



# ***DEP Requirements for Water Sample Collection***



**December 3, 2014**

**Department of Environmental Protection  
Aquatic Ecology and Quality Assurance Section**





## *What we will cover today:*

- General sampling considerations
- Meter calibration and verification
  - Field testing and measurement
- General sampling procedure
  - Surface, Ground and Waste water
- Quality assurance requirements (blanks)
- Documentation requirements





## ***What does the DEP QA Rule require?***

- Use DEP SOPs (Effective date 7/30/14)

<http://www.dep.state.fl.us/water/sas/sop/sops.htm>

- Pre-approval for alternative field procedures
- Create and retain mandatory documentation
- Follow preservation & holding times
- Submit to audits





## *Quality Manual*

Includes quality assurance policies  
and procedures for your specific  
organization or program

➤ **See requirements in FA 3300**



# ***Auditing***

**You may be audited by DEP!**



Find Example Checklists for Selected SOPs:

- FA 1000 Appendix and QA audit webpage

<http://www.dep.state.fl.us/water/sas/qa/dr-audits.htm>

- DEP SOPs are audit criteria
  - Basis for checklists for performance and documentation





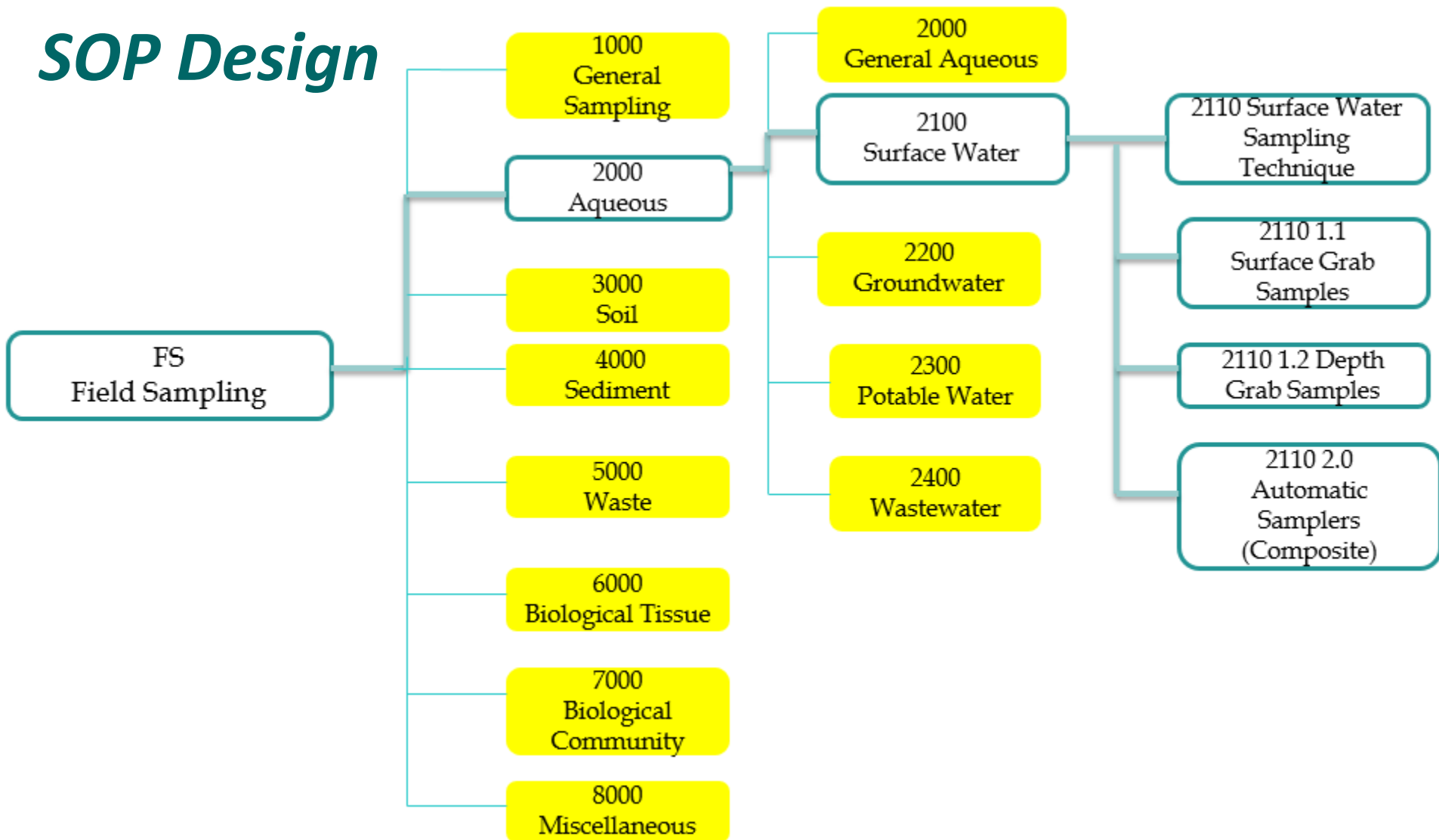
# ***Naming Conventions for Field SOPs***

- FA Administrative & Quality Systems
- FC Field Cleaning
- FD Documentation
- FM Mobilization & Laboratory
- FQ Quality Control
- FS Sampling Procedures
- FT Field Testing





# SOP Design





# ***FT 1000 General Field Testing and Measurement***

## **Using meters to collect data in the field**

- Verification
- Calibration
- Documentation





## *Five terms to know:*

- Verification
- Calibration
- Acceptance criteria
- Chronological bracket
- Quantitative bracket



## ***Verification:***

- Measuring a known standard with the instrument *as if* the standard was a water sample.

## ***Calibration:***

- Changing the reading of an instrument by setting it to a known standard.

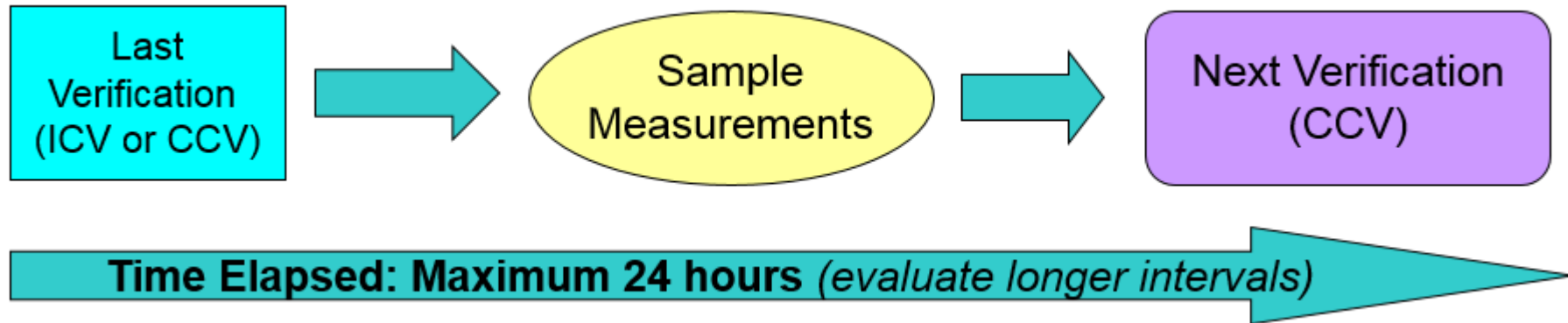


## WHY VERIFY?

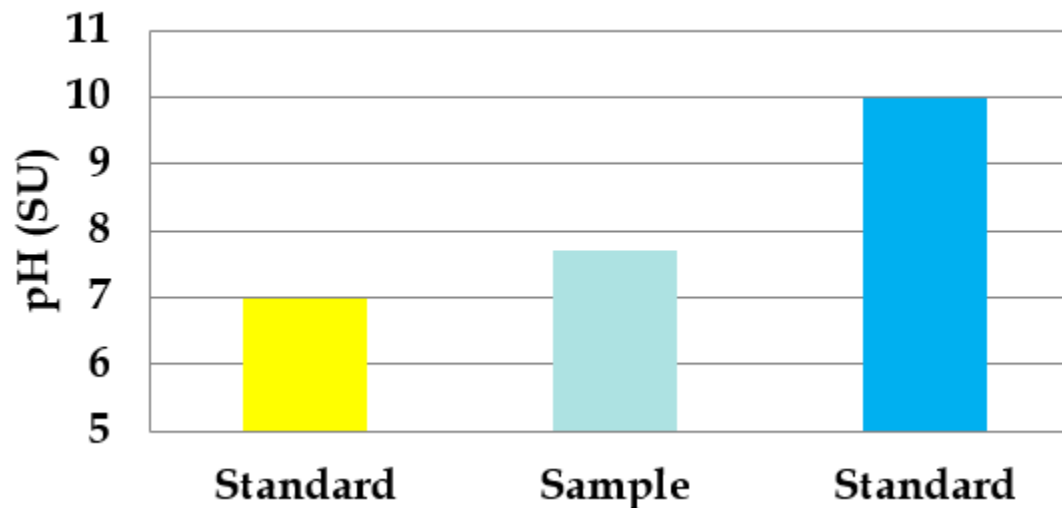
- Instrument calibrations are not always reliable or stable due to drift or other errors
- Establishes *chronological and quantitative brackets* for the sample measurements



## Chronological Verification Bracket



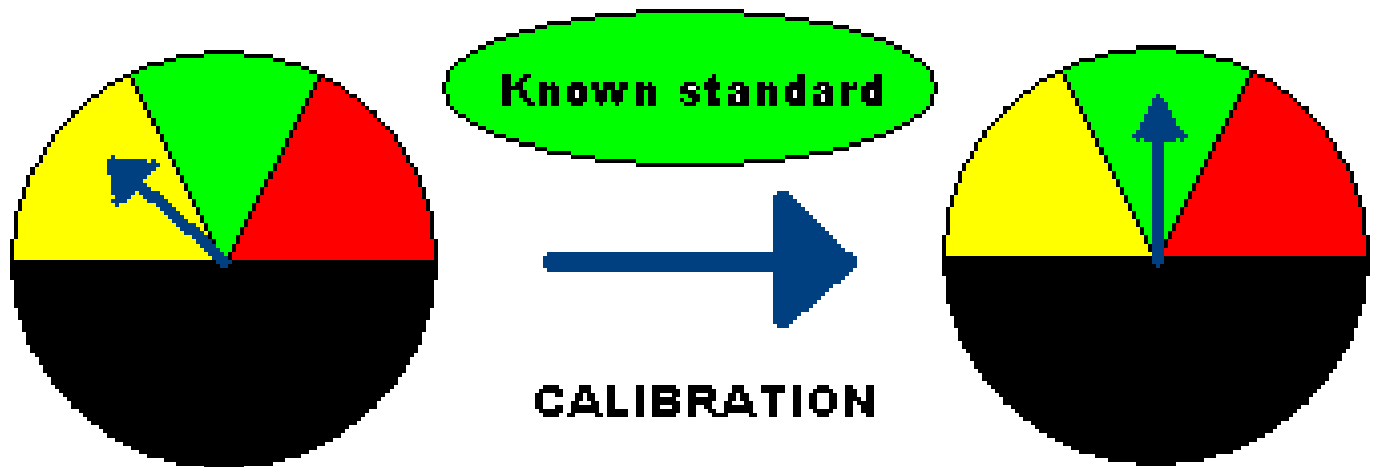
## Quantitative Verification Bracket





## *What if verification fails?*

- Repeat verification, if it still fails...
- “J” qualify the sample data  
(J = estimated value)
- Perform calibration





