SAFE and SUSTAINABLE Drinking Water Supply Wells

STEVE SCHNEIDER

BSME, MGWC

Past President & Director

National Ground Water Research & Educational Foundation

Charitable arm of the NGWA

VP - Drilling Operations

Schneider Water Services

7th RWSN Forum

Water for Everyone

2016

Abidjan Cote d'Ivoire

SAFE & SUSTAINABLE WELLS INSTITUTE

Providing groundwater & wells education

book available in 5 languages

MWONGOZO WA KISIMA CHA KUSAMBAZA MAJI

kwa matumizi katika NCHI ZINAZOSTAWI

DIRECTRICES PARA POZOS DE ABASTECIMIENTO DE AGUA

para usar en PAÍSES EN DESARROLLO

TERCERA EDICIÓN

WATER SUPPLY WELL GUIDELINES

for use in DEVELOPING COUNTRIES

THIRD EDITION

供水井指南

供发展中国家使用

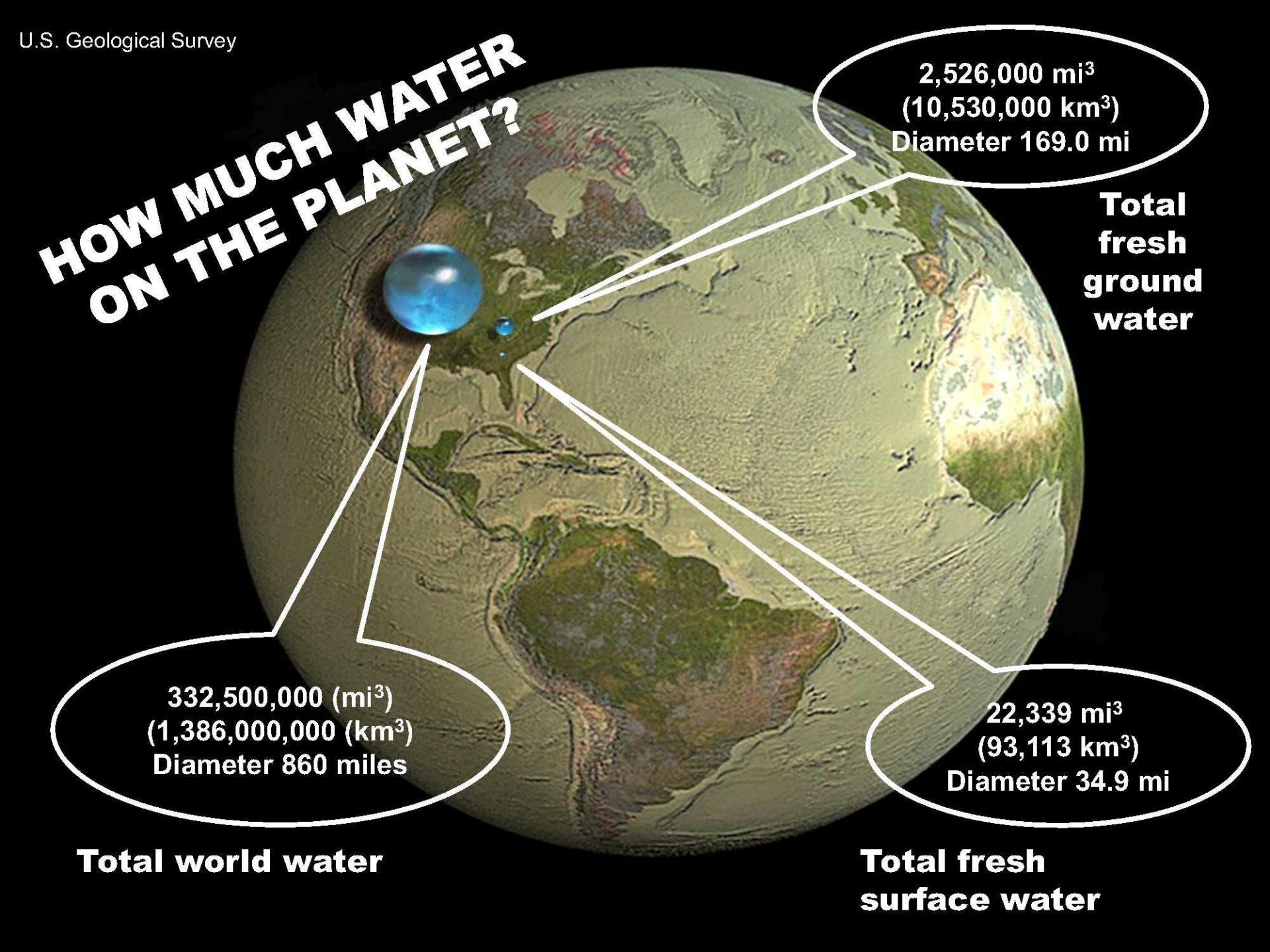
第三版

DIRECTIVES POUR LES PUITS D'ALIMENTATION EN EAU

destinés à être utilisés dans les PAYS EN VOIE DE DÉVELOPPEMENT

TROISIÈME ÉDITION

U.S. Geological Survey



GW / SW COMPARISON

- Less than 1% of all water is liquid fresh water
- There is over 100 times more liquid fresh groundwater than fresh liquid surface water
- Fresh groundwater makes up over 99% of all liquid freshwater.

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

WHY USE GROUNDWATER?

- ACCESSIBILITY
- SAFETY
- SUSTAINABILITY

NOTE: These were in the original MDG for water.

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

DID MDG MISS TARGET? or, should these be our SDG targets?

- Accessibility
  - Drinking water in home or on premises
  - Pathogen free water for sanitation (hygiene)
- Safety
  - Chemically - for drinking
  - Bacteriologically – for drinking
  - During construction
- Sustainablility
  - Protection of groundwater resource

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

SDG 6.1.1 DEVELOP SAFE WATER

- Located on premises (or piped from well to premise); preferably into home
