



**A demonstration of a U.S. Geological
Survey ground-water sampling mobile
laboratory, techniques and computerized
field notes.**

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Collecting a Representative Ground-Water Water-Quality Sample

- What is being sampled for?
- What materials will touch the water?
- What will the pump do to the water?
- Were all the samples you will be comparing sampled in the same way?
- How do you know?

Factors that affect the chemistry of samples

- Equipment that touches the water.
- Cleanliness of equipment.
- Exposure to the atmosphere.
- Temperature change.
- Pressure decrease.



A dedicated mobile laboratory is
a useful tool to control these
factors





Factors that affect the chemistry of samples

- Equipment material.
- Equipment cleaning protocols.
- Exposure to the atmosphere.



Factors that affect the chemistry of samples

- Temperature change.
- Pressure decrease.



Sample Collection

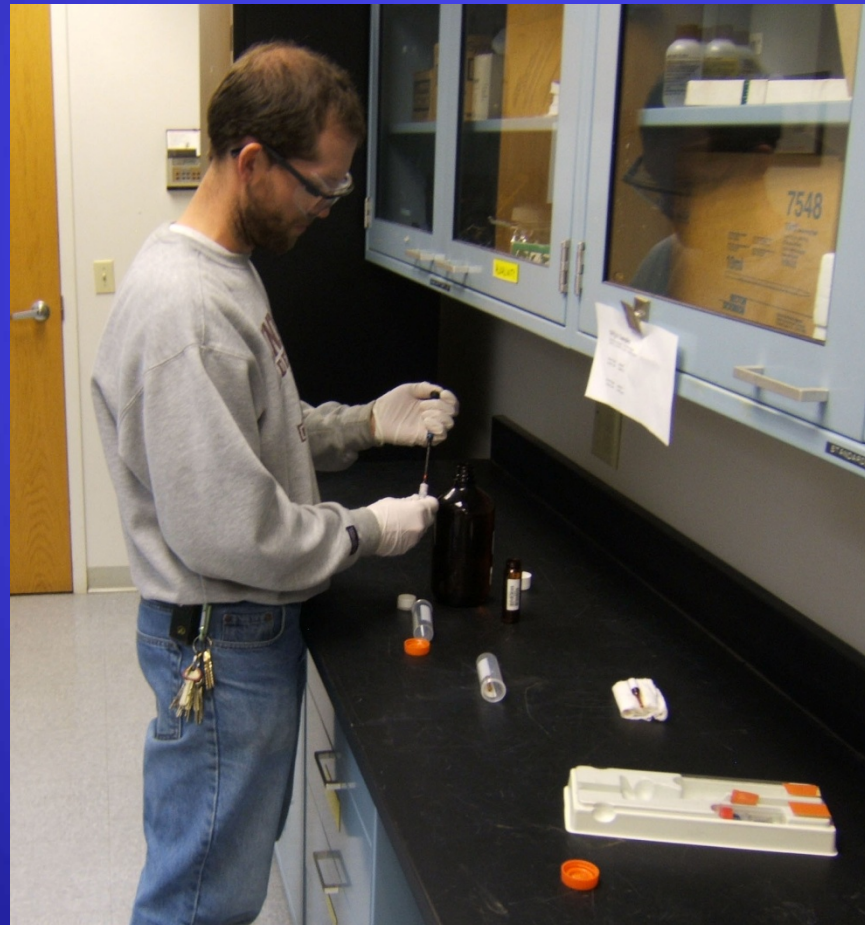
- Position of pump in well is important.
- Pump 3X casing volume.
- Measure pH, temperature, specific conductance, dissolved oxygen and turbidity at regular intervals.
- Continue until 5 consecutive readings are measured that fall with a set range.

Sample Collection

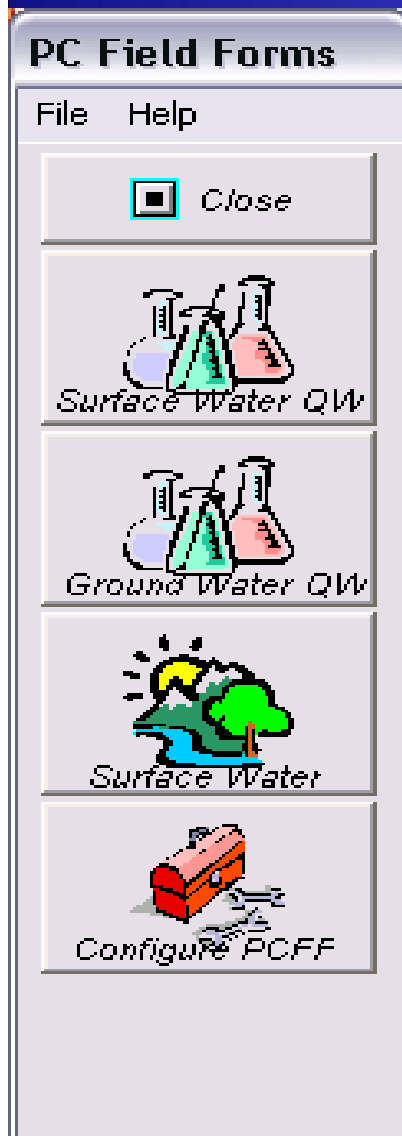
- Drawdown not to exceed 1 ft.
- Flowrate not to exceed 500 mL/min.
- Fill bottles in consistent order.
- Rinse sample bottles & preserve if appropriate.

