | 314  | <5  | 57                        | 35           | 0.08             | <0.03            | 0.004            | 0.002            |              |             |              |              | 1.66              | <0.05             | 11                | 314                                    | 415                                  | 9.2                | 8.4               | 4.4            |     |
| NOG-17 (WQ36-2) | 22-Sep-09 | 1.09               | 8.9       | 7.19 | 785             | 486           | 72            | 106.61       | 34.93        | 19.23        | 2.66        | 331  | <5  | 57                        | 35           | 0.81             | <0.03            | 0.053            |                  |              |             |              |              | 0.27              | 0.1               |                   | 331                                    | 410                                  | 9.1                | 8.79              | 1.7            |     |
| NOG-17 (WQ36-2) | 11-Nov-09 | 1.06               | 8.7       | 7.29 | 781             | 482           | 43            | 108.47       | 34.9         | 19.27        | 2.63        | 330  | <5  | 58                        | 35           | 0.22             | <0.03            | 0.014            | <0.002           |              |             |              |              | 0.3               | <0.05             |                   | 330                                    | 415                                  | 9.19               | 8.8               | 2.17           |     |
| NOG-17 (WQ36-2) | 15-Jun-10 | 2.36               | 3.8       | 7.43 | 610             | 469           | 10            | 101.86       | 30.97        | 18.66        | 2.42        | 324  | <5  | 57                        | 33           | <0.05            | <0.03            | <0.002           | <0.002           | 0.026        | 0.04        | <0.01        | <0.01        | 0.26              | <0.05             | 12                | 324                                    | 382                                  | 8.5                | 8.6               | -0.54          |     |
| NOG-17 (WQ36-2) | 17-Sep-10 | 0.80               | 8.9       | 7.51 | 775             | 474           | 55            | 102          | 30.8         | 17.6         | 2.00        | 336  | <1  | 58                        | 34           | 0.14             | <0.02            | 0.011            | 0.016            | 0.023        | <0.05       | <0.005       | <0.02        | 0.2               | 0.03              |                   | 337                                    | 339                                  | 8.4                | 8.9               | -2.6           |     |
| NOG-21 (WQ1-1)  | 01-Nov-06 | 6.61               | 6.1       | 7.45 | 725             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 30-Jun-07 | 8.89               | 4.9       | 7.23 | 714             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 25-Sep-07 | 5.04               | 6.8       | 7.71 | 653             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 19-Nov-07 | 3.87               | 6.2       | 7.26 | 669             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 27-Jun-08 | 24.4               | 5.5       | 7.23 | 697             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 27-Sep-08 | 7.35               | 6.5       | 7.12 | 738             | 471           | 36            | 118.13       | 40.95        | 5.54         | 3.06        | 373  | <5.   | 48                        | 10           | 0.15             |                  | 0.004            |                  |              |             |              |              | 3.16              | <.05              |                   | 373                                    | 464                                  | 9.6                | 8.7               | 4.7            |     |
| NOG-21 (WQ1-1)  | 30-Oct-08 | 6.47               | 6.4       | 7.12 | 737             | 444           | 13            | 111.75       | 36.79        | 5.35         | 2.92        | 379  | <5.   | 48                        | 10           | 0.12             |                  | 0.004            |                  |              |             |              |              | 2.3               | <.05              |                   | 379                                    | 431                                  | 8.9                | 8.9               | 0.3            |     |
| NOG-21 (WQ1-1)  | 16-Jun-09 | 16.1               | 4.9       | 7.24 | 747             | 434           | 14            | 109.61       | 35.22        | 5.67         | 2.84        | 345  | <5.   | 42                        | 9            | <.05             |                  | <.002            |                  |              |             |              |              | 1.74              | <.05              |                   | 345                                    | 419                                  | 8.7                | 8                 | 3.9            |     |
| NOG-21 (WQ1-1)  | 29-Jun-09 | 11.9               | 5.1       | 7.09 | 747             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 28-Jul-09 | 7.8                | 6         | 7.08 | 790             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 12-Nov-09 | 3.7                | 6.1       | 6.94 | 792             |               |               |              |              |              |             |  |   |                           |              |                  |                  |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |
| NOG-21 (WQ1-1)  | 15-Jun-10 | 10.1               | 3.8       | 7.43 | 610             | 410           | 66            | 90.11        | 28.82        | 4.69         | 2.36        | 342  | <5.   | 36                        | 8            | 0.31             | <.03             | 0.012            | <.002            | 0.035        | 0.04        | <.01         | <.01         | 0.89              | 0.1               | 13                | 342                                    | 344                                  | 7.13               | 7.81              | -4.51          |     |
| NOG-21 (WQ1-1)  | 27-Sep-10 | 4.6                | 6.6       | 7.3  | 760             | 492           | <4.           | 96.6         | 30           | 5.3          | 3.3         | 301  | <1.   | 45                        | 9            | <.02             | <.02             | <.005            | <.005            | 0.044        | 0.05        | <.005        | <.02         | 0.4               | <.01              |                   | 247                                    | 373                                  | 7.6                | 6.2               | 10             |     |
| CS-20           | 17-Jun-02 | 367                | 19.2      | 8.55 | 338             | 191           | 14            | 46           | 10           | 4            | 1           | 128  | 3.6   | 19                        | 3            | 0.1              | <.05             | <.05             | <.05             |              |             |              |              | <.03              |                   |                   | 139                                    | 256                                  | 5.4                | 5.2               |                |     |
| CS-20           | 04-Nov-02 | 165                | 0         | 7.57 | 437             | 297           | <5.           | 76           | 16           | 5            | 2           | 219  |   | 33                        | 4            | <.1              | <.1              | <.05             | <.05             |              | 0.11        | <.1          | <.1          | 0.22              | <5.               |                   | 219                                    |                                      |                    |                   |                |     |
| CS-20           | 17-Jun-03 | 871                | 11.4      | 8.28 | 323             | 195           | 9             | 55.1         | 9.35         | 2.83         | 1.41        | 151  |   | 17                        | 3            | 0.168            | 0.014            | 0.014            |                  |              |             |              |              | 0.37              |                   |                   | 155                                    |                                      |                    |                   |                | 1   |
| CS-20           | 18-Sep-03 | 108                | 5.4       | 8.38 | 376             | 263           | <5.           | 65.3         | 13.3         | 3            | 1.34        | 194  |   | 25                        | 3            | 0.062            | 0.02             | 0.009            | 0.007            | 0.021        | 0.015       | <.01         | <.005        | <.03              | <5.               |                   | 196                                    |                                      |                    |                   |                | 1   |
| CS-20           | 30-Oct-03 | 158                | 2.4       | 8.53 | 383             | 239           | 8             | 61.8         | 12.9         | 3.18         | 1.68        | 180  | 3   | 27                        | 3            | 0.119            |                  | 0.01             |                  |              |             |              |              | 0.04              |                   |                   | 189                                    |                                      |                    |                   |                | 1   |
| CS-20           | 23-Jun-04 | 684                | 18.9      | 8.14 | 313             | 200           | 13            | 52.1         | 9.57         | 2.63         | 1.22        | 127  |   | 19                        | 3            | 0.24             | <.03             | 0.016            |                  |              |             |              |              | 0.07              | <5.               |                   | 155                                    |                                      |                    |                   |                | 1   |
| CS-20           | 06-Sep-04 | 117                | 12.8      | 8.27 | 332             | 204           | <5.           | 57.1         | 11.8         | 3.08         | 2.04        | 163  | <5.   | 24                        | 4            | 0.37             | <.03             | 0.015            | 0.006            | 0.024        | 0.02        | <.01         | <.01         |                   |                   | <5.               | 167                                    |                                      |                    |                   |                | 1   |
| CS-20           | 10-Nov-04 | 266                | 1         | 8.52 | 318             | 242           | <5.           | 62.6         | 11.1         | 2.87         | 1.42        | 177  | <5.   | 24                        | 3            | 0.07             |                  | 0.008            |                  |              |             |              |              |                   |                   |                   | 177                                    |                                      |                    |                   |                | 1   |
