
https://www.geoproberentals.com


https://www.geoproberentals.com

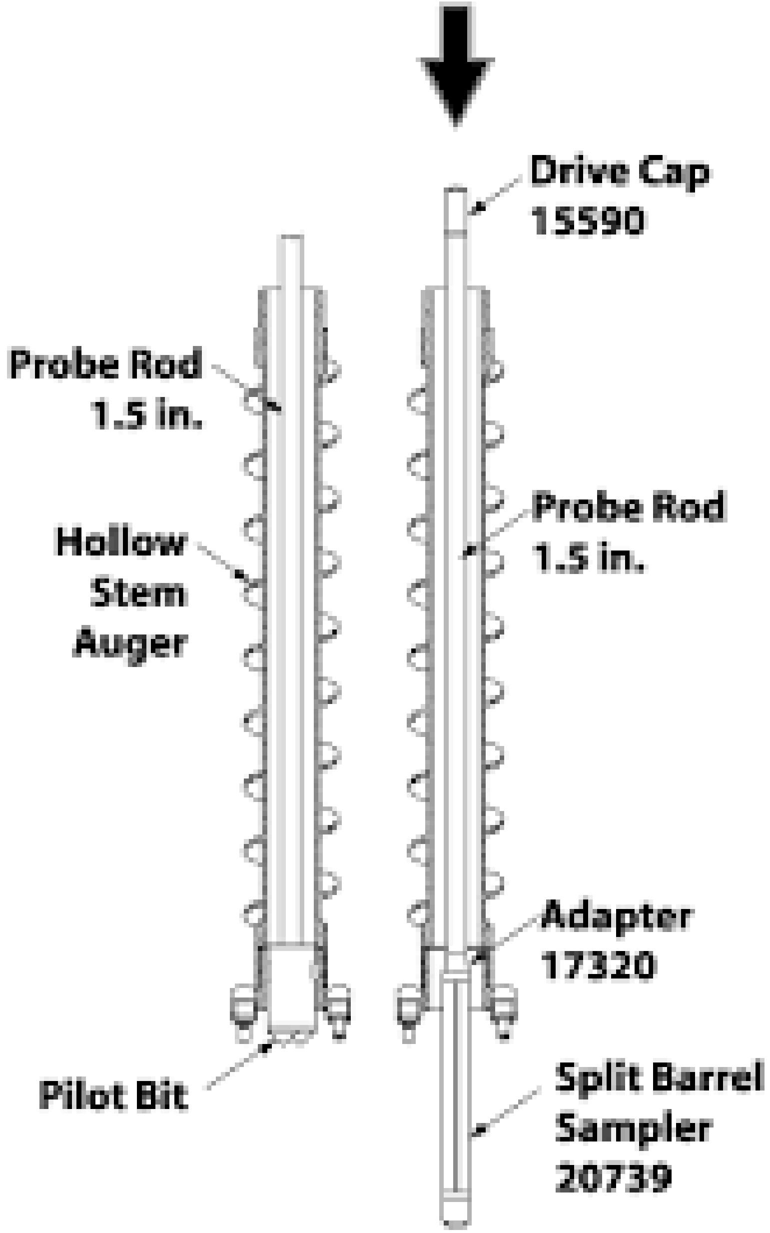

Geoprobe Systems


geoprobe.com
https://www.rigsourceinc.com