- Available whenever needed
- Free of faecal and priority chemical constituents

IMPACT ON OTHER SDGs

#1 – No Poverty

#3 – Good Health and Well-Being

#4 – Quality Education

#5 – Gender Equality

#8 – Decent Work and Economic Growth

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

QUOTES & FACT

"You will never solve poverty without solving water and sanitation" *Matt Damon*

"You will never solve sanitation without water free of harmful pathogens" *S^3*

"…1.8 billion people globally use a source of drinking water that is faecally contaminated…"

Progress on Drinking Water and Sanitation – 2014 update *WHO & UNICEF*

The LADDER out of EXTREME POVERTY

- Surface water

The LADDER out of EXTREME POVERTY

- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Drilled well – Electric grid pump
- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Drilled well – Solar pump
- Drilled well – Electric grid pump
- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Drilled well – Pathogen free
- Drilled well – Solar pump
- Drilled well – Electric grid pump
- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- Safe water piped into home
- Drilled well – Pathogen free
- Drilled well – Solar pump
- Drilled well – Electric grid pump
- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

The LADDER out of EXTREME POVERTY

- On-site sanitation w/ safe water
- Safe water piped into home
- Drilled well – Pathogen free
- Drilled well – Solar pump
- Drilled well – Electric grid pump
- Drilled well – Hand pump (deeper depths)
- Hand dug well – w/pump (e.g. rope)
- Hand dug well – dipped access
- Spring
- Surface water

AFRICA - POPULATION

~2000	~2013	Percent Change	
815	1100	135%	TOTAL POPULATION
327	431	132%	PIPED, SOURCE UNKNOWN
174	195	112%	HAND DUG WELLS
72	172	239%	BOREHOLE