## *Field Testing Acceptance Criteria per DEP-SOP-001/01*

| <b>Parameter</b>               | <b>Acceptance Criteria</b>                                                                                                                                                                                                                                     |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>pH</b>                      | <b><math>\pm 0.2</math> Standard pH Units of calibration buffer</b>                                                                                                                                                                                            |
| <b>Specific Conductance</b>    | <b><math>\pm 5\%</math> of calibration standard value</b>                                                                                                                                                                                                      |
| <b>Dissolved Oxygen</b>        | <b><math>\pm 0.3</math> mg/L of theoretical value</b>                                                                                                                                                                                                          |
| <b>Temperature</b>             | <b><math>\pm 0.5</math> °C. of NIST-traceable value (w/correction factors)<br/>Verification over range of sample values</b>                                                                                                                                    |
| <b>Turbidity</b>               | <b>0.1-10 NTU : <math>\pm 10\%</math> of standard value<br/>11-40 NTU : <math>\pm 8\%</math> of standard value<br/>41-100 NTU : <math>\pm 6.5\%</math> of standard value<br/>&gt; 100 NTU : <math>\pm 5\%</math> of standard value</b>                         |
| <b>Total residual chlorine</b> | <b>0.995 calibration curve correlation coefficient<br/><math>\pm 10\%</math> of primary standard value<br/><math>\pm 10\%</math> of secondary standard value<br/>Color comparator acceptance criterion<br/><math>\pm 10\%</math> of primary standard value</b> |



## *FT 1100 pH*

- Calibrate with 2 standards (2-point)
  - Start with pH 7
- Rinse probe with deionized water between standards
- Verify with 1 standard
- Bracket with verifications
- Acceptance criterion is  $\pm 0.2$  mg/L
- Weekly check % theoretical slope, if meter allows



## *pH Sample Measurement*

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Because of temperature dependence also be sure of stable temperature reading before recording
- Record value to one decimal place



## ***FT 1200 Specific Conductance***

- Conductivity: 1-point calibration
- 100  $\mu\text{mhos}$  standard sufficient for lower end of quantitative bracket
- Ensure stable temperature prior to calibration, verification or sample measurement
- Rinse probe between standards with deionized water.
- Acceptance criteria:  $\pm 5\%$  of calibration standard value



## ***Specific Conductance Sample Measurement***

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Because of temperature dependence also be sure of stable temperature reading before recording



## ***FT 1500 Dissolved Oxygen***

- Calibrate and verify with 100% humid air (enclosed chamber)
- Ensure that the temperature is stable
- Set atmospheric pressure (760 mm Hg default)
- Compare meter reading to theoretical saturation (look-up table)
- Acceptance criterion is  $\pm 0.3$  mg/L



# ***Dissolved Oxygen***

Vent to atmosphere



**Inspect membrane**



**Enclose with saturated air**



**Ensure stable temperature**



## ***DO Sample Measurement***

- Select representative sampling point
- Ensure flow of refreshed sample around probe
- Stabilize reading before recording
- Unstable readings indicate temperature fluctuation or DO sensor malfunction
- Low readings may indicate anoxic water column near sediments
- Hydrogen sulfide damages electrode



## ***FT 1400 - Temperature***

- Verify field-temperature devices against NIST-traceable thermometer
- Bracket sample measurements with appropriate verification temperatures
- Verify at demonstrated time intervals
- Document all deviations from NIST thermometer verification values
- Measure samples *in situ*, to one decimal place



# FT 1600 Turbidity



Standard turbidimeter design



*In-situ* turbidity probes for monitoring well purging and other applications



## ***FT 1600 - Turbidity***

- Hand-held turbidimeter typically used
- Primary standards for initial calibration
- Secondary standards for everyday use



**Settled formazin**

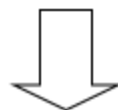


**Gel standard  
(Use for field verification)**



## ***Turbidity Calibration and Secondary Standard Verification***

Calibrate turbidimeter with series of formazin or styrene divinylbenzene standards and turbidity-free water blank



Verify with formazin or styrene divinylbenzene standard

### **Verify acceptance**

**$\pm 10\%$  for 1 – 10 NTU**

**$\pm 8\%$  for 11 – 40 NTU**

**$\pm 6.5\%$  for 41 – 100 NTU**

**$\pm 5\%$  for >100 NTU**

Calibrate or verify  
secondary standards  
(if required)

Measure samples



## ***Secondary Turbidity Standards***

- ***Use secondary standards for continuing calibration verification only***
- Typically manufacturer-specific
- Field-rugged for routine use
- Assign values using calibrated meter
- Verify against manufacturer tolerances
- Discard when no longer verifiable





Keep fingers away from  
clean optical vials



Align index marks



Rinse vial & dry exterior between samples



# *FT 2000 Residual Chlorine Methods*



DPD Colorimetric



DPD Color comparator  
(drinking water only)

Titration



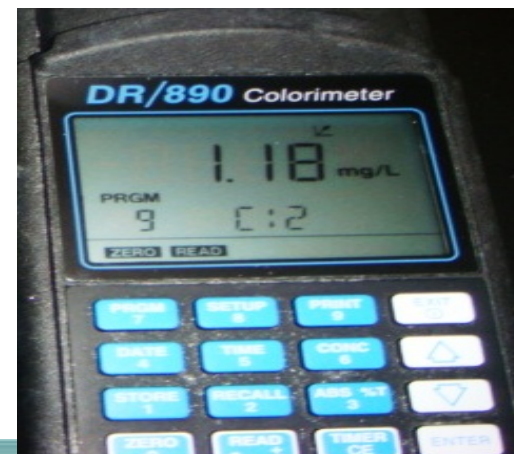
Electrode





# Basics – DPD Chlorine Meters

- **Initial calibration verification** with *primary* standards.
  - Primary standards are made from known concentrations using laboratory techniques
  - Verify meter before first time use (factory-calibrated meters)
    - Annual verification with primary standards thereafter
- The instrument readings must be within 10% of the standard values.
- Secondary standards for everyday use





# ***Secondary Standards for Chlorine***

*Use secondary standards for field verifications*

- **Measure** (read) secondary standards with a calibrated meter that has been verified with primary standards
  - At least annually
  - If routine (daily or other) field verifications fail
  - If standards have been discolored or damaged
- **Assign** measured values to the secondary standards
  - Or **accept** previously assigned values
    - Measured values within  $\pm 10\%$  of assigned values?
    - If not, are measured values within manufacturer's tolerances?
      - If **yes**, assign new measured values
      - If **no**, discard secondary standards





Keep fingers away from  
clean optical vials



Mix color reagents with sample



Rinse vial & dry exterior between samples



Align index marks



Cover optical chamber prior to reading sample



## *Continuous Monitoring*

- Calibration & verification for installed meters
- Same calibration, verification, and bracketing rules apply
  - Calibration prior to installation
- Daily verification with *grab sample*
  - Use *grab sample* acceptance criteria in FT 1900
- Maximum period between verifications is one month



## *Continuous Monitoring (con't)*

- If verification fails-
  - Perform instrument maintenance and reduce time interval.
  - Perform initial calibration when instrument is taken off-line, after preventative maintenance, or immediately after verification criteria are not met.



# FD 1000 Documentation



- Sign or initial all documentation.
- Record enough information so interpretations are not necessary.
- Clearly link documentation with the associated sample or measurement.
- Make corrections with a line through the error so that it is still legible. Initial the error and its correction.
- Keep electronic or hard copies of all documentation for at least 5 years after the date of generation or completion of the documentation.



SITE NAME:

DATE: 01/01/2006

TIME 1200  
(military)

EST CST DEPTH^: 1 ft (m) FIELD ID: 1234ab

1234ab

| SAMPLING TEAM MEMBERS | WQ MEASUREMENTS | DOCUMENTATION | SAMPLE COLLECTION | PRESERVATION | PRESERVATION CHECK |
|-----------------------|-----------------|---------------|-------------------|--------------|--------------------|
| Holly Sample          |                 |               | ✓                 |              | ✓                  |
| Mark Metric           | ✓               | ✓             |                   |              |                    |
| John Gather           |                 |               |                   | ✓            |                    |
|                       |                 |               |                   |              |                    |

| SAMPLING EQUIPMENT                                   |                                             |
|------------------------------------------------------|---------------------------------------------|
| <input checked="" type="checkbox"/> Sample Container | <input type="checkbox"/> Tubing type: _____ |
| <input type="checkbox"/> Pole                        | <input type="checkbox"/> Other _____        |
| <input type="checkbox"/> Pump ID#: _____             | <input type="checkbox"/> Other _____        |
| WATER QUALITY MEASUREMENTS                           |                                             |
| Instrument ID: <u>A4567</u>                          |                                             |
| COLLECTION MODE                                      |                                             |
| <input checked="" type="checkbox"/> Wading           | <u>Via Boat</u>                             |
| <input type="checkbox"/> Diving                      | <input type="checkbox"/> Canoe              |
| <input type="checkbox"/> From Shore                  | <input type="checkbox"/> Electric Motor     |
| <input type="checkbox"/> Other _____                 | <input type="checkbox"/> Gasoline Motor     |

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| Learning Site         | Formative/Summative                                                                                                   | Self-Check                                               | Formative?                                               | Summative?                                               | Self-Check?                                              |
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| Personal Project      | Yes <input type="checkbox"/> No <input type="checkbox"/> Both <input type="checkbox"/> Other <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Personal Journal      | Yes <input type="checkbox"/> No <input type="checkbox"/> Both <input type="checkbox"/> Other <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Personal Interview    | Yes <input type="checkbox"/> No <input type="checkbox"/> Both <input type="checkbox"/> Other <input type="checkbox"/> | Yes                                                      |                                                          |                                                          |                                                          |

one line for each set of sample (as supplied by the laboratory) containers. (Use separate sheet for field or laboratory duplicate or blank or different media results)

Code (check profile): 000 = Surface Water 001 = Groundwater 002 = Drinking Water 003 = Wastewater 0 = Other \_\_\_\_\_

a: number of containers supplied by the left raters for the test (e.g., 3 for visible negative, etc.)