| CS-20           | 23-Jun-05 | 2800               | 13.4      | 8.26 | 276             | 188           | <5.           | 54.2         | 8.63         | 2.41         | 1.2         | 138  | <5.   | 15                        | 2            | 0.11             | <.03             | 0.009            | 0.009            | 0.03         | 0.03        | <.01         | <.01         |                   | <5.               |                   | 138                                    |                                      |                    |                   |                | 1   |
| CS-20           | 15-Sep-05 | 263                | 8         | 8.59 | 427             | 227           | <5.           | 65           | 12.8         | 3.45         | 1.43        | 185  | <5.   | 25                        | 4            | 0.07             | <.03             | 0.009            |                  |              |             |              |              |                   |                   |                   | 185                                    |                                      |                    |                   |                | 1.7 |
| CS-20           | 18-Oct-05 | 301                | 3.1       | 8.49 | 344             | 209           | 6             | 69.3         | 13.4         | 3.07         | 1.32        | 188  | <5.   | 25                        | 3            | 0.07             |                  | 0.009            |                  |              |             |              |              |                   |                   |                   | 188                                    |                                      |                    |                   |                | 4   |
| CS-20           | 26-Jun-06 | 718                | 14.3      | 8.67 | 403             | 207           | 9             | 61           | 10.5         | 3.03         | 1.23        | 161  | <5.   | 18                        | 4            | 0.12             | <.03             | 0.011            | 0.005            |              |             |              |              |                   |                   |                   | 166                                    |                                      |                    |                   |                | 4.7 |
| CS-20           | 25-Sep-06 | 373                | 4.9       | 8.73 | 344             | 241           | 7             | 65.33        | 11.76        | 3.28         | 1.37        | 180  | <5.   | 24                        | 4            | 0.06             |                  | 0.008            |                  |              |             |              |              | 0.11              | <.05              |                   | 180                                    |                                      |                    |                   |                | 4   |
| CS-20           | 01-Nov-06 | 474                | 0.4       | 8.5  | 480             | 275           | 12            | 70.8         | 12.63        | 3.74         | 1.33        | 186  | <5.   | 25                        | 4            | 0.07             |                  | 0.009            |                  |              |             |              |              | 0.33              | <.05              |                   | 186                                    |                                      |                    |                   |                | 4.6 |
| CS-20           | 30-Jun-07 | 129                | 16.1      | 8.44 | 403             | 231           | <5.           | 68           | 11.9         | 3.37         | 1.13        | 189  | <5.   | 18                        | 4            | 0.07             |                  | 0.011            |                  |              |             |              |              | <.05              | <.05              |                   | 189                                    |                                      |                    |                   |                | 3.2 |
| CS-20           | 25-Sep-07 | 161                | 4.7       | 8.76 | 336             | 266           | <5.           | 68.7         | 12.9         | 3.61         | 1.53        | 184  | <5.   | 24                        | 4            | 0.06             |                  | 0.009            |                  |              |             |              |              | 0.07              | <.05              |                   | 184                                    |                                      |                    |                   |                | 4.4 |
| CS-20           | 19-Nov-07 | 228                | 0.5       | 8.23 | 311             | 291           | <5.           | 67.22        | 12.91        | 3.08         | 1.52        | 194  | <5.   | 26                        | 3            | <.05             |                  | 0.006            |                  |              |             |              |              | 3.13              | <.05              |                   | 194                                    |                                      |                    |                   |                | 0.9 |