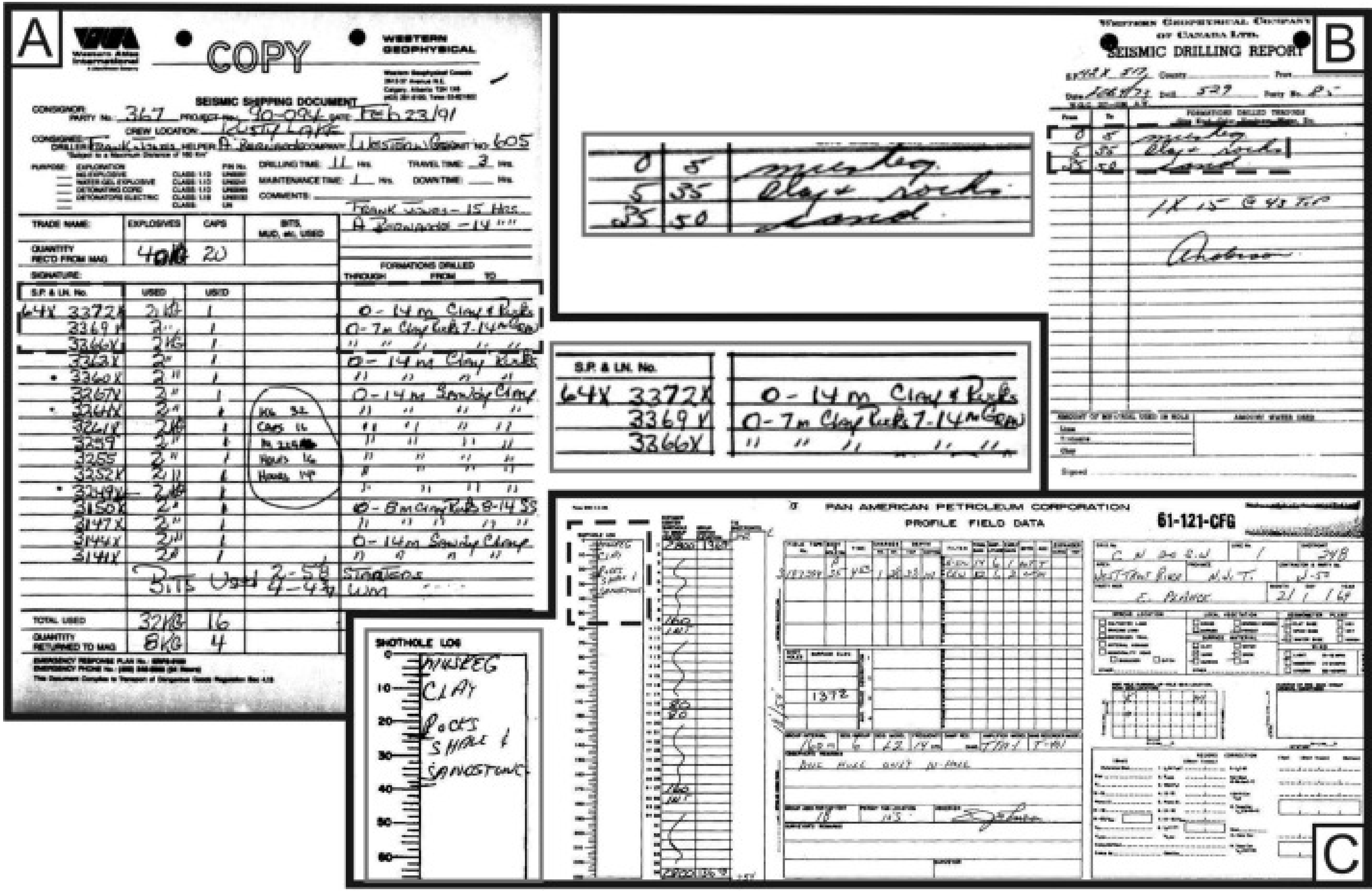
Hollow stem auger

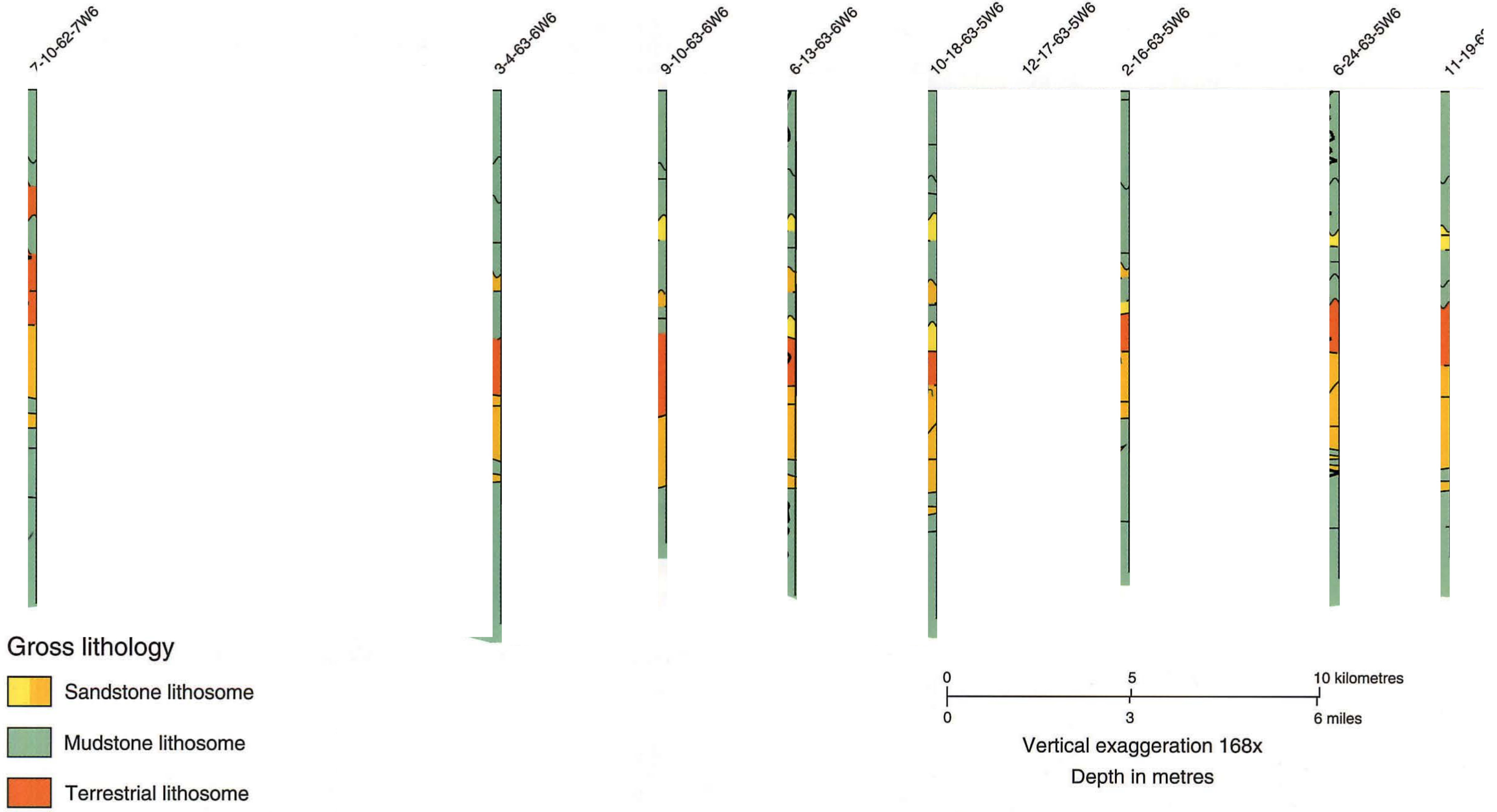
Split spoon sampler


09/16/2009 10:32