DEP Bureau of Laboratories Water Sample Collection Record

➤ **Details about sample method, samplers, and site**

| Parameter Suite               | Parameter(s)/Method                                                                                                                                                                                                                                                   | Matrix Code* | Preservation**                                                                                             | Preservative Lot # | pH Check                               | # Bottles *** |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------|---------------|
| Preserved Nutrients           | <input type="checkbox"/> TKN <input checked="" type="checkbox"/> TP <input checked="" type="checkbox"/> NOx <input checked="" type="checkbox"/> NH3 <input type="checkbox"/> TOC <input checked="" type="checkbox"/> Total N<br><input type="checkbox"/> Other: _____ | W            | <input checked="" type="checkbox"/> Ice <input checked="" type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> | A6897              | <input checked="" type="checkbox"/> <2 | 1             |
| Filtered Nutrients            | <input type="checkbox"/> oP <input type="checkbox"/> Other: _____                                                                                                                                                                                                     | W            | <input type="checkbox"/> Ice <input type="checkbox"/> .45 um Filter                                        |                    |                                        |               |
| Unpreserved Nutrients         | <input type="checkbox"/> NO <sub>2</sub> <input type="checkbox"/> NO <sub>3</sub> <input type="checkbox"/> SO <sub>4</sub> <input type="checkbox"/> Other: _____                                                                                                      | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Physical/Aggregate Properties | <input type="checkbox"/> TDS <input type="checkbox"/> TSS <input type="checkbox"/> TS <input type="checkbox"/> Turbidity <input type="checkbox"/> Alk <input type="checkbox"/> Color<br><input type="checkbox"/> Other: _____                                         | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Chlorophyll                   | <input checked="" type="checkbox"/> CHL-PPTN-W                                                                                                                                                                                                                        | W            | <input checked="" type="checkbox"/> Ice                                                                    |                    |                                        | 1             |
| BOD                           | <input type="checkbox"/> BOD-INHB <input type="checkbox"/> BOD-UNIN                                                                                                                                                                                                   | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Microbiology                  | MF: <input type="checkbox"/> E coli <input checked="" type="checkbox"/> T Coli <input checked="" type="checkbox"/> F Coli <input type="checkbox"/> Entero <input type="checkbox"/> F Strep                                                                            | W            | <input checked="" type="checkbox"/> Ice                                                                    |                    |                                        | 2             |
| Macroinvertebrates            | <input type="checkbox"/> MI-FW-QLDC <input type="checkbox"/> MI-FW-QLBR <input type="checkbox"/> MI-FW-QNNC<br><input type="checkbox"/> MI-MN-QNNC                                                                                                                    | W            | <input type="checkbox"/> Formalin                                                                          |                    |                                        |               |
| Phytoplankton                 | <input type="checkbox"/> PKD-QN-C <input type="checkbox"/> DTY-QN-C                                                                                                                                                                                                   | W            | <input type="checkbox"/> Lugol's                                                                           |                    |                                        |               |
| Periphyton                    | <input type="checkbox"/> PRN-QL-C <input type="checkbox"/> DTM-QL-C <input type="checkbox"/> PRN-QN-C <input type="checkbox"/> DTM-QN-C                                                                                                                               | W            | <input type="checkbox"/> Formalin                                                                          |                    |                                        |               |
| AGP                           | <input type="checkbox"/> AA-AGP <input type="checkbox"/> AA-LIM-NUT                                                                                                                                                                                                   | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Metals                        | ICPMS <input type="checkbox"/> W-ICP-Tr                                                                                                                                                                                                                               | W            | <input type="checkbox"/> HNO <sub>3</sub>                                                                  |                    | <input type="checkbox"/> <2            |               |
| Filtered Metals               | <input type="checkbox"/> W-ICPMS-F <input type="checkbox"/> W-ICP-Tr-F                                                                                                                                                                                                | W            | <input type="checkbox"/> HNO <sub>3</sub> <input type="checkbox"/> .45 um Filter                           |                    | <input type="checkbox"/> <2            |               |
| Mercury                       |                                                                                                                                                                                                                                                                       | W            |                                                                                                            |                    |                                        |               |
| Base Neutr                    | BN <input type="checkbox"/> W-PAH                                                                                                                                                                                                                                     | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Extractable                   | Other: _____                                                                                                                                                                                                                                                          | W            | <input type="checkbox"/> Ice <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub>                       |                    | <input type="checkbox"/> <2            |               |
| Pesticides                    | <input type="checkbox"/> W-PEST-NP <input type="checkbox"/> W-PSCL-PCB<br><input type="checkbox"/> C-AA-SF <input type="checkbox"/> W-PSHRB-NP<br>SULFN-LC <input type="checkbox"/> Other: _____                                                                      | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
| Purgeable                     |                                                                                                                                                                                                                                                                       | W            | <input type="checkbox"/> Ice <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub>                       |                    |                                        |               |
| Bioassay                      |                                                                                                                                                                                                                                                                       | W            | <input type="checkbox"/> Ice <input type="checkbox"/> MCAA                                                 |                    |                                        |               |
| OTHER                         |                                                                                                                                                                                                                                                                       | W            | <input type="checkbox"/> Ice <input type="checkbox"/> HCl                                                  |                    |                                        |               |
|                               |                                                                                                                                                                                                                                                                       | W            | <input type="checkbox"/> Ice                                                                               |                    |                                        |               |
|                               |                                                                                                                                                                                                                                                                       | W            | <input type="checkbox"/> Other: _____                                                                      |                    |                                        |               |

➤ **Specific information by parameter**



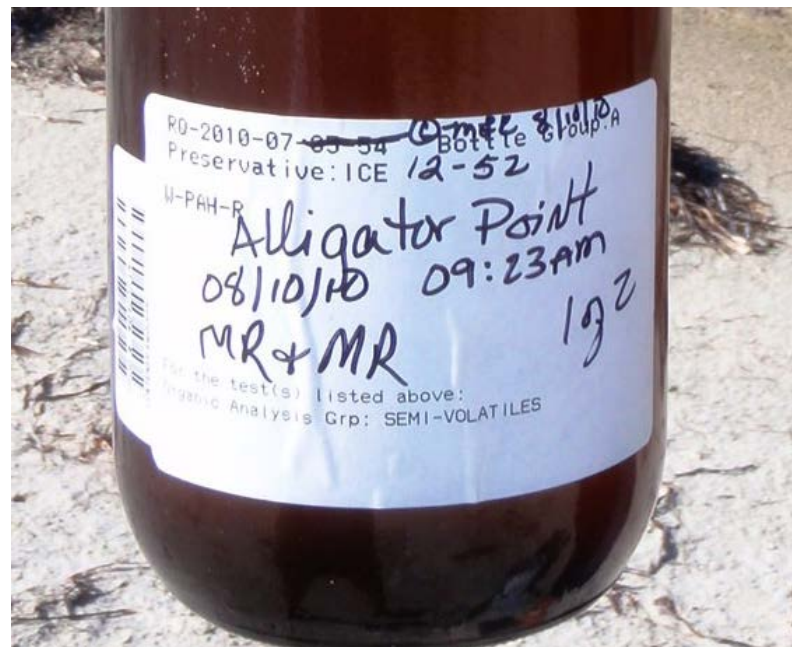
# Good Documentation Habits

**“When in doubt, write it down”**

## *Unique bottle ID*

### *Must link to:*

- Site ID
- Date
- Time ( $\leq 48$  hr hold time)
- Analytes
- Preservation
- QC sample type (if applicable)
- Multiple containers for same analyte/group (1 of 2, 2 of 2)



- **Currently available documentation forms**  
**<http://www.dep.state.fl.us/water/sas/qa/forms.htm>**





## ***FQ 1000 Quality Control Samples***

### ***Required***

- Field Blanks

### ***Optional***

- Duplicates or Replicates
- Split Samples

★ SOP tells you which analytes require QC blanks





## *Why use blanks?*

- Monitor sampling environment (container, cleaning, preservatives, analyte-free water, storage, and transport conditions).
- Show that samples are not contaminated.
- Ensure that samples are representative of the sampling source and not biased by a contamination error.



## *Field Blanks*



Analyte-free water collected directly into a sample bottle at the sampling site.



## *Equipment Blanks*

Analyte-free water collected by rinsing the sampling equipment at the sampling site.



**Collect *before* using pre-cleaned equipment**  
**Collect *after* cleaning equipment in the field**



## ***Trip Blanks (VOCs Only)***

VOC vials filled with analyte-free water accompany the empty vials and real VOC samples through the entire sampling trip.

- ★ **Remain unopened** until analysis
- ★ Minimum of 1 vial per VOC cooler and trip.
- ★ Multiple sites in same cooler OK, if all samples and trip blank analyzed by the same lab.