| CS-20           | 27-Jun-08 | 2650               | 14.9      | 8.6  | 303             | 189           | <5.           | 49.28        | 8.03         | 2.61         | 0.98        | 106  | 23  | 15                        | 3            | 0.07             | </               |                  |                  |              |             |              |              |                   |                   |                   |  |                                      |                    |                   |                |     |

|       | Date      | Discharge<br>(gpm) | T<br>(°C) | pH   | Cond<br>(µS/cm) | TDS<br>(mg/L) | TSS<br>(mg/L) | Ca<br>(mg/L) | Mg<br>(mg/L) | Na<br>(mg/L) | K<br>(mg/L) | HCO <sub>3</sub><br>(mg/L <sub>CaCO3</sub> ) | CO <sub>3</sub><br>(mg/L <sub>CaCO3</sub> ) | SO <sub>4</sub><br>(mg/L) | Cl<br>(mg/L) | Fe (t)<br>(mg/L) | Fe (d)<br>(mg/L) | Mn (t)<br>(mg/L) | Mn (d)<br>(mg/L) | Ba<br>(mg/L) | B<br>(mg/L) | Cu<br>(mg/L) | Pb<br>(mg/L) | NO2+NO3<br>(mg/L) | T-Phos.<br>(mg/L) | Acidity<br>(mg/L) | Alkalinity<br>(mg/L <sub>CaCO3</sub> ) | Hardness<br>(mg/L <sub>CaCO3</sub> ) | Cations<br>(meq/L) | Anions<br>(meq/L) | Balance<br>(%) |
|-------|-----------|--------------------|-----------|------|-----------------|---------------|---------------|--------------|--------------|--------------|-------------|--|---|---------------------------|--------------|------------------|------------------|------------------|------------------|--------------|-------------|--------------|--------------|-------------------|-------------------|-------------------|--|--------------------------------------|--------------------|-------------------|----------------|
| CS-21 | 22-Jun-05 | 1795               | 9.7       | 8.25 | 301             | 229           | 18            | 60           | 9.89         | 3            | 1.1         | 152  | < 5.  | 14                        | 3            | 0.42             | < .03            | 0.015            | 0.007            | 0.02         | 0.03        | < .01        | < .01        | < 5.              | 155               |                   |  | 238                                  | 5                  | 5                 | 1              |
| CS-21 | 06-Sep-05 | 126                | 11        | 8.43 | 403             | 275           | 9             | 72.9         | 13.7         | 4.02         | 1.34        | 216  | < 5.  | 23                        | 6            | 0.09             | < .03            | 0.009            | 0.009            |              |             |              |              |                   |                   |                   | 216                                    | 238                                  | 5                  | 5                 | 0.1            |
| CS-21 | 13-Oct-05 | 78                 | 2.6       | 8.25 | 409             | 304           | < 5.          | 77.1         | 16           | 4.22         | 1.46        | 233  | < 5.  | 21                        | 5            | 0.07             |                  | 0.008            |                  |              |             |              |              |                   |                   |                   | 233                                    | 258                                  | 5.4                | 5.2               | 1.4            |
| CS-21 | 28-Jun-06 | 512                | 11.8      | 8.46 | 427             | 250           | 13            | 73.5         | 12.2         | 4.21         | 1.23        | 204  | < 5.  | 18                        | 5            | 0.13             |                  | 0.011            |                  |              |             |              |              |                   |                   |                   | 204                                    | 234                                  | 4.9                | 4.6               | 3.1            |
| CS-21 | 26-Sep-06 | 134                | 6.3       | 8.3  | 442             | 302           | < 5.          | 77.44        | 13.75        | 4.48         | 1.37        | 212  | 16  | 21                        | 5            | 0.07             |                  | 0.007            |                  |              |             |              |              |                   |                   |                   | 229                                    | 250                                  | 5.2                | 5.1               | 0.9            |
| CS-21 | 02-Nov-06 | 124                | 1.6       | 8.43 | 493             | 276           | 12            | 81.75        | 14.73        | 4.81         | 1.12        | 227  | < 5.  | 23                        | 5            | 0.15             |                  | 0.01             |                  |              |             |              |              |                   |                   |                   | 227                                    | 265                                  | 5.5                | 5.2               | 3.5            |
| CS-21 | 30-Jun-07 | 455                | 20        | 8.53 | 344             | 201           | 11            | 57.8         | 11           | 2.79         | 1.26        | 160  | < 5.  | 20                        | 3            | 0.29             |                  | 0.022            |                  |              |             |              |              |                   |                   |                   | 160                                    | 190                                  | 3.9                | 3.7               | 3.2            |
