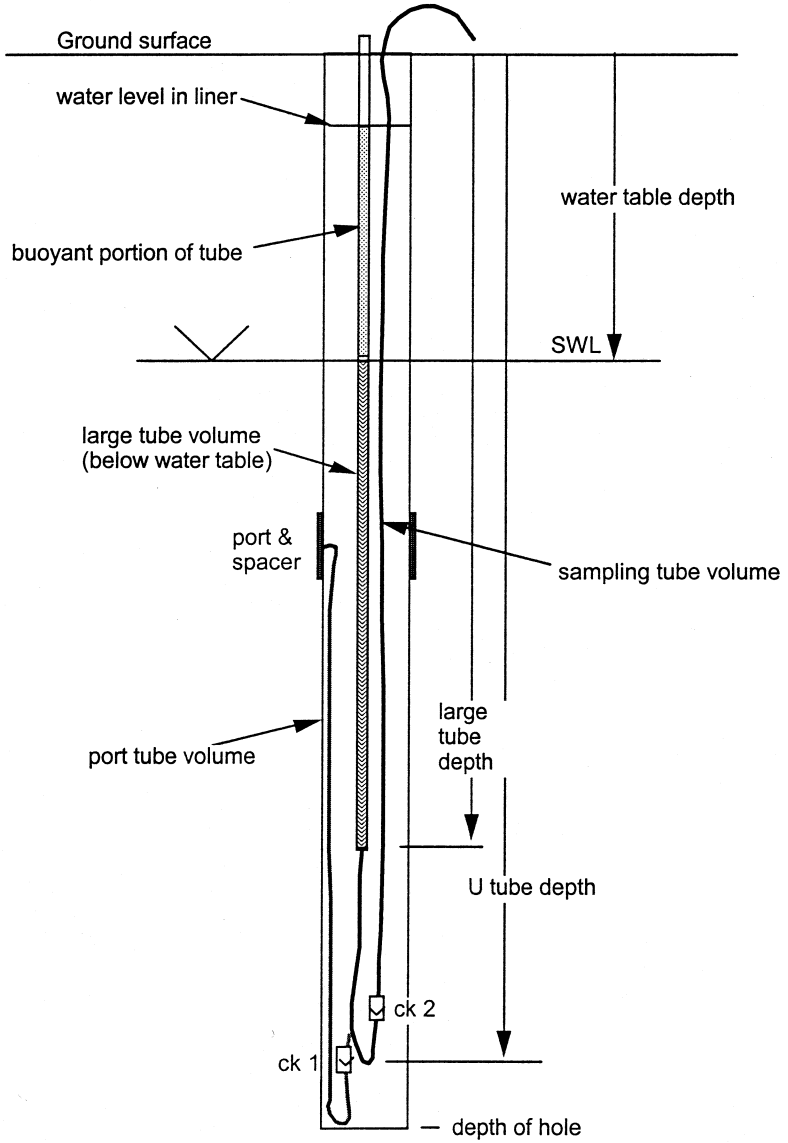
INSTALLATION AND USE OF FLUTe™ MULTI-LEVEL MONITORING SYSTEMS FOR WATER LEVEL AND WATER QUALITY MONITORING

MONITORING OBJECTIVE

Long-Term Water Level and Water Quality Monitoring in Several Bedrock Formations


Ground surface
water level in liner
water table depth
buoyant portion of tube
SWL
large tube volume
(below water table)
port &
spacer
sampling tube volume
port tube volume
large
tube
depth
U tube depth
ck 2
ck 1
depth of hole