## *Blank Collection Frequency*

- Equipment & Field Blanks
  - **Minimum of 1 blank annually** for each *required* analyte/matrix combination
  - **5%** of total number of samples collected for each combination *over the life of the project* as applicable
- Trip Blanks (VOCs)
  - Each sampling trip, at least one per cooler with VOCs



## *Handle blanks exactly like the associated environmental samples!*

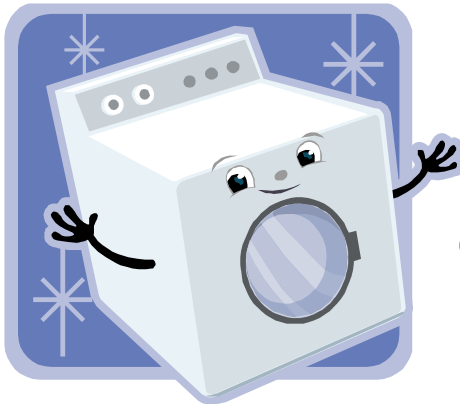
- Same sample containers
- Same preservation
  - Add maximum amount of preservative that was added to any samples
  - Don't preserve with too much acid (may interfere with analysis)
- Same storage conditions





## ***“Performance-Based” Cleaning***

- Demonstrate effective cleaning with blanks
- See Table FC 1000-1



**Cleaning to meet a performance specification (no detections in field-QC blanks) rather than following a rigid, required procedure**





## *Field Planning and Mobilization*

- Not a required SOP
- Working with Labs
- Trip Planning
- Equipment and Supply Preparations
- Table FM 1000-1 Lists Data Qualifier Codes
  - Reproduced from table of required codes in QA Rule
- General Field Equipment Checklists





## *General Considerations for Sampling*

- Understand sampling plan, Data Quality Objectives, and if applicable permit specifications
- Collect a representative sample
- Maintain the integrity of the sample
- Complete all documentation



## ***FS 1000 General Sampling Procedures***

Important information for all types of sampling

- **Useful tables:**
  - Sample Preservation, Holding Times & Container Types
  - Construction Materials & Approved Sampling Equipment





**Table FS1000-4 Table IB Inorganic Tests**

| Parameter No./Name          | Container         | Preservation                                                                                                     | Maximum holding time                              |
|-----------------------------|-------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| 38. Nitrate                 | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$                                                                              | 48 hours                                          |
| 39. Nitrate-nitrite         | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$ , $\text{H}_2\text{SO}_4$ to $\text{pH}<2$                                   | 28 days                                           |
| 40. Nitrite                 | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$                                                                              | 48 hours                                          |
| 41. Oil and grease          | G                 | Cool, $\leq 6^{\circ}\text{C}^{18}$ , HCl or $\text{H}_2\text{SO}_4$ to $\text{pH}<2$                            | 28 days                                           |
| 42. Organic Carbon          | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$ HCl, $\text{H}_2\text{SO}_4$ , or $\text{H}_3\text{PO}_4$ to $\text{pH}<2$ . | 28 days                                           |
| 44. Orthophosphate          | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$ , <sup>24</sup>                                                              | Filter within 15 minutes; Analyze within 48 hours |
| 46. Oxygen, Dissolved Probe | G, Bottle and top | None required                                                                                                    | Analyze within 15 minutes                         |
| 47. Winkler                 | G, Bottle and top | Fix on site and store in dark                                                                                    | 8 hours                                           |
| 48. Phenols                 | G                 | Cool, $\leq 6^{\circ}\text{C}^{18}$ , $\text{H}_2\text{SO}_4$ to $\text{pH}<2$                                   | 28 days                                           |
| 49. Phosphorous (elemental) | G                 | Cool, $\leq 6^{\circ}\text{C}^{18}$                                                                              | 48 hours                                          |
| 50. Phosphorous, total      | P, FP, G          | Cool, $\leq 6^{\circ}\text{C}^{18}$ , $\text{H}_2\text{SO}_4$ to $\text{pH}<2$                                   | 28 days                                           |



## ***FS 2000 General Aqueous Sampling***

- Grab and composite sampling
- Filtration preservation procedures
- Quality control sample blanks



## *Sampling Strategies*

- Consider
  - Representative sampling points
  - Location relative to artificial structures
- Collect
  - Least to most contaminated
    - Downstream to upstream
  - Upwind and away from fuel sources
    - Bow of the boat
  - Upstream and away from body
  - Sample water before sediments
  - Don't suspend bottom material into water column





***Your sample should be REPRESENTATIVE  
of the water body you are sampling***



***This is a stagnant pool near a bridge crossing. It is  
NOT representative of the entire stream.***





## *Collecting Grab Samples*

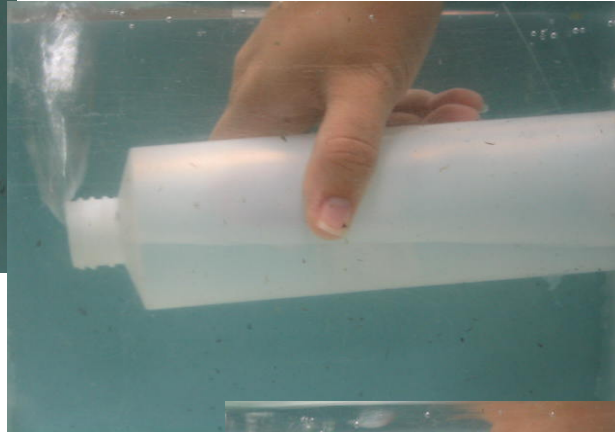
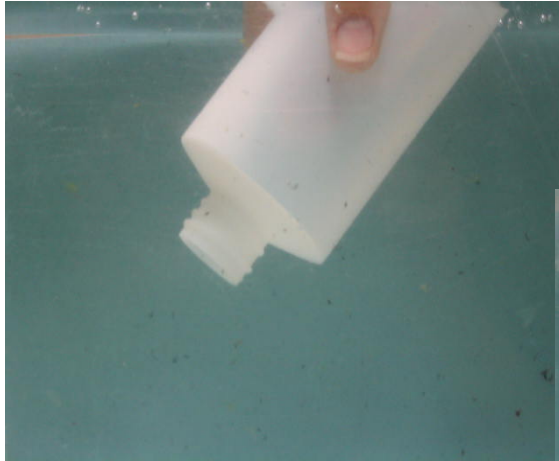
- A grab sample is a snapshot in time.
- A discrete sample collected over a period of time not to exceed 15 minutes.





# *Direct Grab Technique*

(Surface Sample)



Leave head space



- Avoid skimming
- Collect within top foot
- May use pole extension





## *Intermediate Device (Using Sample Container Or Other Device)*

Direct grab is preferred, but some samples may require an intermediate device.

- Pre-preserved containers
- Depth sampling



## *Examples of Intermediate Devices*



Equipment depends  
on project  
objectives and  
analyte groups



## *Grabs using an intermediate device*

- Rinse the intermediate vessel with ample amounts of site water prior to collecting the first sample.
- Discard rinsate away from and downstream of the sampling site.
- Do not touch the sample container with the intermediate vessel.





## *Composite Sample*

A sample collected over time, taken either by continuous sampling or by mixing discrete samples. Composite samples reflect the average characteristics during the compositing period

### Indicated Uses:

- Continuous flow
- Limited analytical capacity
- Calculating mass/unit time loadings
- Correlating concentration data with flow
- Average analyte concentration over time
- Reducing sampling errors and hazard exposure using autosamplers
- Unattended sampling with autosamplers





## *Most Common Composite Types*

- Time
  - Discrete aliquots collected in 1 container at constant time intervals
    - Use if flow rate varies less than  $\pm 10\%$  of the average flow rate
  - Manual or automatic collection
- Flow Proportional
  - Collect with:
    - Autosampler & flow measuring device
    - Semi-automatically w/ flow chart & autosampler
    - Manually
  - Methods:
    - Collect constant volume @ time intervals proportional to stream flow
    - Collect volume proportional to flow @ constant time interval



# Collecting VOC Samples

- Teflon-coated silicone cap liner (septum)
- Prevent contamination from fuel sources
- Do not open VOC vial until ready to fill
- No aeration or agitation of sample
- Reduce flow: pumps 100-400 mL/min; faucets  $\leq 100$  mL/min
- Dechlorinate per SOP instructions and restrictions
- Do not overfill pre-preserved vials
- Do not pour sample into vial cap
- No headspace in VOC vial after collection
- Do not re-open vials to refill or to remove bubbles ( $\leq 5$ mm total bubble diameter OK)





## *Sampling VOCs* (continued)

- Can use gloves to help prevent sample contamination
- No insect repellent or other sprays
- Don't park vehicle by sampling site
- Avoid other fuel sources
- Fill VOC vial to form convex meniscus
- Slide cap septum over bottle opening (Teflon side down) and screw cap tightly into place
- Overturn bottle and tap side to see if air bubbles are present

Water level slightly  
above top of vial  
prior to capping





## *Sampling for Hydrocarbons (Oil & Grease, TRPH, FL-PRO)*

- Do not skim surface of water (unless required by sampling plan)
- Do not pre-rinse bottles with sample
- Do not use automatic samplers
- Preserve with sulfuric or hydrochloric acid and chill



## *Sampling for Bacteria*

- Sterilized containers required
- Use dechlorinating agent (if applicable)
- Thoroughly rinse any intermediate devices
- Keep fingers away from container opening
- Cool immediately with wet ice
- \* See allowance in DEP SOPs (FS 2000 and FS 2300) for sterilizing taps and spigots of questionable condition





# What about Preservation?

- Dechlorinate and/or filter (if applicable) before preserving
- Preserve per tables in FS 1000 Appendix (**matrix-specific**)
- Preserve (and filter) within 15 minutes of collection
- Check pH of pH-preserved samples (see check frequencies in FS 2000) with narrow range pH paper (including pre-preserved containers, except VOCs)
- Don't dip pH paper into the sample
- pH checks not required for VOCs
- Carry and add extra preservative if needed
- Avoid excess preservative (can dilute sample or cause analytical problems)
- Use ice to cool & keep samples at required temperatures
- Use refrigeration or ice for automatic samplers





## ***FS 2100 Surface Water Sampling***

- Sampling Representativeness
- Autosampler deployment
- Common manual sampling procedures
  - Direct grab sample
  - Intermediate sampling devices
  - Depth sampling



## *Sampling in shallow water*

- Don't collect if  $<10$  cm deep
- Use extreme caution not to disturb sediment
- Intermediate device such as a dipper or peristaltic pump may help prevent contamination
  - Especially for low- or no-flow condition



## ***FS 2400 Wastewater Sampling***

- Composite vs. grab samples
- Autosampler deployment
- Common manual sampling procedures
  - Similar to surface water techniques
- Sampling from spigots
- Biosolids sampling
- Cryptosporidium & Giardia





# *Wastewater Sampling*

- Representativeness
  - Should be specified in the permit the location of sampling
  - If no other specifications, SOP requires sampling at a depth in the center of flow (adequate mixing)



## ***FS 2450 Cryptosporidium and Giardia Wastewater Sampling***

- Use EPA method 1623
- Follow bacteriological sampling restrictions in FS 2005





## ***FS 2440: Biosolids***

### **Important considerations for:**

- Sampling techniques and containers
- Safety precautions
- Compositing
- Transporting infectious waste
- ✓ Collect samples per rule, permit or sampling plan requirements