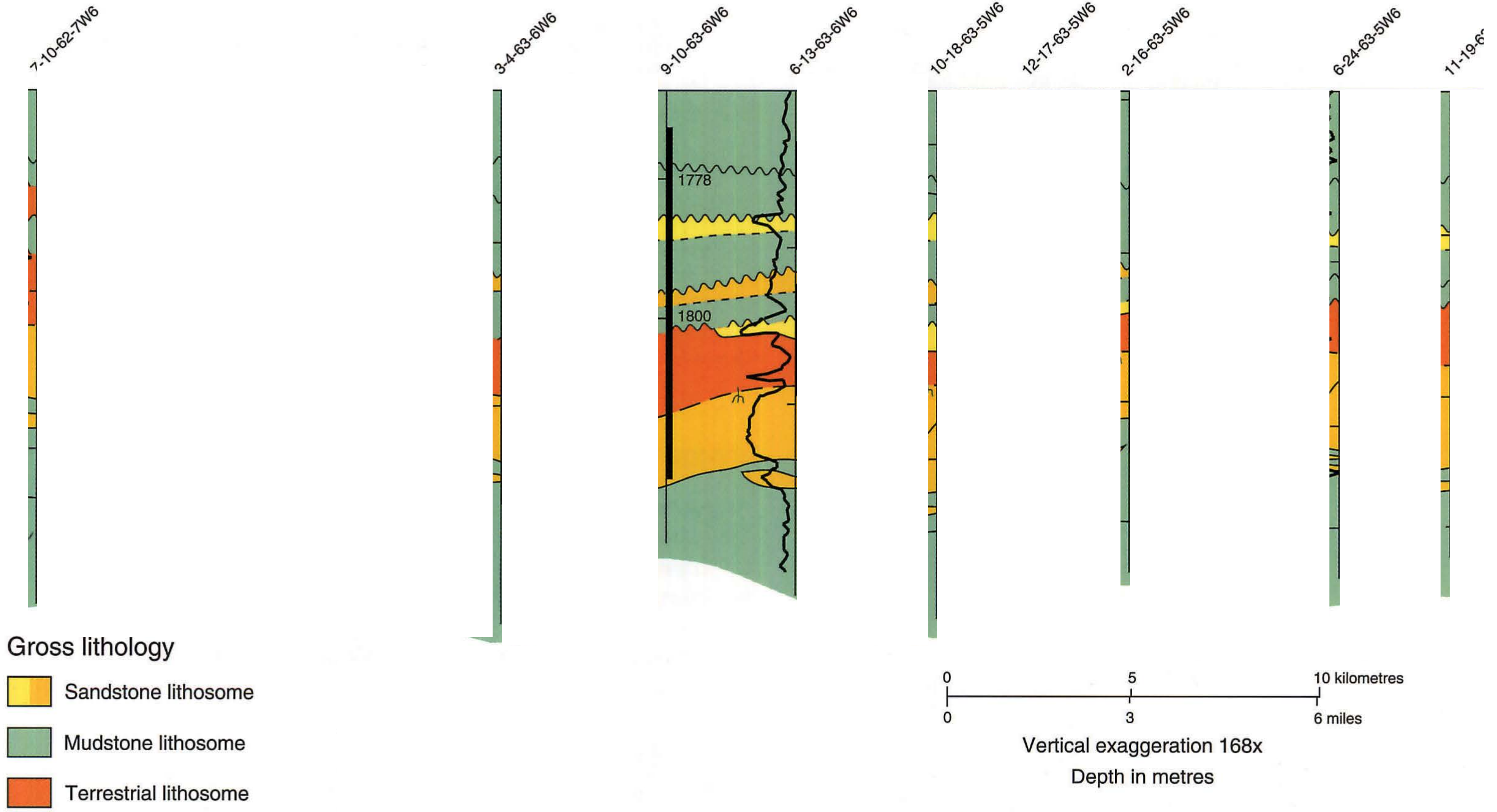

Drive Cap
15590
Probe Rod
1.5 in.
Probe Rod
1.5 in.
Hollow
Stem
Auger
Adapter
17320
Pilot Bit
Split Barrel
Sampler
20739