MONITORING INTERVAL SELECTION CRITERIA

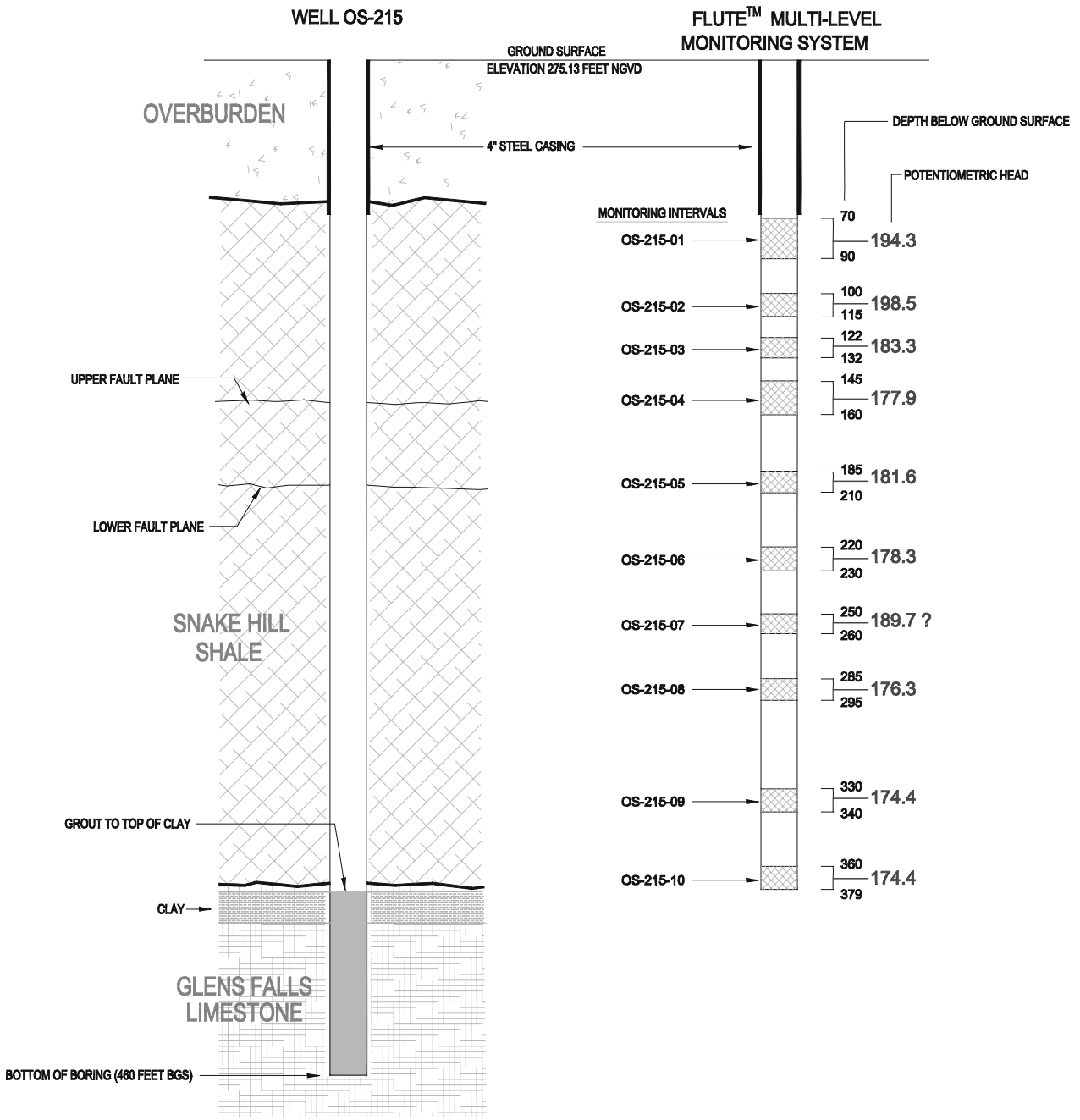
- Distributed Across Entire Borehole Length
- Known Hydrostratigraphic Features
- Water-Yielding Zones
- “Open” Fractures