JMP 2015 report / Kerstin Danert 2015 UO International WaTER Conference keynote

national ground water research and educational foundation

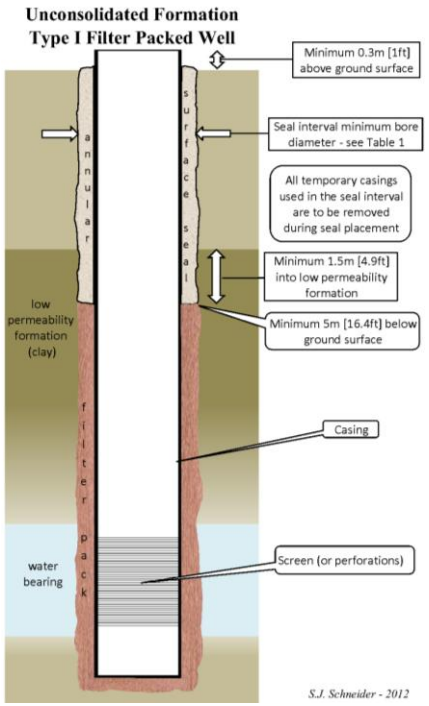
Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

STARTING A WELL PROJECT

1. Define the desired or expected outcome
   - Purpose (e.g. safe drinking water)
   - Pathogen free (all wells can control this)
   - No unacceptable levels of harmful chemicals
   - Adequate yield
   - Plumb and aligned
2. Locate – 3 dimensional
3. Plan (design)
   - Sand control
   - Pump chamber size (i.e. casing)

Note: Locating & Planning sometimes occur simultaneously



national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

STARTING A WELL PROJECT

Getting data:

2014 survey of states in US with public accessible database of well logs

70% had them at that time

More have followed

ONLINE DEMO of OR & WA

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

WATER WELL LOG (COMPLETION REPORT) DATABASES BY STATE IN UNITED STATES

STATE	ONLINE	WEB ADDRESS	COMMENT
Alabama	no		no response & online search unsuccessful
Alaska	yes	http://dnr.alaska.gov/mlw/welts/#/?page=show-welts-intro-template	
Arizona	yes	http://www.azwater.gov/azdwr/default.aspx	
Arkansas	yes	http://geology2.ar.gov/water/WaterWellDownload/	
California	no		logs submitted but considered confidential - contact CA DWR
Colorado	yes	http://www.dwr.state.co.us/WellPermitSearch/default.aspx	limited info available; not a database
Connecticut	no		logs submitted but considered confidential - contact local health dept
Delaware	yes	http://maps.dgs.udel.edu/dgir/draft/	
Florida	no	http://www.dep.state.fl.us/water/groundwater/fluwid.htm	centralized database not found
Georgia	no		online search unsuccessful and one other unable to find such
Hawaii	no		logs submitted and held by State
Idaho	yes	http://www.idwr.idaho.gov/apps/appswell/searchWC.asp	
Illinois	yes	http://isgs.illinois.edu/?q=ilwater	
Indiana	yes	http://www.in.gov/dnr/water/3595.htm	
Iowa	yes	http://www.iowadnr.gov/InsideDNR/RegulatoryWater/PrivateWellProgram/WellLogs.aspx	requires user name and password
Kansas	yes	http://www.kgs.ku.edu/Magellan/WaterWell/index.html	
Kentucky	yes	http://kgs.uky.edu/kgsweb/DataSearching/watersearch.asp	
Louisiana	no		searched online but unsuccessful at retrieving logs
Maine	yes	http://www.maine.gov/dacf/mgs/pubs/digital/well.htm	
Maryland	no		contact local authorities or MDE
Massachusetts	yes	http://public.dep.state.ma.us/searchwell/	
Michigan	yes	https://secure1.state.mi.us/wellogic/Login.aspx?ReturnUrl=%2fwellogic%2fdefault.aspx	http://www.deq.state.mi.us/well-logs/
Minnesota	yes	http://www.health.state.mn.us/divs/eh/cwi/	
Mississippi	no		not statewide, check out Miss DEQ
Missouri	yes	http://www.dnr.mo.gov/ENV/wrc/logmain/index.html	partial list of geologic logs; well construction details not included
Montana	yes	http://mbmggwic.mtech.edu/	
Nebraska	yes	http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx	
Nevada	yes	http://water.nv.gov/mapping/	
New Hampshire	yes	http://www2.des.state.nh.us/DESOnestop/BasicSearch.aspx	
New Jersey	yes	http://datamine2.state.nj.us/DEP_OPRA/OpraMain/categories?category=WS+Well+Permits	
New Mexico	yes	http://nmwrrs.ose.state.nm.us/nmwrrs/meterReport.html	
New York	yes	http://www.dec.ny.gov/cfmx/extapps/WaterWell/index.cfm?view=searchByCounty	Limited but useable info available without FOIL request which is required to get fu
North Carolina	yes	http://wellcontractors.nc.gov	
North Dakota	yes	http://swc.state.nd.us/4dlink2/4dcgi/logsearchformweb/Map%20and%20Data%20Resources	
Ohio	yes	http://www.dnr.state.oh.us/water/maptechs/wellogs/appNEW/	
Oklahoma	yes	www.owrb.ok.gov/supply/wd/drillers.php	
Oregon	yes	http://apps.wrd.state.or.us/apps/gw/well_log/	
Pennsylvania	yes	http://www.dcnr.state.pa.us/topogeo/groundwater/pagwis/index.htm	
Rhode Island	no		searched online but unsuccessful at retrieving logs
South Carolina	no	http://www.dnr.sc.gov/water/hydro/docs/Project_Well_Database.pdf	in process; hopefully operational in 2014 - see web address to pdf explanation
South Dakota	yes	http://denr.sd.gov/des/wr/dblogsearch.aspx	
Tennessee	no		available but not online
Texas	yes	http://www.twdb.texas.gov/groundwater/data/drillersdb.asp	
Utah	yes	http://www.waterrights.utah.gov/cgi-bin/wellview.exe?Startup	
Vermont	yes	http://www.anr.state.vt.us/dec/dwgwp/cfm/WellReportSearchFormi.htm	
Virginia	no	http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/GroundwaterCharacterization/WellDatabase.aspx	in process; see web addrss to access an explanation
Washington	yes	https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx	
West Virginia	no		contact county health departments
Wisconsin	yes	http://prodoasext.dnr.wi.gov/inter1/watr$.startup	for pre 1988 logs, go to: http://datcpgis.wi.gov/WellLogs
Wyoming	no	http://wwdc.state.wy.us/	
Total "yes"	**35**	**70%**	
Total "no"	**15**	**30%**	
Responding	**50**	**100%**	
INTERNATIONAL	no	http://www.un-igrac.org/publications/281	

DEPARTMENT OF ECOLOGY
State of Washington

Well Logs

Washington State Well Log Viewer

Welcome to the Department of Ecology Well Logs. A *Well Log* means a Well Report and describes the location, ownership, construction details and lithology of a completed well. This web site enables you to search for wells which have well reports and to view the well report using a variety of search tools.
Tell a friend!

Map Search

Search for well logs by navigating a Washington State map.

Text Search

Search for well logs using information you key in or select from a list.

Please Note: Water well locations within this site are not exact locations. Please read the Disclaimer.

national ground water research and educational foundation

OREGON

Water Resources Department

Well Log Query

Township: South

Range: West

Sections

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Find T-R-S by Address

Well Log:

Startcard:

Well Tag: L

Completed Date to

Received Date to

County

Bonded License# Find a Driller

Owner Last Name

Company Name

Completed Depth to

Taxlot

Type of Log

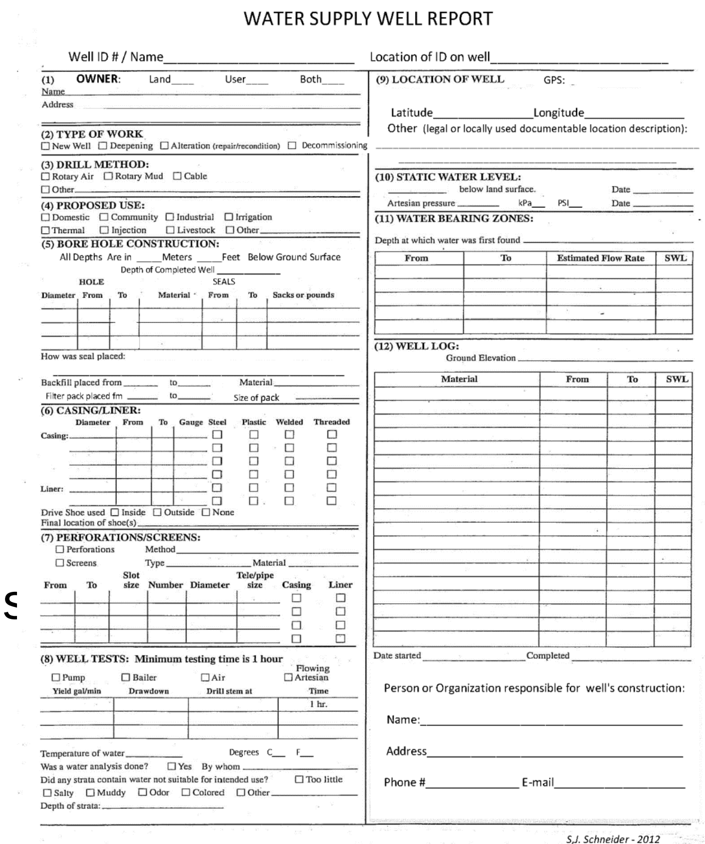
Records per Page: 10

Frequently Asked Questions

Search Reset

KEY COMPONENTS

- Location, location, location
  - Set backs
  - Three dimensional
- Annular seal
  - Mandatory
  - Chip bentonite
  - Commingling
- Documentation – well logs
  - Facilitates O&M
  - Used by drillers, hydrogeologists
    - Locate other well sites
    - Design other wells
    - Facilitate drilling plans for other wells
    - Aquifer characterization
    - Reposited & accessible



WATER SUPPLY WELL REPORT

Well ID # / Name________________ Location of ID on well________________

(1) **OWNER:** Land____ User____ Both____
Name
Address

(2) TYPE OF WORK
☐ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Decommissioning

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other________

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other________

(5) BORE HOLE CONSTRUCTION:
All Depths Are in _____Meters _____Feet Below Ground Surface
Depth of Completed Well ________

HOLE			SEALS			
Diameter	From	To	Material	From	To	Sacks or pounds

How was seal placed:
Backfill placed from ______ to______ Material________
Filter pack placed fm ______ to______ Size of pack ________

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☐ Outside ☐ None
Final location of shoe(s)________

(7) PERFORATIONS/SCREENS:
☐ Perforations Method________
☐ Screens Type________ Material________

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of water________ Degrees C___ F___
Was a water analysis done? ☐ Yes By whom ________
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other________
Depth of strata:________

(9) LOCATION OF WELL GPS: _
Latitude________Longitude________
Other (legal or locally used documentable location description):

(10) STATIC WATER LEVEL:
________ below land surface. Date ________
Artesian pressure ________ kPa___ PSI___ Date ________

(11) WATER BEARING ZONES:
Depth at which water was first found ________

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground Elevation ________

Material	From	To	SWL

Date started ________ Completed ________

Person or Organization responsible for well's construction:
Name:________
Address________
Phone #________ E-mail________