Driller's logs

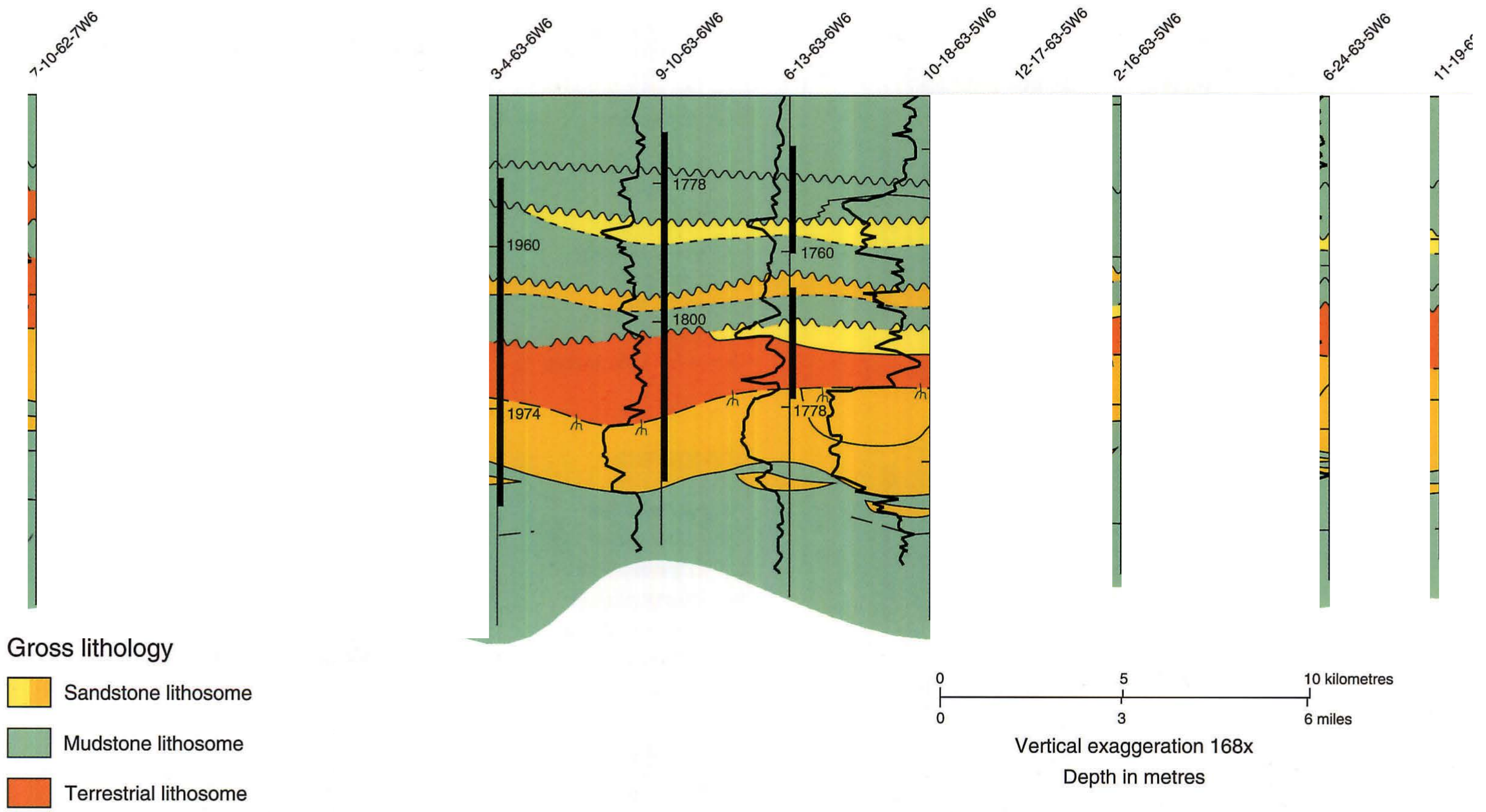


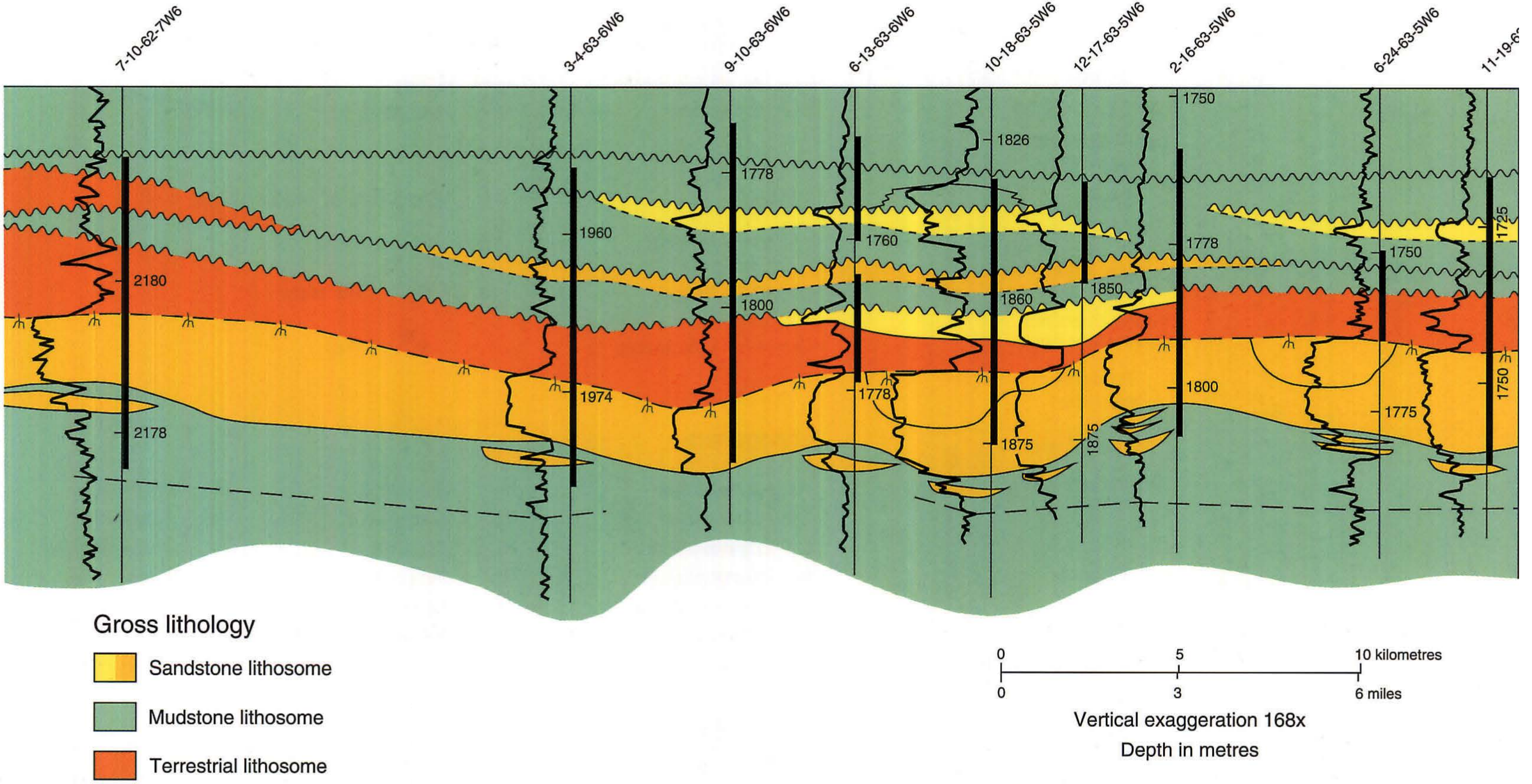


7-10-62-7W6
3-4-63-6W6
9-10-63-6W6
6-13-63-6W6
10-18-63-5W6
12-17-63-5W6
2-16-63-5W6
6-24-63-5W6
Gross lithology
Sandstone lithosome
Mudstone lithosome
Terrestrial lithosome
0
5
10 kilometres
0
3
6 miles
Vertical exaggeration 168x
Depth in metres