Quality Control

- Validates sampling protocols
- At least 10% replicates, blanks and spikes

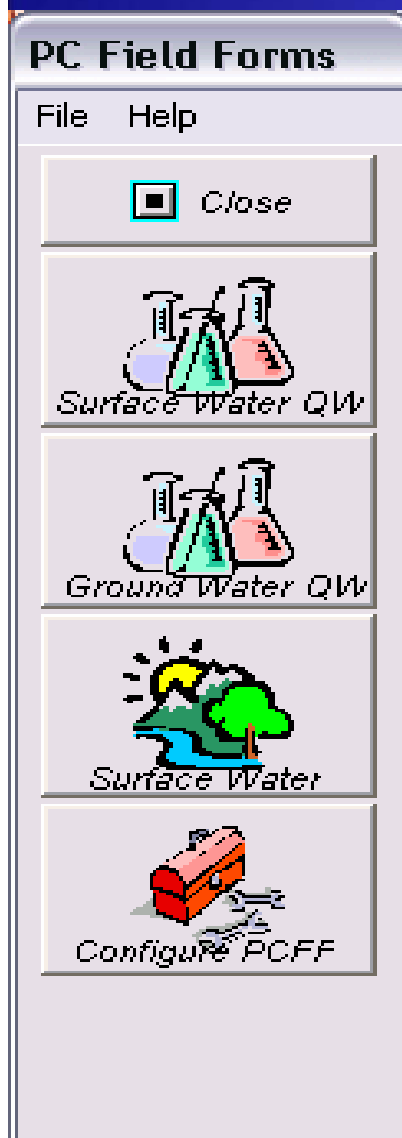


Use of Automation to Increase Efficiency and Accuracy



- Field notes can be pre-populated to save time and reduce errors
- Aids in producing thorough notes
- Dropdown menus expedite note taking
- Greatly increases consistency of filed notes

Use of Automation to Increase Efficiency and Accuracy



- Built-in checks prevent math errors and illogical coding errors
- Eliminates transcription errors and deciphering hand written forms
- Expedites uploading field data into databases

Sample Coding Screen

PCFF SWQW Ver 6.0

09069000 Eagle River at Gypsum

Station Number

Station Name

Cancel

Save

Update

3/20/2007



12:00

//



:

KJB

Sample Date

Mean Time

End Date

End Time

Sampling Team:

Help

858200310

Project Account

Project Name

No

QC Samples Collected

Coding

Sampler

Sampling Conditions

Cross Section / Lake Profile

Field Meas

LAB ASR

Lot Numbers

Sample Coding

Sample Medium +	9
Analysis Status +	H
Analysis Source +	9
Hydrologic Condition +	9
Sample Type +	9
Hydrologic Event +	9
Collection Agency +	USGS-WRD

Sample Methods

Purpose of visit (50280)+	1001
Sample Purpose (71999)+	10.00
Sample Method (82398)+	10

QA data type associated with, Sample (99111)+	1
Purpose, Topical QC data, (99112)+	
Replicate, type, fixed value, code (99105)+	

Example of Dropdown Menus

PCFF SWQW Ver 6.0

09069000 Eagle River at Gypsum

Station Number Station Name

3/20/2007 12:00 //

Sample Date Mean Time End Date

858200310

Project Account Project Name

Coding Sampler Sampling Conditions Cross Section

Sample Coding

Sample Medium →	9
Analysis Status →	H
Analysis Source →	9
Hydrologic Condition →	9
Sample Type →	9
Hydrologic Event →	9
Collection Agency →	USGS-WRD

Sample Methods

Purpose of visit (50280)→	1001
Sample Purpose (71999)→	10.00
Sample Method (82398)→	10

SAMPLING METHOD CODES (82398)

Description RESIN TRAP COLLECTOR

Code 4110

☒ Paramcode search

☐ Description search

Search for

Favorite Values All Values

paramcode	description	Hide
4048	SUBMERSIBLE GAS-DISPLACEMENT PUMP	<input checked="" type="checkbox"/>
4050	SQUEEZE PUMP	<input checked="" type="checkbox"/>
4060	GAS RECIPROCATING PUMP	<input checked="" type="checkbox"/>
4070	GAS LIFT	<input checked="" type="checkbox"/>
4080	PERISTALTIC PUMP	<input checked="" type="checkbox"/>
4090	JET PUMP	<input checked="" type="checkbox"/>
4100	FLOWING WELL	<input checked="" type="checkbox"/>
4110	RESIN TRAP COLLECTOR	<input checked="" type="checkbox"/>
50	POINT SAMPLE	<input type="checkbox"/>
5010	SEDIMENT CORE	<input checked="" type="checkbox"/>
55	COMPOSITE # MULTIPLE POINT SAMPLES	<input checked="" type="checkbox"/>
60	WEIGHTED BOTTLE	<input checked="" type="checkbox"/>
70	GRAB SAMPLE	<input type="checkbox"/>
8010	OTHER	<input type="checkbox"/>
8020	SYRINGE SAMPLE	<input checked="" type="checkbox"/>
8030	GRAB SAMPLE AT WATER SUPPLY TAP	<input type="checkbox"/>