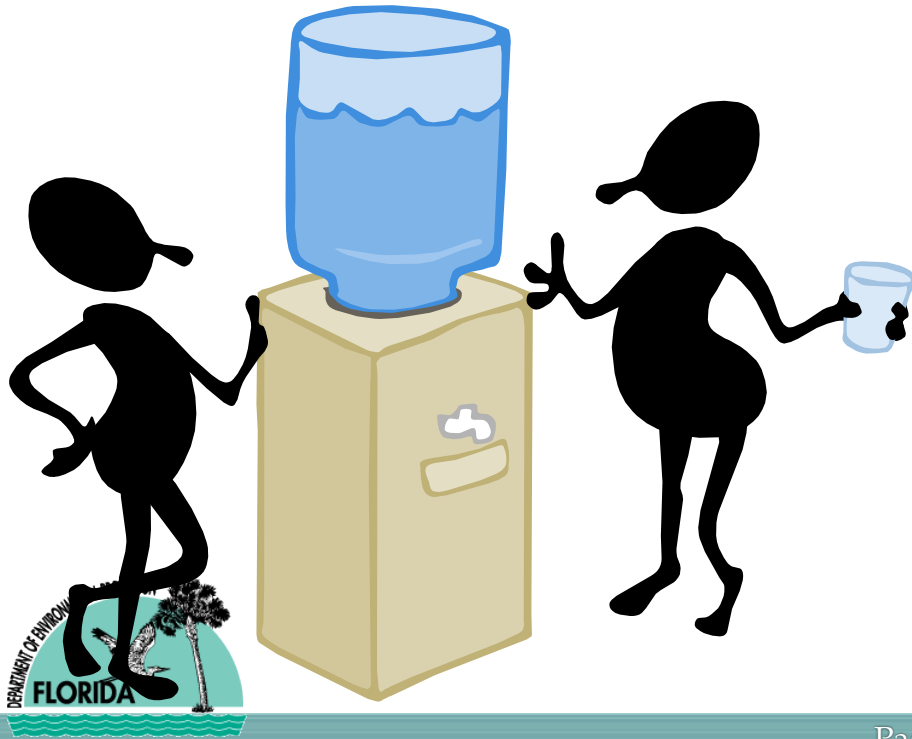




# ***FS 2300 Drinking Water***

**Important considerations for:**

- Drinking Water Wells
- Lead and Copper Rule
- Supply Systems
- Microbiologicals





## *Sampling Drinking Water Wells*



- Purge and Sample Spigot Closest to the Well
- Remove Hoses, Aerators and Filters
- Purge Spigot and Lines
- Reduce Flow to 500 mL/minute to Collect Samples
  - 100 mL/minute or less for VOCs



# *Sampling Supply Systems*

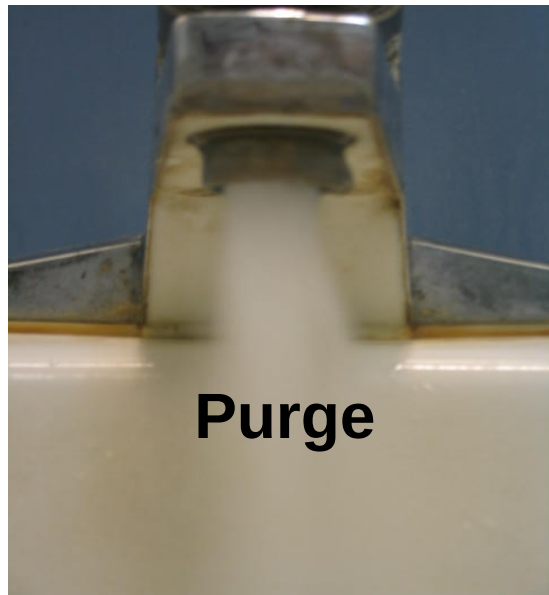


- Sample at Designated Sample Port
- Flush Lines and Port
  - 2 to 5 minutes or as required
- Reduce Flow to 500 mL/minute
  - 100 mL/min or less for VOCs
- Dechlorinate Sample if Necessary

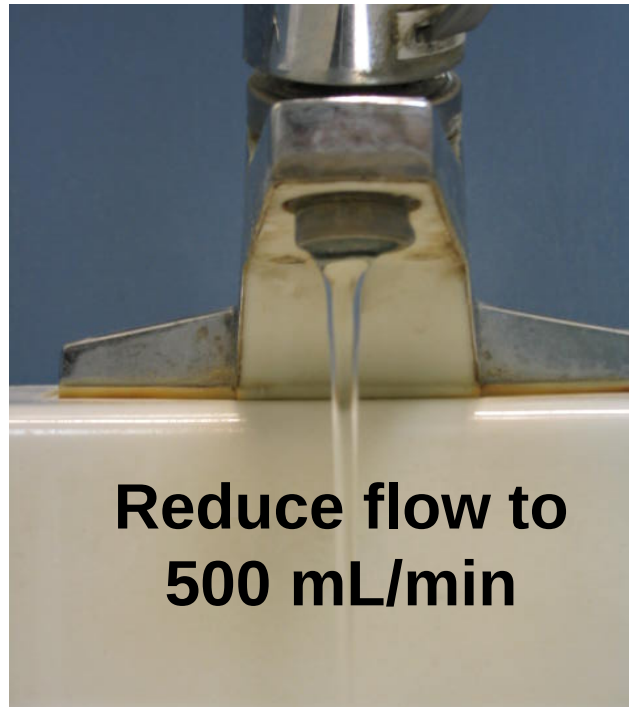




# ***Sampling Taps and Spigots***



**Purge**



**Reduce flow to  
500 mL/min**



**Collect**





## ***Sampling VOCs from taps and spigots***



**Reduce flow to  
 $\leq 100$  mL/min**



## ***Lead and Copper Rule***

- Collect from kitchen or bathroom
- Use cold water tap
- Do not use system for six hours before sampling
- Collect first flush into sample container
- Acid-preservation may be delayed up to 14 days





## ***FS 2200 Groundwater Sampling***

- Equipment Selection
- Measuring Water Level in Monitoring Wells
- Calculating Required Purge Volume
- Placement of Purging Devices in the Well
- Stabilization Parameter Measurement
- Purging Completion Criteria
- Purging & Sampling Techniques for Monitoring Wells
- Purging & Sampling Wells with Installed Plumbing
- Purging & Sampling Remediation Installations





*Typical private  
supply wells with  
pressure tanks*





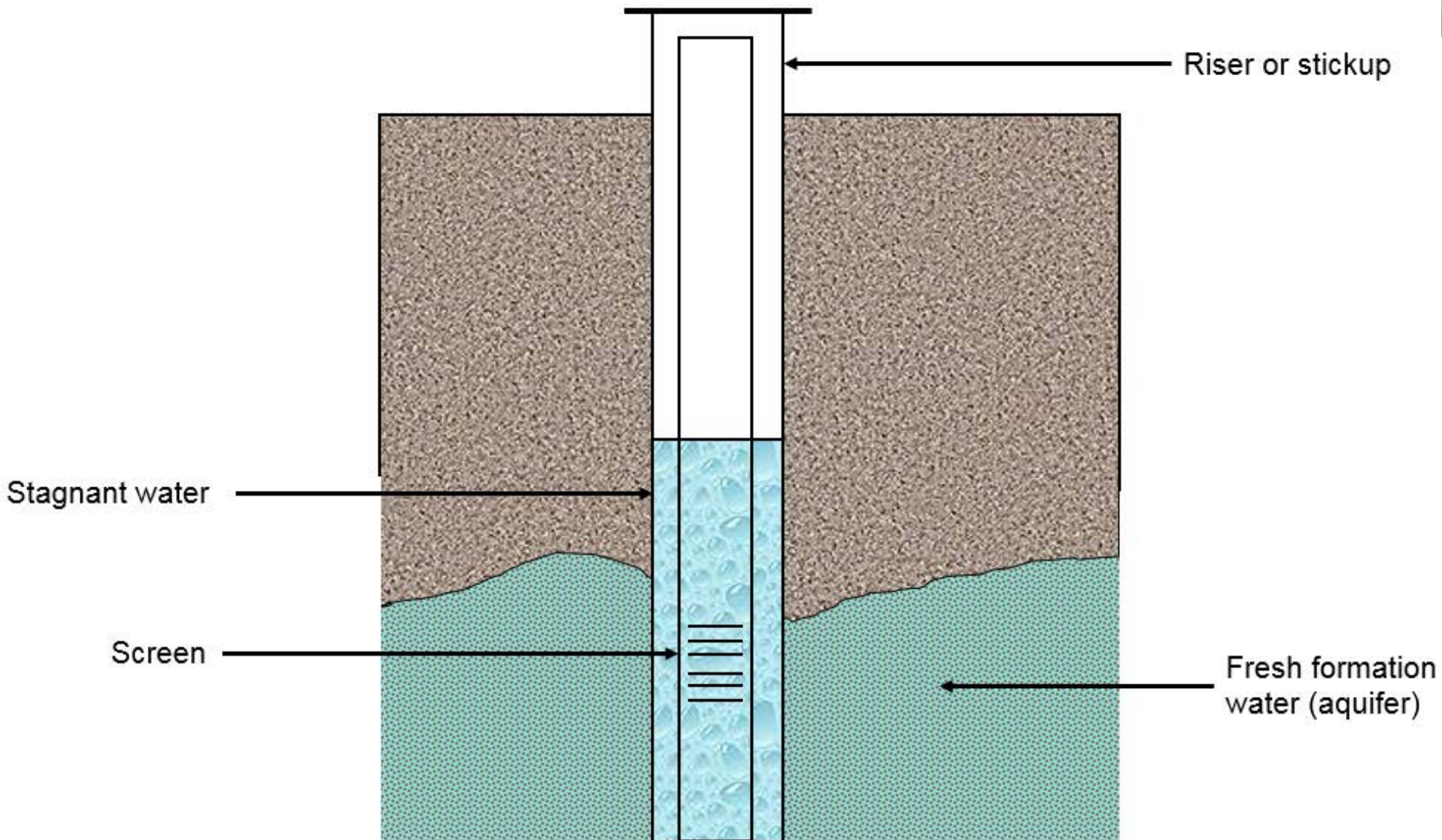
Large Public Use and  
Municipal Supply Wells





## *Monitor wells*





Simplified well diagram without pump or tubing



# ***Purging & Sampling Groundwater***

## Specifications to ensure:

### **Representative sample**

- Collect fresh formation (aquifer) water

### **No Contamination**

- Proper placement of purging devices

### **Appropriate equipment**

- Bailers are not recommended

### **Proper purging completion**

- Stable field measurements per SOP





# *General Purging Procedures*

- Avoid dropping anything to the bottom of well
- Ensure proper pump or tubing placement in well and record placement depth
- Measure water level frequently during purging and stabilize drawdown with pump rate
- Purge required minimum volumes
- Measure parameters at proper frequency
- Satisfy purge completion criteria