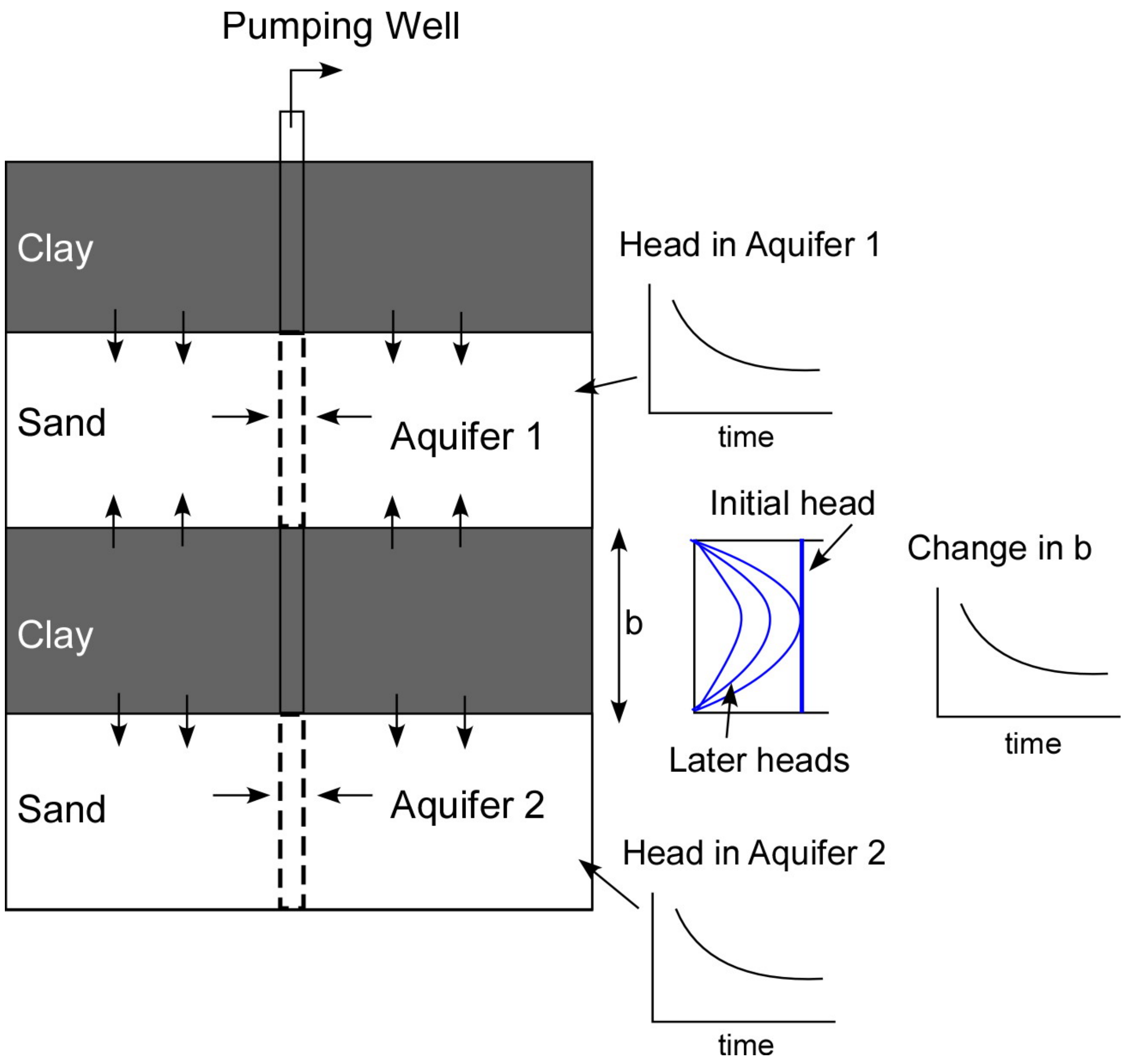
7-10-62-7W6
3-4-63-6W6
9-10-63-6W6
6-13-63-6W6
10-18-63-5W6
12-17-63-5W6
2-16-63-5W6
6-24-63-5W6
1778
1800
Gross lithology
Sandstone lithosome
Mudstone lithosome
Terrestrial lithosome
0
5
10 kilometres
0
3
6 miles
Vertical exaggeration 168x
Depth in metres


7-10-62-7W6
3-4-63-6W6
9-10-63-6W6
6-13-63-6W6
10-18-63-5W6
12-17-63-5W6
2-16-63-5W6
6-24-63-5W6
1778
1960
1760
1800
1974
1778
Gross lithology
Sandstone lithosome
Mudstone lithosome
Terrestrial lithosome
0
5
10 kilometres
0
3
6 miles
Vertical exaggeration 168x
Depth in metres



7-10-62-7W6
3-4-63-6W6
9-10-63-6W6
6-13-63-6W6
10-18-63-5W6
12-17-63-5W6
2-16-63-5W6
6-24-63-5W6
2180
2178
1960
1974
1778
1800
1760
1778
1826
1860
1875
1850
1875
1750
1778
1800
1750
1775
1725
1750
Gross lithology
Sandstone lithosome
Mudstone lithosome
Terrestrial lithosome
0
5
10 kilometres
0
3
6 miles
Vertical exaggeration 168x
Depth in metres

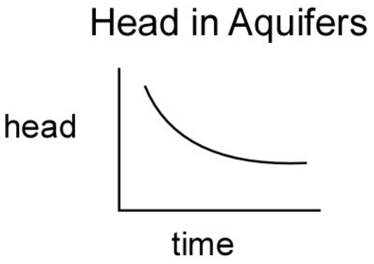
Basics of Land Subsidence:

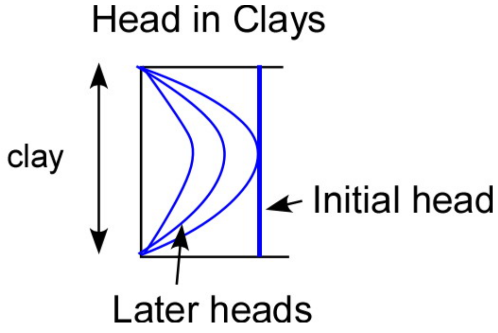


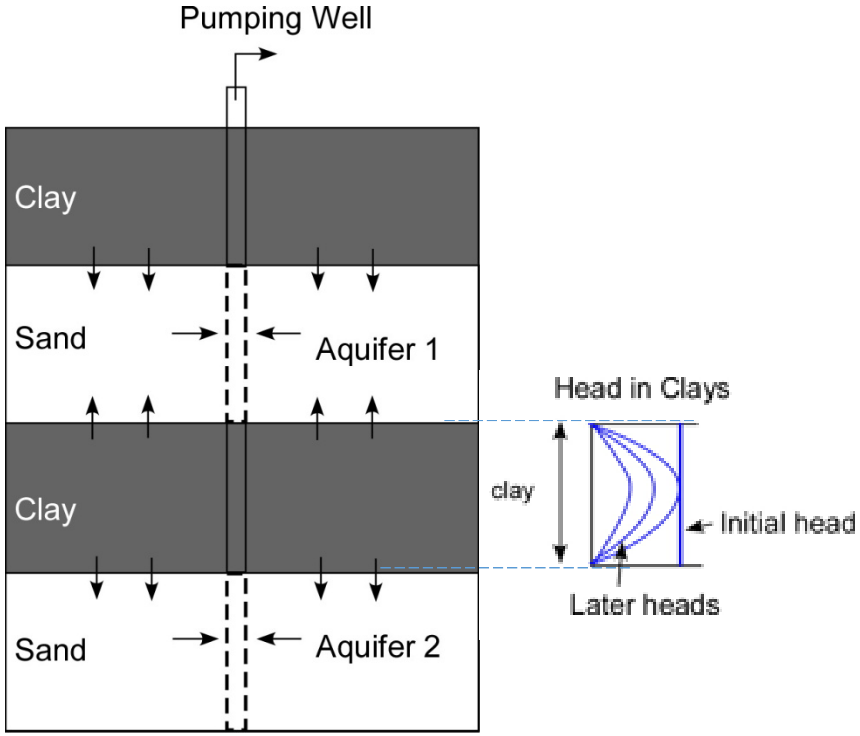
- Wells are screened in sand aquifers, extracting water lowers the heads in the sand
- Compressibility of clay is 1-2 orders of magnitude greater than that of sand. For a clay, $\alpha \gg \eta\beta$
- K is much lower for clay than for sand, so drainage and compaction are much slower for confining units than for aquifers.
- Aquifer drainage leads to compaction of aquitards.

Basics of Land Subsidence:

When pumping occurs, there is a decrease in pressure in both the aquifer and the clay beds. The increase in effective stress acting on the clay can cause it to compact.







In our example, the water produced IS the volume released from aquifer and clay compaction (ignoring water expansion). If all water comes completely from compression of the clay, the change in thickness of the system is related to our change in storage term (storativity):

$$S_S = \underbrace{\rho g \alpha}_{\text{Aquifer Compaction}} + \cancel{\underbrace{\rho g \beta \eta}_{\text{Expansion of Water}}}$$

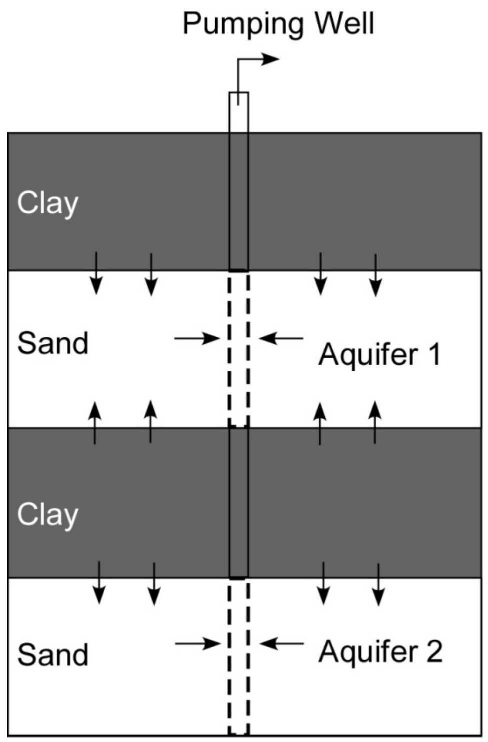
$$\Delta b = b \rho g \alpha \Delta h$$

Actually a function of time

Basics of Land Subsidence:

Clay thickness = 30m
Clay compressibility = 10^{-7} $m^2 s^2$/kg m
Water density = 1000 kg/m^3
Gravitational constant = 9.81 m/s^2
Drawdown (reduction in head) in aquifer = 2m

$$\Delta b = b\rho g\alpha\Delta h$$

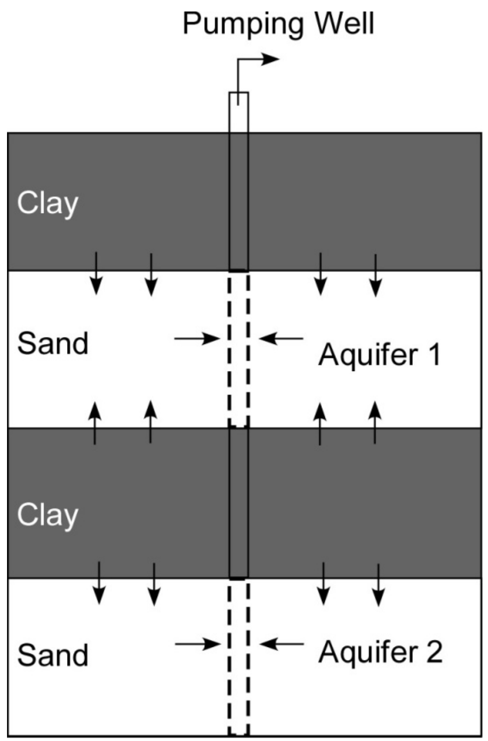


Basics of Land Subsidence:

Clay thickness = 30m
Clay compressibility = 10^{-7} $m^2 s^2/kg\ m$
Water density = 1000 kg/m^3
Gravitational constant = 9.81 m/s^2
Drawdown (reduction in head) in aquifer = 2m

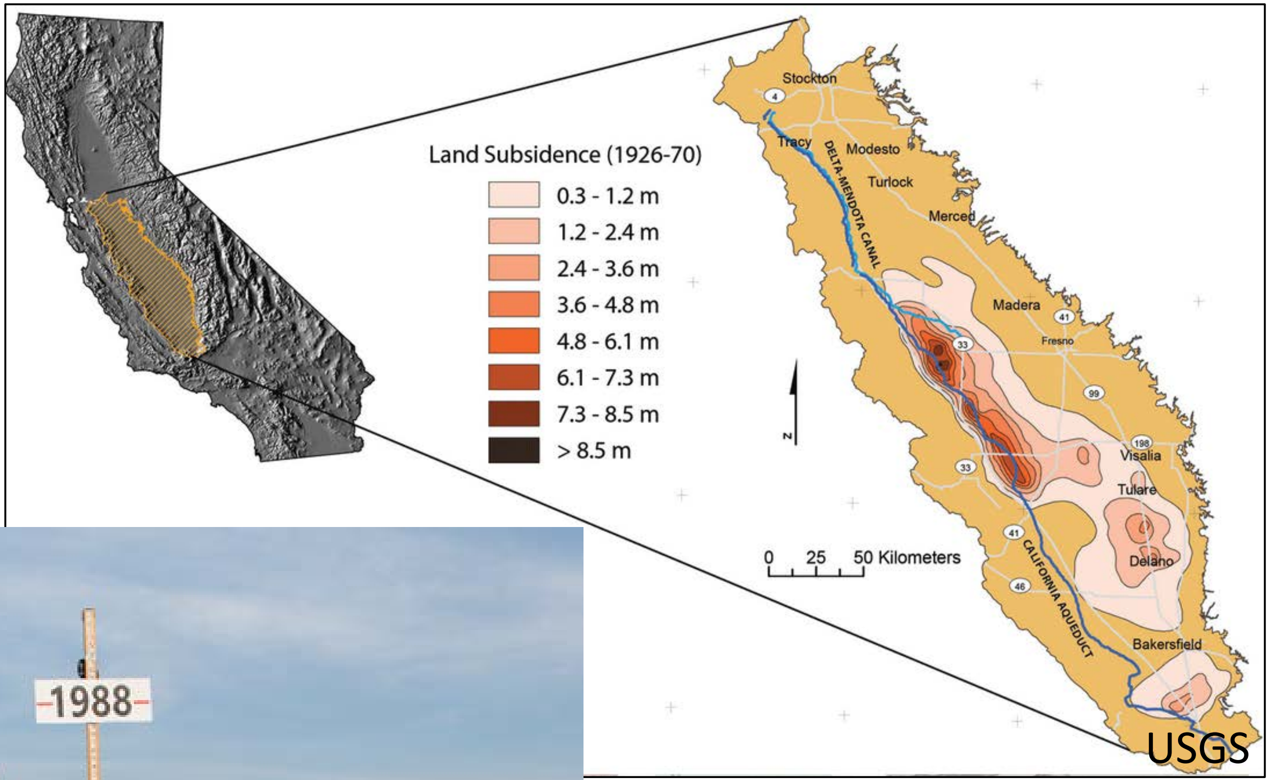
$$\Delta b = b \rho g \alpha \Delta h$$

Subsidence = (30)(1000)(9.81)(10^{-7})(2) = 0.059 m




1925
1955
SAN JOAQUIN VALLEY
CALIFORNIA
BM S661
SUBSIDENCE 9M
1925-1977
1977
USGS


1988
SAN JOAQUIN VALLEY, CA
SUBSIDENCE 6.2 ft
1988-2016
Benchmark
H1235
USGS
2004
2008
H 1235
2016
USGS


Land Subsidence (1926-70)
0.3 - 1.2 m
1.2 - 2.4 m
2.4 - 3.6 m
3.6 - 4.8 m
4.8 - 6.1 m
6.1 - 7.3 m
7.3 - 8.5 m
> 8.5 m
Stockton
Tracy
Modesto
Turlock
Merced
DELTA-MENDOTA CANAL
Madera
Fresno
Visalia
Tulare
Delano
Bakersfield
CALIFORNIA AQUEDUCT
0 25 50 Kilometers
N
USGS