Example of a Calibration Screen

pH Calibration

Field pH | Alkalinity

Meter ID: Meter Make/Model: Thermister check date: / /

Electrode ID: Electrode type: Temp correction factors for buffers applied?:

% Slope for pH:

pH BUFFER	Buffer Temp.	Theoretical pH from table	pH BEFORE ADJ.	pH AFTER ADJ.	SLOPE	MILLIVOLTS	BUFFER LOT NUMBER	BUFFER EXPIRATION DATE

Sample Filter: Sample Temperature: ° C Stirrer used?:

Measurement or Subsample Location:

Param Code: **00400** Method:

Field Readings (units):

Median (units):

RMK: ValQ:

Done Notes Help

Alkalinity Screen

Alkalinity Calibration

pH Meter

Meter ID:
 Meter Make/Model:
 Thermister check date:

First Titration

Begin Date: Time: Temp (C): Initials:

End Date: Time: Temp (C):

Stirrer:

Start pH:
 End pH:

Titration Type:
 Sample Filter:

Sample Volume: mL
 Digital Titrator: ☒
 Burette Titrator: ☐

ACID USED IN TITRATION:
 lot num:
 Exp Date:
 Acid normality:
 HACH/Normality Corr. Factor:

Speciation Calculation Method
☐ Simple Mass-Balance
☒ Advanced Speciation

** Sample Temperature:
 ** Required Fields for Advanced Speciation
 ** Sample Conductance:

near pH 8.3 : pH Digital Count
 near pH 4.5 : pH Digital Count

	Method	Value
Alkalinity (39086)	TT013	55.8
Bicarbonate (00453)	TT017	67.6
Carbonate (00452)	TT019	0.2

☒ Use First Titration
☐ Use Second Titration

	Method	Value	RMK	ValQ
Alkalinity (39086)	TT013	55.8		
Bicarbonate (00453)	TT017	67.6		
Carbonate (00452)	TT019	0.2		

Field Measurements Screen

PCFF SWQW Ver 6.0

394259106405900		Alkali Crk blw Muddy Crk nr Wolcott, CO		Cancel		Save		Update	
Station Number		Station Name							
3/21/2007	09:45	/ /	:	KJB				Help	
Sample Date	Mean Time	End Date	End Time	Sampling Team:					
858200310				No					
Project Account		Project Name		QC Samples Collected					

Coding | Sampler | Sampling Conditions | Cross Section / Lake Profile | **Field Meas** | LAB ASR | Lot Numbers

Method	RMK	Val	Q	Field Result Level Comments (NOTE: Only the first 60 characters will be saved in the NWIS database)
Q. Inst. (00061)+	4.67	CFS		
Gage Ht (00065)+		Ft.		
Temp. Air (00020)+		°C		
Temp. Water(00010)+	THM01 2.82	°C		
pH (00400)+	PROBE 8.3	units		
Sp. Cond. (00095)+	SC001 979	µS/cm @25°C		
Dis. Oxy. (00300)+	MEMBR 10.7	mg/L		
DO Sat. (00301)	103	%		
Bar. Press. (00025)+	587	mm Hg		
Alkalinity (39086)+	TT013 284.1	mg/L		
Bicarbonate (00453)+	TT017 338.7	mg/L		
Carbonate (00452)+	TT019 3.7	mg/L		
Turbidity ()+				

Microbiology		Method	RMK	Val	Q
C,modmTEC,water(90902)		BAC19	8	CFU/ 100 mL	E k
Bacteria 2()+					
Bacteria 3()+					

Floating Debris (01345):	0	Floating garbage (01320):	0	Floating algae mats (01325):	0	Fish kill (01340):	0
Detergent suds (01305):	0	Turbidity (01350):	2	Atms. Odor (01330):	0	Oil-grease (01300):	0

SEVERITY
0=none, 1=mild, 2=moderate 3=serious, 4=extreme

Data Output Screen

Surface Water QW Form

09069000

Station Number

Eagle River at Gypsum

Station Name

 Close

3/20/2007

BEGIN DATE:

12:00

BEGIN TIME:

 Help



New



Clone






Edit



Delete

Unprocessed Samples

Processed Samples

	Begin date	Begin time	Station Name
	3/20/2007	12:00	Eagle River at Gypsum
	3/21/2007	09:45	Alkali Crk blw Muddy Crk nr Wolcott, CO
	3/21/2007	12:25	Gore Crk blw Black Gore Crk nr Vail, CO



ASR



Field Note Sheet



batch Output

Ground-water sampling using PCFF



Summary

- Comparable data requires consistent methodology!
- Mobile laboratories are an effective sampling tool.
- Automation can be a substantial aid to efficiency and accuracy!



QUESTIONS?

<http://mn.water.usgs.gov>