# Purging Completion Criteria

Use a flow-through container to measure stabilization parameters

- Three consecutive Measurements
  - Temperature:  $\pm 0.2^{\circ} \text{C}$
  - pH:  $\pm 0.2$  Standard Units
  - Specific Conductance:  $\pm 5.0\%$  difference
  - Dissolved Oxygen:  $\leq 20\%$  Saturation
  - Turbidity:  $\leq 20$  NTU
- Or: Three Consecutive Measurements:
  - Temperature:  $\pm 0.2^{\circ} \text{C}$
  - pH:  $\pm 0.2$  Standard Units
  - Specific Conductance:  $\pm 5.0\%$  of reading
  - Dissolved Oxygen:  $\pm 0.2 \text{ mg/L}$  or  $\pm 10\%$ , whichever is greater
  - Turbidity:  $\pm 5 \text{ NTU}$  or  $\pm 10\%$ , whichever is greater



| EQUIPMENT PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME<br>(only fill out if applicable) |                         |                                |                                               |                       |                     |                            |                                                  |                                                      |                   |                                   |                     |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------|--------------------------------|-----------------------------------------------|-----------------------|---------------------|----------------------------|--------------------------------------------------|------------------------------------------------------|-------------------|-----------------------------------|---------------------|
| - gallons + (                                                                                                                           |                         |                                | gallons/foot X                                |                       |                     | feet) +                    |                                                  |                                                      | gallons = gallons |                                   |                     |
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 8                                                                                          |                         |                                | FINAL PUMP OR TUBING DEPTH IN WELL (feet): 28 |                       |                     | PURGING INITIATED AT: 0834 |                                                  | PURGING ENDED AT: 0924                               |                   | TOTAL VOLUME PURGED (gallons): 20 |                     |
| TIME                                                                                                                                    | VOLUME PURGED (gallons) | CUMUL. VOLUME PURGED (gallons) | PURGE RATE (gpm)                              | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C)                 | COND. (circle units) $\mu$ mhos/cm or $\mu$ S/cm | DISSOLVED OXYGEN (circle units) mg/L or % saturation | TURBIDITY (NTUs)  | COLOR (describe)                  | ODOR (describe) ORP |
| 0834                                                                                                                                    | 0                       | 0                              | 0.4                                           | 25.92                 | 7.41                | 24.89                      | 561                                              | 9.9 0.82                                             | 0.86              | Clear                             | -151                |
| 0852                                                                                                                                    | 7.2                     | 7.2                            | 0.4                                           | 25.62                 | 7.25                | 24.22                      | 563                                              | 2.2 0.18                                             | 0.80              | Clear                             | -171                |
| 0856                                                                                                                                    | 1.6                     | 8.8                            | 0.4                                           | 25.25                 | 7.33                | 24.14                      | 549                                              | 2.0 0.17                                             | 0.74              | Clear                             | -180                |
| 0903                                                                                                                                    | 2.8                     | 11.6                           | 0.4                                           | 25.07                 | 7.36                | 24.16                      | 543                                              | 1.9 0.16                                             | 0.71              | Clear                             | -183                |
| 0910                                                                                                                                    | 2.8                     | 14.4                           | 0.4                                           | 24.95                 | 7.38                | 24.18                      | 543                                              | 1.9 0.15                                             | 0.70              | Clear                             | -188                |
| 0917                                                                                                                                    | 2.8                     | 17.2                           | 0.4                                           | 24.98                 | 7.39                | 24.20                      | 544                                              | 2.0 0.17                                             | 0.71              | Clear                             | -186                |
| 0924                                                                                                                                    | 2.8                     | 20.0                           | 0.4                                           | 25.01                 | 7.37                | 24.22                      | 545                                              | 1.9 0.16                                             | 0.71              | Clear                             | -184                |
|                                                                                                                                         |                         |                                |                                               |                       |                     |                            |                                                  |                                                      |                   |                                   |                     |
|                                                                                                                                         |                         |                                |                                               |                       |                     |                            |                                                  |                                                      |                   |                                   |                     |
|                                                                                                                                         |                         |                                |                                               |                       |                     |                            |                                                  |                                                      |                   |                                   |                     |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88  
TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016  
PURGING EQUIPMENT CODES: B = Baller; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

### SAMPLING DATA

|                                                 |              |               |        |                            |                               |          |                                                   |  |                            |  |                                       |
|-------------------------------------------------|--------------|---------------|--------|----------------------------|-------------------------------|----------|---------------------------------------------------|--|----------------------------|--|---------------------------------------|
| SAMPLED BY (PRINT) / AFFILIATION:<br>SIS Team 2 |              |               |        | SAMPLER(S) SIGNATURE(S):   |                               |          | SAMPLING INITIATED AT: 0925                       |  | SAMPLING ENDED AT: 0945    |  |                                       |
| PUMP OR TUBING DEPTH IN WELL (feet): 28         |              |               |        | TUBING MATERIAL CODE: HDPE |                               |          | FIELD-FILTERED: Y N<br>Filtration Equipment Type: |  | FILTER SIZE: _____ $\mu$ m |  |                                       |
| FIELD DECONTAMINATION: PUMP Y N                 |              |               |        | TUBING Y N (replaced)      |                               |          | DUPLICATE: Y N                                    |  |                            |  |                                       |
| SAMPLE CONTAINER SPECIFICATION                  |              |               |        | SAMPLE PRESERVATION        |                               |          | INTENDED ANALYSIS AND/OR METHOD                   |  | SAMPLING EQUIPMENT CODE    |  | SAMPLE PUMP FLOW RATE (mL per minute) |
| SAMPLE ID CODE                                  | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED          | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH |                                                   |  |                            |  |                                       |
|                                                 | 1            | AG            | 1L     | Na2SO4, Ice                | 1.2 gr                        | 3        | 1,4-Dioxane                                       |  |                            |  |                                       |
|                                                 | 2            | AG            | 1L     | Ice                        |                               |          | BNAs                                              |  |                            |  |                                       |
|                                                 | 1            | PE            | 1L     | Ice                        |                               |          | Cl, SO4, TDS                                      |  |                            |  |                                       |
|                                                 | 1            | PE            | 1L     | HNO3, Ice                  | 1                             | 2        | Hg, ICPMS, ICP                                    |  |                            |  |                                       |
|                                                 | 1            | PE            | 125ml  | H2SO4, Ice                 | 1                             | 2        | NH3, NO2NO3                                       |  |                            |  |                                       |
|                                                 | 2            | AG            | 1L     | Ice                        |                               |          | Pest NP                                           |  |                            |  |                                       |
|                                                 | 2            | AG            | 1L     | Ice                        |                               |          | PSCL-PCB                                          |  |                            |  |                                       |
|                                                 | 1            | PE            | 125ml  | ZnAc-NaOH                  | 2                             | 11       | Sulfide                                           |  |                            |  |                                       |
|                                                 | 4            | CG            | 40ml   | HCl, Ice                   |                               |          | VOCs                                              |  |                            |  |                                       |

REMARKS:

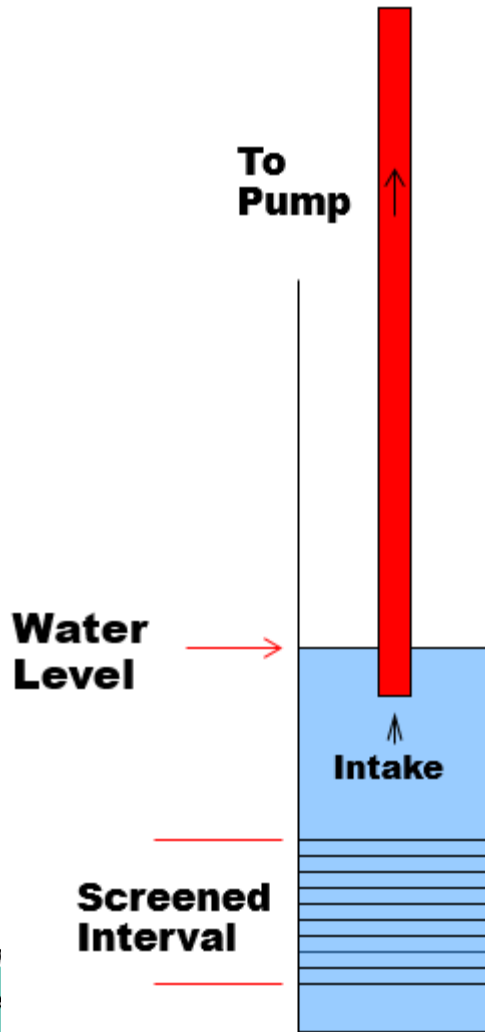


***Purging microwells  
and screen points***



FS 2212 & FS 2213

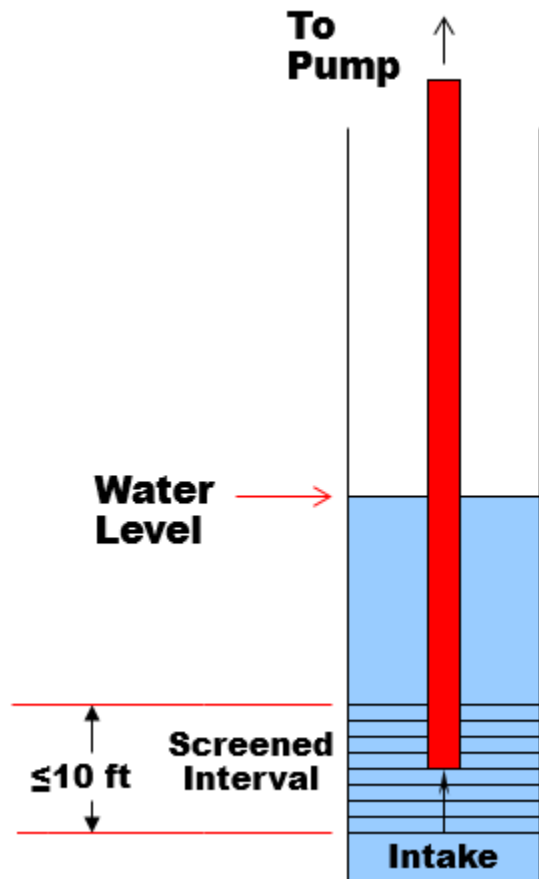
## *Conventional Purge*



- Intake placed at the top of water column
- Calculate well volume
- Purge one well volume
- Measure stabilization parameters no sooner than each  $\frac{1}{4}$  well volume interval
- Purge at least  $1\frac{1}{2}$  well volumes