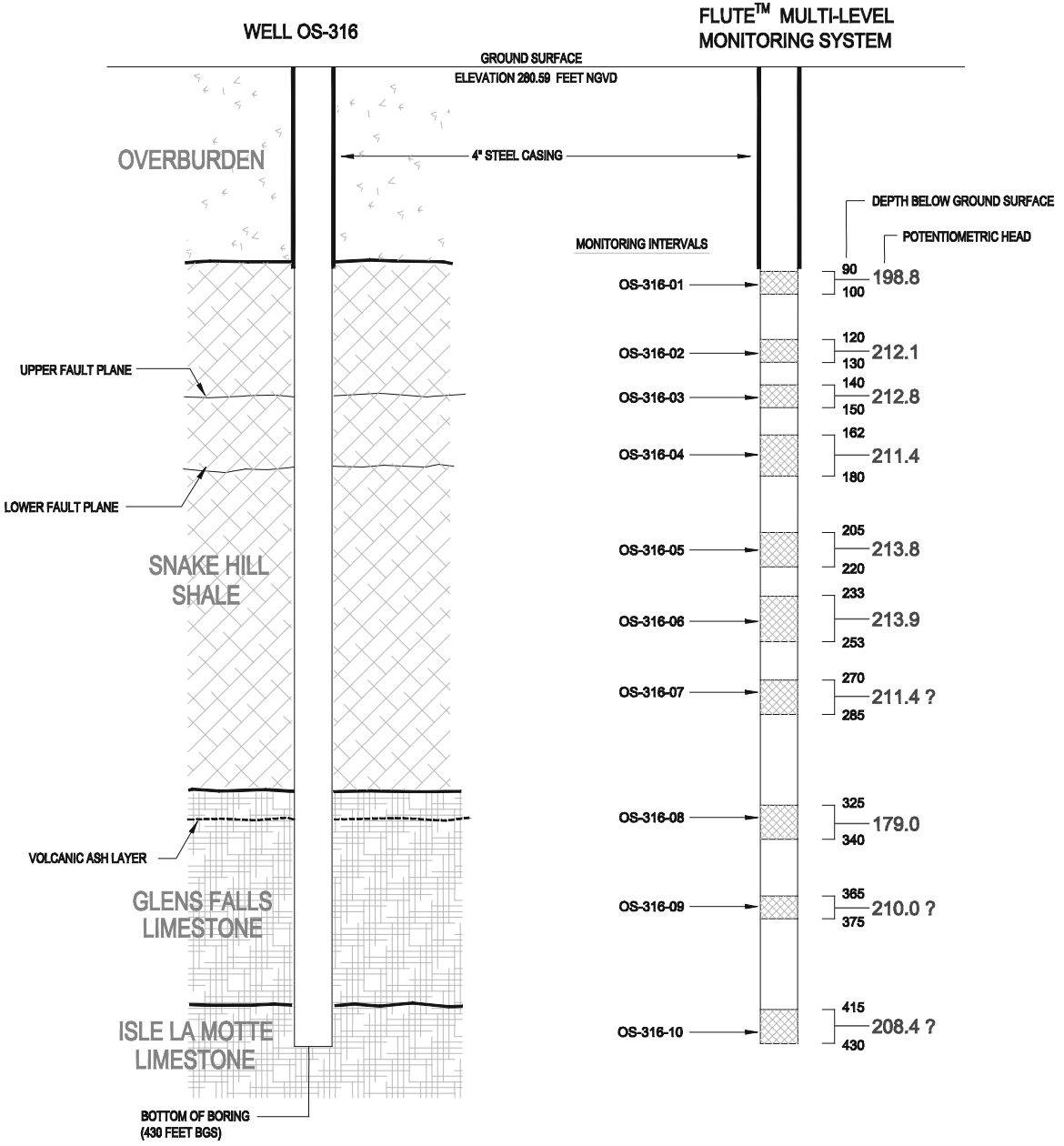
BOREHOLE LOGGING

- Continuous Core
- Caliper
- Natural Gamma
- Spontaneous Potential
- Single Point Resistivity
- Fluid Resistivity
- Temperature
- Acoustic Televiewer*
- Borehole Flowmeter*
  - stressed
  - unstressed
- Packer Development Yield*

SITE APPLICATION

- Drill Borehole
- Well Development Using Inflatable Packers with Overlapped Intervals
- Borehole Logging
- Temporary FLUTe™ Liner
- Monitoring Interval Selection
- FLUTe™ Installation
- Water Level Measurements
- Periodic Purging of Sampling Ports
- Water Quality Sampling


WELL OS-215
FLUTE™ MULTI-LEVEL MONITORING SYSTEM
GROUND SURFACE
ELEVATION 275.13 FEET NGVD
OVERBURDEN
4" STEEL CASING
DEPTH BELOW GROUND SURFACE
POTENTIOMETRIC HEAD
MONITORING INTERVALS
OS-215-01
70
90
194.3
OS-215-02
100
115
198.5
OS-215-03
122
132
183.3
OS-215-04
145
160
177.9
OS-215-05
185
210
181.6
OS-215-06
220
230
178.3
OS-215-07
250
260
189.7 ?
OS-215-08
285
295
176.3
OS-215-09
330
340
174.4
OS-215-10
360
379
174.4
UPPER FAULT PLANE
LOWER FAULT PLANE
SNAKE HILL SHALE
GROUT TO TOP OF CLAY
CLAY
GLENS FALLS LIMESTONE
BOTTOM OF BORING (460 FEET BGS)


WELL OS-316
FLUTE™ MULTI-LEVEL MONITORING SYSTEM
GROUND SURFACE
ELEVATION 280.59 FEET NGVD
OVERBURDEN
4" STEEL CASING
DEPTH BELOW GROUND SURFACE
POTENTIOMETRIC HEAD
MONITORING INTERVALS
UPPER FAULT PLANE
LOWER FAULT PLANE
SNAKE HILL SHALE
VOLCANIC ASH LAYER
GLENS FALLS LIMESTONE
ISLE LA MOTTE LIMESTONE
BOTTOM OF BORING (430 FEET BGS)
OS-316-01 90 100 198.8
OS-316-02 120 130 212.1
OS-316-03 140 150 212.8
OS-316-04 162 180 211.4
OS-316-05 205 220 213.8
OS-316-06 233 253 213.9
OS-316-07 270 285 211.4 ?
OS-316-08 325 340 179.0
OS-316-09 365 375 210.0 ?
OS-316-10 415 430 208.4 ?

GOOD NEWS AND BAD NEWS

GOOD	BAD
Multiple monitoring intervals in a single borehole	WL measurements difficult when DTW is large
Borehole can be sealed with a continuous liner	
Continuous seal between monitored intervals	Liners can be damaged
Potentially removable and reusable	Not always removable
Easily installed in permeable formations	Installed with great difficulty in less permeable formations
Can be configured for pressure transducers and sampling	Expensive when “fully” equipped
	Difficult or impossible to repair non-working parts