| CS-21 | 25-Sep-07 | 67                 | 5.3       | 8.62 | 414             | 304           | < 5.          | 79.7         | 14.2         | 4.43         | 1.56        | 227  | < 5.  | 20                        | 5            | 0.07             |                  | 0.009            |                  |              |             |              |              |                   |                   |                   | 227                                    | 257                                  | 5.4                | 5.1               | 2.7            |
| CS-21 | 19-Nov-07 | 100                | 1.2       | 8.2  | 391             | 335           | < 5.          | 78.64        | 13.88        | 3.83         | 1.4         | 228  | 5   | 23                        | 5            | 0.06             |                  | 0.006            |                  |              |             |              |              |                   |                   |                   | 233                                    | 254                                  | 5.3                | 5.3               | 0.1            |
| CS-21 | 27-Jun-08 | 2080               | 11.8      | 8.34 | 330             | 221           | 6             | 60.88        | 9.63         | 3.28         | 1           | 158  | < 5.  | 14                        | 4            | 0.13             |                  | 0.009            |                  |              |             |              |              |                   |                   |                   | 158                                    | 192                                  | 4                  | 3.6               | 5.8            |
| CS-21 | 27-Sep-08 | 139                | 7.6       | 8.48 | 455             | 291           | < 5.          | 78.59        | 16.18        | 4.5          | 1.49        | 219  | < 5.  | 21                        | 5            | < .05            |                  | 0.004            |                  |              |             |              |              |                   |                   |                   | 220                                    | 263                                  | 5.5                | 5                 | 4.8            |
| CS-21 | 30-Oct-08 | 125                | 2.2       | 8.33 | 471             | 263           | < 5.          | 81.14        | 14.3         | 4.39         | 1.36        | 232  | < 5.  | 23                        | 5            | 0.05             |                  | 0.005            |                  |              |             |              |              |                   |                   |                   | 232                                    | 261                                  | 5.5                | 5.3               | 1.6            |
| CS-21 | 29-Jun-09 | 605                | 15.8      | 8.37 | 403             | 242           | 5             | 68.39        | 11.21        | 3.78         | 1.24        | 171  | 9   | 18                        | 4            | 0.14             |                  | 0.013            |                  |              |             |              |              |                   |                   |                   | 180                                    | 217                                  | 4.5                | 4.1               | 5.1            |
| CS-21 | 28-Aug-09 | 121.6              | 11.7      | 8.37 | 453             | 265           | 6             | 76.18        | 13.94        | 4.23         | 1.37        | 208  | < 5.  | 20                        | 5            | < .05            |                  | 0.006            |                  |              |             |              |              |                   |                   |                   | 208                                    | 248                                  | 5.17               | 4.72              | 4.58           |
| CS-21 | 02-Nov-09 | 104.5              | 1.5       | 8.17 | 536             | 295           | < 5.          | 80.29        | 14.6         | 4.18         | 1.45        | 228  | < 5.  | 23                        | 5            | < .05            |                  | 0.003            |                  |              |             |              |              |                   |                   |                   | 228                                    | 261                                  | 5.43               | 5.18              | 2.36           |
| CS-21 | 15-Jun-10 | 1067               | 10        | 8.47 | 262             | 190           | 15            | 51.11        | 7.45         | 3.05         | 1.08        | 135  | < 5.  | 12                        | 3            | 0.29             | < .02            | 0.015            |                  |              |             |              |              |                   |                   |                   | 135                                    | 158                                  | 3.32               | 3.04              | 4.45           |
| CS-21 | 17-Sep-10 | 67.5               | 9.2       | 8.48 | 447             | 266           | 4             | 72.8         | 13.1         | 3.9          | 1.2         | 274  | 2   | 22                        | 5            | 0.06             | < .02            | 0.006            | < .005           | 0.014        | < .05       | < .005       | < .02        | 0.4               | 0.03              |                   | 228                                    | 233                                  | 4.9                | 5.1               | -1.8           |