## Minimized Purge Volumes

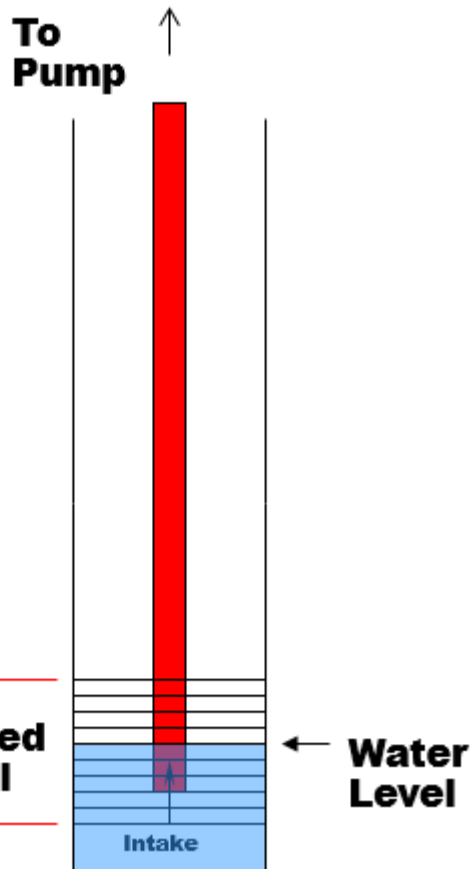


- Well screen length  $\leq 10$  feet
- Configuration used for both purging and sampling
- Intake or pump placed at mid-screen
- Calculate equipment volume
- Purge one equipment volume
- Measure stabilization parameters
- Collect additional measurements no sooner than every 2 minutes
- Purge a minimum of 3 equipment volumes





## *Partially Submerged Screen*



- Intake placed at  $\frac{1}{2}$  distance between top of water column and bottom of screen
- Calculate well volume
- Purge one well volume
- Measure stabilization parameters
- Collect additional measurements no sooner than every 2 minutes



## *Groundwater Scenarios*

Important considerations also discussed for:

- Can't achieve purging completion criteria
- Purging low-recharge wells
- Maximum time between purging and sampling
- Sampling wells with installed plumbing



# *Maximum (Default) Purge Volumes When Purging Completion Criteria Can't Be Achieved*

- 5 well volumes only if
  - Stabilization measurements fail
  - Proper techniques verified
  
- One fully dry purge (only for low recharge at  $< 100 \text{ mL/min}$  pump rate)





## ***Purging and Sampling Low-Recharge Wells***

- Minimize equipment volume
- Use thick-walled tubing
- Use same equipment for purging and sampling
- Place intake at mid-screen depth
- Purge < 100 mL/min
- Purge 2 equipment volumes
- Measure parameters just before sampling
- Keep pump at the purge position
- Keep pumping rate the same (unless purged dry)
- Collect samples immediately after purging (or after dry recharge)

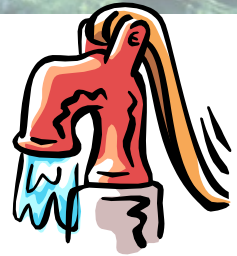


## *Maximum Time Between Purging & Sampling*

- Dry-purge wells sampled immediately after sufficient recharge & parameter measurement
- Re-measure parameters > 1 hour after purging
- Re-purge if parameters > 10% of original
- All samples collected within 6 hours of purging



## *Purging & Sampling Wells with Installed Plumbing*



- Purge and sample from tap between well head and pressure tank or at point closest to pump
- Remove hoses, aerators and filters between sample tap point and pump, if possible
- Purge volume of pressure tank, lines and spigot
- For **intermittently** pumping systems, flush stagnant volume of system until stabilization is achieved per FS 2212, section 3
- Reduce flow to  $\leq 500$  ml/min ( $\leq 100$  mL/min for VOCs)
- Collect samples directly into sample containers



## Collecting Organic Samples With Peristaltic Pumps

- The “trap method” for extractable organics – *optional*
  - Use trap if concerns about analyte interaction with silicone pump head tubing
  - Otherwise, collection through pump head assembly allowed with no more than 1-foot length of **new** silicone tubing for each well





## *Collecting Organic Samples With Peristaltic Pumps – option 1*

### Option 1: “Through-Pumphead” Technique for VOCs

- Maximum of 1 ft. of new silicone tubing in pump head
- Do not use LDPE drop or delivery tubing
- Use smallest inside diameter tubing possible
- Maximize sampling flow rate within 100-400 mL/min
- Disconnect all devices from delivery tubing
- Minimize turbulence or aeration
- Fill VOC containers last, if multiple analytes collected
  - Collect VOCs **first** for low-recharge wells with excessive drawdown or dry purge conditions



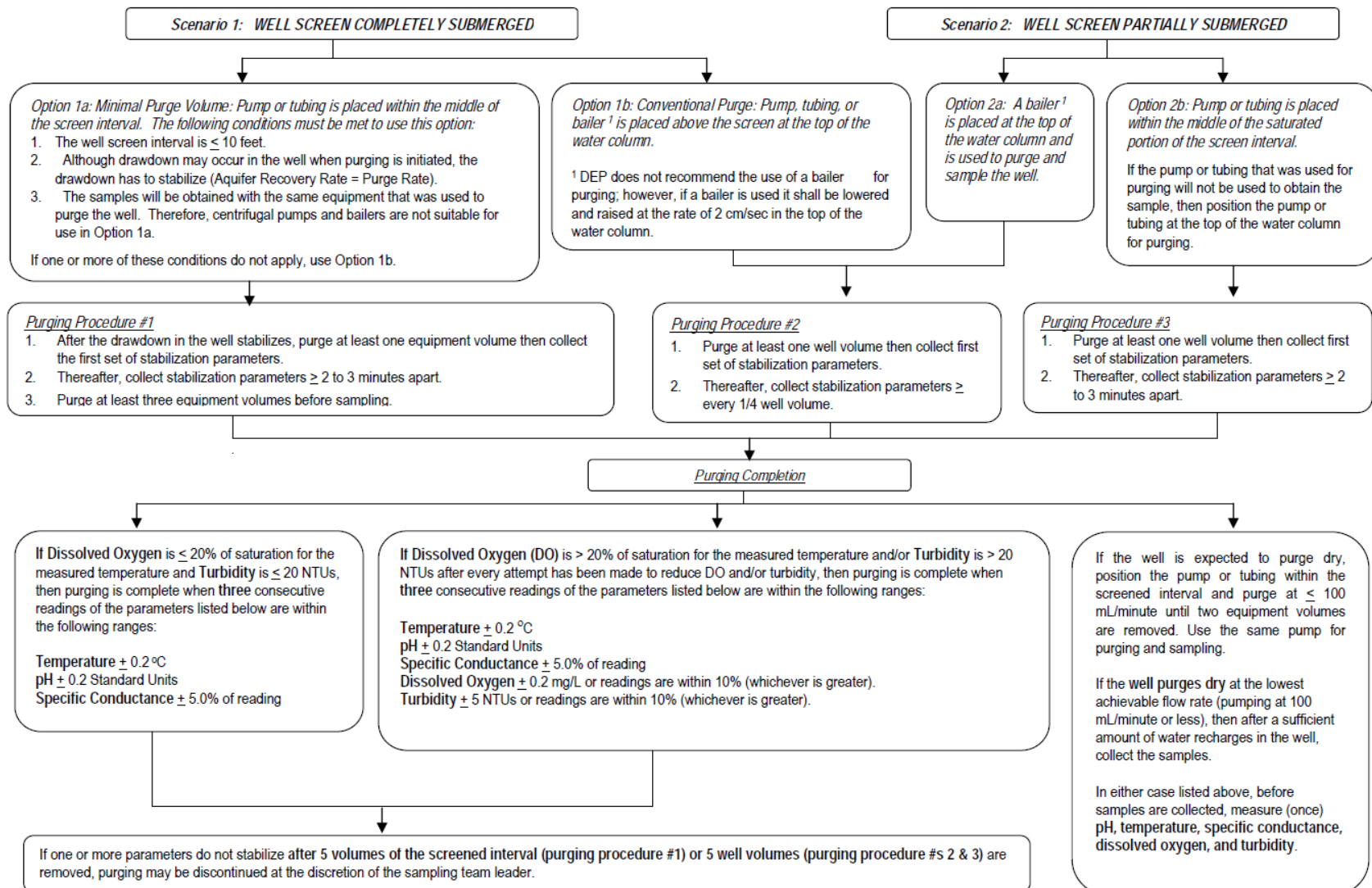


## ***Collecting Organic Samples With Peristaltic Pumps – option 2***

### **Option 2: “Straw” Technique for VOCs**

- “Reverse-Flow” or “Manual Fill” (gravity drain)
- Do not use LDPE drop or delivery tubing
- Use pump to fill downhole tubing with sample
- Remove downhole tubing from well (and pump) without losing sample
- Reverse-pump (or drain) sample into VOC vial without turbulence or aeration
- Reduce flow rate to  $\leq 100$  mL/min for VOC collection

DEP-SOP-001/01  
FS 2200 Groundwater Sampling



Use Ground Water Sampling Flow  
Chart for Monitor Well Scenarios



# *Common Sampling Mistakes*

- Not following DEP SOPs
- Poor contamination control and sample handling (e.g., touching inside the lid with fingers, not rinsing intermediate vessels)
- DEP SOP calibration/verification protocols for testing instruments not followed
  - Standards did not bracket sample values
  - Calibration acceptance criteria were not assessed
  - Pre-deployment checks on field testing and sampling equipment were not conducted
- Equipment does not work during sampling event





# *Florida Department of Environmental Protection*

## ***Groundwater Audit Checklist and Sampling Log***





## ***Common Documentation Errors***

- Not documenting required information:
- Date and time of calibration, verification or sample measurement
- Sample measurement results are not legible
- Forms are incomplete
- Linkage between meter calibration records and sample measurement data
- No meter identification information
- Sources for field calibration standards not documented