S.J. Schneider - 2012

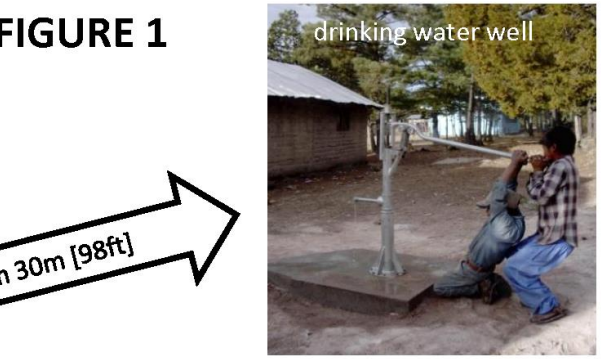
national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

WELL LOCATION

FIGURE 1



WELL SETBACKS

minimum 30m [98ft]

minimum 15m [49ft]

minimum 30m [98ft]

minimum 30m [98ft]

minimum 150m [490ft]

minimum 150m [490ft]

minimum 30m [98ft]

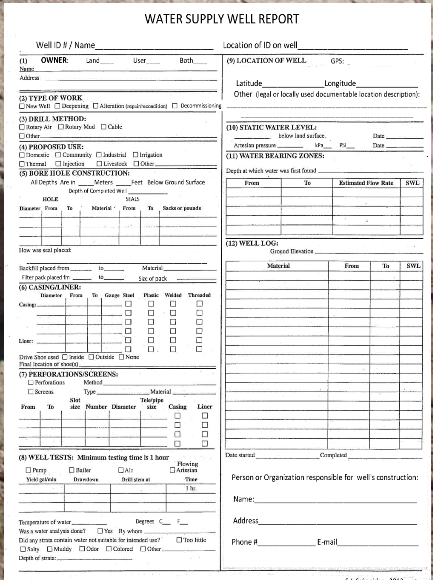
ANNULAR SEAL

- MANDATORY – 1 of 2 (zero e-coli is other)
- Most important component physically incorporated into a well's construction
- Well construction - NOT FOR AMATEURS
- Installation can be very challenging
  - Deep seals (e.g. through shoes)
  - Flowing conditions (whether at surface or not)
  - Removing temporary casing(s)

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES



WATER SUPPLY WELL REPORT

Well ID # / Name____________________ Location of ID on well____________________

(1) OWNER: Land___ User___ Both___
Name
Address

(2) TYPE OF WORK
☐ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Decommissioning

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other____________________

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other____________________

(5) BORE HOLE CONSTRUCTION:
All Depths Are in _____Meters _____Feet Below Ground Surface
Depth of Completed Well __________

HOLE			SEALS			
Diameter	From	To	Material	From	To	Sacks or pounds

How was seal placed:

Backfill placed from ______ to______ Material____________
Filter pack placed fm ______ to______ Size of pack ____________

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☐ Outside ☐ None
Final location of shoe(s)____________________

(7) PERFORATIONS/SCREENS:
☐ Perforations Method____________________
☐ Screens Type ____________ Material ____________

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of water__________ Degrees C___ F___
Was a water analysis done? ☐ Yes By whom ____________
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other____________
Depth of strata:____________

(9) LOCATION OF WELL GPS:
Latitude____________ Longitude____________
Other (legal or locally used documentable location description):

(10) STATIC WATER LEVEL:
________ below land surface. Date ________
Artesian pressure ________ kPa___ PSI___ Date ________

(11) WATER BEARING ZONES:
Depth at which water was first found ____________

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground Elevation ____________

Material	From	To	SWL

Date started ____________ Completed ____________

Person or Organization responsible for well's construction:

Name:____________________
Address____________________
Phone #____________ E-mail____________

WATER SUPPLY WELL REPORT

Well ID # / Name_____ Location of ID on well_____

(1) OWNER: Land____ User____ Both____

Name_____

Address_____

(2) TYPE OF WORK

☐ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Decommissioning

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other_____

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other_____

(5) BORE HOLE CONSTRUCTION:

All Depths Are in ____Meters ____Feet Below Ground Surface

Depth of Completed Well _____

HOLE				SEALS		
Diameter	From	To	Material	From	To	Sacks or pounds

How was seal placed:

Backfill placed from _____ to_____ Material_____

Filter pack placed fm _____ to_____ Size of pack _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☐ Outside ☐ None

Final location of shoe(s)_____

(7) PERFORATIONS/SCREENS:

☐ Perforations Method_____

☐ Screens Type_____ Material_____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of water_____ Degrees C___ F___

Was a water analysis done? ☐ Yes By whom_____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other_____

Depth of strata:_____

(9) LOCATION OF WELL GPS:

Latitude_____ Longitude_____

Other (legal or locally used documentable location description):

_____

(10) STATIC WATER LEVEL:

_____ below land surface. Date _____

Artesian pressure _____ kPa___ PSI___ Date _____

(11) WATER BEARING ZONES:

Depth at which water was first found _____

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:

Ground Elevation _____

Material	From	To	SWL

Date started _____ Completed _____

Person or Organization responsible for well's construction:

Name:_____

Address_____

Phone #_____ E-mail_____

S.J. Schneider - 2012

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

DOCUMENTATION SUBMISSION

- Logs (reports) must be a requirement
  - By whoever is funding the project
    - Final payment (retainage) pending submission and approval of completeness and acceptable accuracy.
  - By rule of law
    - Enforced by civil penalty and/or license revocation or suspension - $ rules
- Storage and retrieval for all, especially:
  - Drillers
  - Hydrogeologists, geologists, scientists & engineers
  - Regulators / government

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

BENEFITS (Prompted by BIG Q)

- **Shouldn't a well be constructed asap, even if resources aren't available to properly build it, in order to get some immediate result - e.g. lives saved?**

or…

- Won't more lives be compromised as a result of inferior construction? *Safety & Sustainability will be compromised.*
  - Adds to 1.8B with fecal contaminated source.
  - Safety incident on your watch; how will you cope?

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

ADD'L RISKS / THOUGHTS re: BIG Q

- Inferior wells require decommissioning or repair at some time in future:
  - $$$ to properly decommission / repair
  - Safety (open boreholes)
- Contamination from GW creates negative perception of the GW resource
  - One chance to make first impression
- Long term aquifer damage
  - GW becomes a problem, not a solution
- Short term solutions are available
  - e.g. ceramic pots, bio-sand filters, etc.

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

COST-BENEFIT ANALYSIS (CBA) Revelations

- Almost 40x more benefit than cost

  If properly constructed, operated, maintained
- ~5X increase in net value with O&M
- Unacceptable: Building wells that will likely produce localized poor water quality – negative NPV (B:C ratio <1)
- 3x-infinity increase in NPV for Proper well v Inferior well

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

CBA Presumption

(i.e. not specifically analyzed)

UNACCEPTABLE: Well that results in GW contamination or aquifer damage:

- Surface water leaking in
- Commingling
- Uncontrolled artesian

NEGATIVE IMPACTS:

- Reduced large-scale benefits
- Added cost of remediation / mitigation

Such impacts will certainly result in a negative NPV

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

MAKING AN IMPACT

Estimates for Education & Training (since 2011)

Individuals incorporating all/part of proper well construction, or teaching it to others >100

Wells impacted >10,000

Individuals impacted (initially) >2,500,000

Add'l individuals impacted >5,000,000

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

SAND TANK MODEL (groundwater flow model)

- Very small scale simulator
- Education & training
- Customizable
- Transportable
- An ‘eye-opener’

BEGIN WITH END IN MIND

- FIB free drinking water wells
- Locate, locate, locate
- Document, document, document
- “If we don’t take care of the groundwater, the groundwater won’t take care of us” S^3

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES

WATER is LIFE
but it can be
LIFE THREATENING

build ASSETS
not LIABILITIES

national ground water research and educational foundation

Safe & Sustainable Wells Institute

SCHNEIDER WATER SERVICES