SITE NAME: Clam Bayou DATE: 11/1/11 TIME 1245 (military) EST CST DEPTH: 0.2 ft (m) FIELD ID: CLB5

| SAMPLING TEAM MEMBERS |  | WQ MEASUREMENTS | DOCUMENTATION | SAMPLE COLLECTION | PRESERVATION | PRESERVATION CHECK |
|-----------------------|--|-----------------|---------------|-------------------|--------------|--------------------|
| [REDACTED]            |  |                 |               |                   |              |                    |
| M [REDACTED]          |  |                 |               |                   |              |                    |
| S [REDACTED]          |  |                 |               |                   |              |                    |
| T [REDACTED]          |  |                 |               |                   |              |                    |

| SAMPLING EQUIPMENT                                   |                                             |
|------------------------------------------------------|---------------------------------------------|
| <input checked="" type="checkbox"/> Sample Container | <input type="checkbox"/> Tubing type: _____ |
| <input type="checkbox"/> Pole                        | <input type="checkbox"/> Other _____        |
| <input type="checkbox"/> Pump ID#: _____             | <input type="checkbox"/> Other _____        |
| WATER QUALITY MEASUREMENTS                           |                                             |
| Instrument ID: _____                                 |                                             |
| COLLECTION MODE                                      |                                             |
| Via boat                                             |                                             |
| <input type="checkbox"/> Wading                      | <input type="checkbox"/> Canoe              |
| <input type="checkbox"/> Diving                      | <input type="checkbox"/> Electric Motor     |
| <input type="checkbox"/> From Shore                  | <input type="checkbox"/> Gasoline Motor     |
| <input type="checkbox"/> Other _____                 |                                             |

| Parameter Suite               | Parameter(s)/Method                                                                                                                                                                                                                                                   | Matrix Code | Preservation**                                                                                             | Preservative Lot # | pH Check                    | # Bottles *** |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------|---------------|
| Preserved Nutrients           | <input checked="" type="checkbox"/> TKN <input checked="" type="checkbox"/> TP <input checked="" type="checkbox"/> NOx <input checked="" type="checkbox"/> NH3 <input type="checkbox"/> TOC <input type="checkbox"/> Total N<br><input type="checkbox"/> Other: _____ | S W         | <input checked="" type="checkbox"/> Ice <input checked="" type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> |                    | <input type="checkbox"/> <2 |               |
| Filtered Nutrients            | <input type="checkbox"/> oP <input type="checkbox"/> Other: _____                                                                                                                                                                                                     | W           | <input type="checkbox"/> Ice <input type="checkbox"/> 45 um Filter                                         |                    |                             |               |
| Unpreserved Nutrients         | <input type="checkbox"/> NO <sub>2</sub> <input type="checkbox"/> NO <sub>3</sub> <input type="checkbox"/> SO <sub>4</sub> <input type="checkbox"/> Other: _____                                                                                                      | W           | <input type="checkbox"/> Ice                                                                               |                    |                             |               |
| Physical/Aggregate Properties | <input type="checkbox"/> TDS <input type="checkbox"/> TSS <input type="checkbox"/> TS <input checked="" type="checkbox"/> Turbidity <input checked="" type="checkbox"/> Alk <input checked="" type="checkbox"/> Color<br><input type="checkbox"/> Other: _____        | S W         | <input checked="" type="checkbox"/> Ice                                                                    |                    |                             |               |
| Chlorophyll                   | <input checked="" type="checkbox"/> CHL-PPTN-W                                                                                                                                                                                                                        | S W         | <input checked="" type="checkbox"/> Ice                                                                    |                    |                             |               |
| BOD                           | <input type="checkbox"/> BOD-INHB <input type="checkbox"/> BOD-UNIN                                                                                                                                                                                                   | W           | <input type="checkbox"/> Ice                                                                               |                    |                             |               |
| Microbiology                  | MF: <input type="checkbox"/> E coli <input type="checkbox"/> T Coli <input type="checkbox"/> F Coli <input type="checkbox"/> Enteroc <input type="checkbox"/> F Strep                                                                                                 | W           | <input type="checkbox"/> Ice                                                                               |                    |                             |               |
| Macroinvertebrates            | <input type="checkbox"/> MI-FW-QLDC <input type="checkbox"/> MI-FW-QLBR <input type="checkbox"/> MI-FW-QNNC<br><input type="checkbox"/> MI-MN-QNNC                                                                                                                    | W           | <input type="checkbox"/> Formalin                                                                          |                    |                             |               |
| Phytoplankton                 | <input type="checkbox"/> PKD-QN-C <input type="checkbox"/> DTY-QN-C                                                                                                                                                                                                   | W           | <input type="checkbox"/> Luqol's                                                                           |                    |                             |               |





## SEDIMENT / SUBSTRATE

### Sediment Oils

☐ Absent ☐ Slight  
☐ Moderate ☐ Profuse

### Sediment Odors

☐ Normal ☐ Sewage ☐ Petroleum  
☐ Chemical ☐ Anaerobic  
☐ Other (Specify):

### Sediment Deposition

☐ Sludge Sand Smothering : None Slight Moderate Severe  
Silt Smothering : None Slight Moderate Severe  
☐ Other (Specify):

### SUBSTRATE TYPE

Assessment Tool: ☐ SCI ☐ BioRecon

☐ LCI ☐ LVI ☐ INVERT ☐ PERI  
% Coverage # Times Sampled # Times Sampled

|                          | % Coverage | # Times Sampled | # Times Sampled |
|--------------------------|------------|-----------------|-----------------|
| Woody Debris (Snags)     |            |                 |                 |
| Undercut Banks / Roots   |            |                 |                 |
| Leaf Packs or Mat .....  |            |                 |                 |
| Aquatic Vegetation ..... |            |                 |                 |
| Rock or Shell Rubble..   |            |                 |                 |
| Sand.....                |            |                 |                 |
| Mud / Muck / Silt .....  |            |                 |                 |
| Other .....              |            |                 |                 |
| Other .....              |            |                 |                 |

### WATER QUALITY

|             | Depth (M) | Temp. (°C) | pH (SU) | D.O. (MG/L) | Cond. (UMHO/CM) | Salinity (PPT) | SECCHI (M)                   |
|-------------|-----------|------------|---------|-------------|-----------------|----------------|------------------------------|
| Top :       | 0.2       | 22.44      | 8.09    | 4.99        | 48403           | 31.65          | 0.35                         |
| Mid-Depth : | 0.6       | 22.03      | 8.13    | 4.71        | 32300           | 34.44          | <input type="checkbox"/> VOB |
| Bottom :    |           |            |         |             |                 |                |                              |

Water Surface Oils : ☒ None ☐ Sheen ☐ Globbs ☐ Slick

Water Odors : ☒ Normal ☐ Sewage ☐ Petroleum ☐ Chemical  
☐ Other (Specify):

Water Sample Taken ? ☒ Yes ☐ No

Algae Sample Taken ? ☐ Yes ☒ No

### Clarity

☐ Clear ☒ Slightly Turbid  
☐ Turbid ☐ Opaque

### SYSTEM TYPE

☐ Stream ☐ Lake  
☐ Wetland ☒ Estuary  
☐ Other (Specify):

### Color

☐ Tannic ☒ Green (Algae) *SLIGHTLY*  
☐ Clear ☐ Other (Specify):

### WEATHER CONDITIONS / NOTES :

Sunny, breezy, ~70F

☒ The antecedent hydrologic conditions have been met to my best knowledge.

Water samples preserved ? ☐ Yes ☐ pH<2 ☐ No ☐ Algae samples preserved ? ☐ Yes ☐ No

### ABUNDANCE

|                        | Absent                              | Rare                                | Common                              | Abundant                 |
|------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Periphyton :           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Fish :                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Aquatic Macrophytes :  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Iron/Sulfur Bacteria : | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |



## SUBSTRATE TYPE

Assessment Tool: ☐ SCI ☐ RPS ☐ LVS

☐ LCI ☐ BioRecon

**INVERT**  
% Coverage    # Times Sampled    # Times Sampled

Woody Debris (Snags)

Undercut Banks / Roots

Leaf Packs or Mat .....

Aquatic Vegetation .....

Rock or Shell Rubble...

Sand.....

Mud / Muck / Silt .....

Other .....

Other .....

## ABUNDANCE

Absent    Rare    Common    Abundant

## WATER QUALITY

|         | Depth (M) | Temp (°C) | pH (SU) | D.O. (MG/L) | D.O. (%) | Cond. (UMHO/CM) | Salinity (PPT) | SECCHI (M) |
|---------|-----------|-----------|---------|-------------|----------|-----------------|----------------|------------|
| Top:    | 0.5       | 28.1      | 7.7     | 7.4         | 107      |                 | 29.4           |            |
| Mid:    |           |           |         |             |          |                 |                |            |
| Bottom: |           |           |         |             |          |                 |                |            |

Meter ID:

YSI #2

Water Odors: Normal ☒ Petroleum ☐  
Sewage ☐ Chemical ☐ Other ☐

Water Sample Taken? ☒ Yes ☐ No  
Sample Preserved? ☒ Yes ☐ No  
Lot Number: \_\_\_\_\_ Exp: \_\_\_\_\_

Algae Sample Taken? ☐ Yes ☒ No  
Sample Preserved? ☐ Yes ☐ No  
Lot Number: \_\_\_\_\_ Exp: \_\_\_\_\_

System Type: Stream ☐ Lake ☐ Wetland ☐ Estuary ☒ Other(Specify) ☐ \_\_\_\_\_

Water Surface Oils: Normal ☒ Sheen ☐  
Globs ☐ Slick ☐ Other ☐

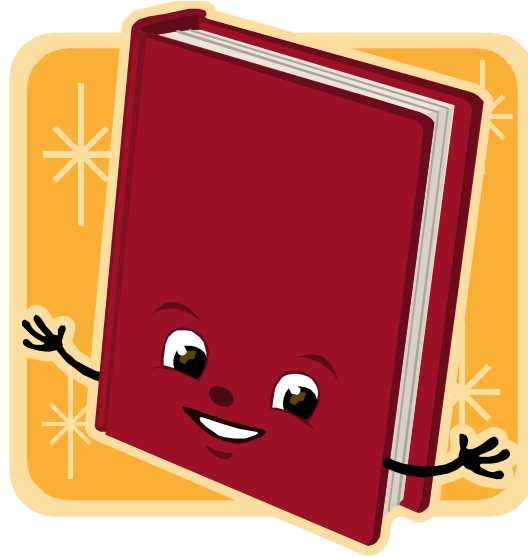
Color: Tannic ☒ Green (Algae) ☐  
Clear ☐ Other (Specify) ☐

Clarity: Clear ☐ Slightly Turbid ☒  
Turbid ☐ Opaque ☐





# *Questions?*



**Stay up to date...**

**Quality of Science Newsletter**

**<http://www.dep.state.fl.us/water/sas/training/listserv.htm>**

