



TECHNICAL UNIVERSITY OF LIBEREC
Faculty of Mechatronics, Informatics
and Interdisciplinary Studies ■

Business Intelligence and Geographic Information System for Hydrogeology

Kamil Nešetřil, Jan Šembera

Proceedings: pp 344–352



IN

PROFIL VRTU

Obec:	Tachovská	Data provedení:	12.53	Ev. zn.:	Tsh 2
Souřadnice x:	977 504,030	Podrobná mapa:	Číslo mapy:	Číslo:	
Učel:	Průzkum dolovního pole dolu 5 květen	Topografická mapa:			
Způsob vrt:	ruční	Vrtanář:	Jedlička	Zaměřil:	Dvořák
Typ soupravy:	M-1	Vzorák:	Průřevák	Vrták:	Vátek Jan

Pos. čis.	Měčnost [m]	Popis kóru a stratigraficko - tektonických horizontů	Číslova hloubka	Nápis, v. B. p. v. č. 219,301
1.	0,50	Omice	0,50	svrasy
2.	7,00	Hlína - tvavé ledi, písčito-řivová	7,50	
3.	4,50	Jíl - tvavé ledi, slabé slidany, slabé písčiny, písčinky	12,00	podzemní voda
4.	3,80	Jíl - tvavé ledi, slabé slidany, slabé písčiny, s úlohy vyústění slabé dře	15,80	
5.	1,70	Jíl - tvavé ledi, slabé slidany, rozpad břidlicový	17,50	
6.	3,30	Uhlí	20,80	hraněnáhl. uhlí
7.	2,60	Uhlí - se slabou příměsí jílu	23,40	
8.	7,10	Jíl - tvavé ledi, slabé slidany, silně jemné písčiny	30,50	podzemní voda

Číslo	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu	Číslo vrtu
1	1301	1302	1303	1304	1305	1306	1307	1308	1309
2	1310	1311	1312	1313	1314	1315	1316	1317	1318
3	1319	1320	1321	1322	1323	1324	1325	1326	1327
4	1328	1329	1330	1331	1332	1333	1334	1335	1336
5	1337	1338	1339	1340	1341	1342	1343	1344	1345
6	1346	1347	1348	1349	1350	1351	1352	1353	1354
7	1355	1356	1357	1358	1359	1360	1361	1362	1363
8	1364	1365	1366	1367	1368	1369	1370	1371	1372
9	1373	1374	1375	1376	1377	1378	1379	1380	1381
10	1382	1383	1384	1385	1386	1387	1388	1389	1390
11	1391	1392	1393	1394	1395	1396	1397	1398	1399
12	1400	1401	1402	1403	1404	1405	1406	1407	1408
13	1409	1410	1411	1412	1413	1414	1415	1416	1417
14	1418	1419	1420	1421	1422	1423	1424	1425	1426
15	1427	1428	1429	1430	1431	1432	1433	1434	1435
16	1436	1437	1438	1439	1440	1441	1442	1443	1444
17	1445	1446	1447	1448	1449	1450	1451	1452	1453
18	1454	1455	1456	1457	1458	1459	1460	1461	1462
19	1463	1464	1465	1466	1467	1468	1469	1470	1471
20	1472	1473	1474	1475	1476	1477	1478	1479	1480
21	1481	1482	1483	1484	1485	1486	1487	1488	1489
22	1490	1491	1492	1493	1494	1495	1496	1497	1498
23	1499	1500	1501	1502	1503	1504	1505	1506	1507
24	1508	1509	1510	1511	1512	1513	1514	1515	1516
25	1517	1518	1519	1520	1521	1522	1523	1524	1525
26	1526	1527	1528	1529	1530	1531	1532	1533	1534
27	1535	1536	1537	1538	1539	1540	1541	1542	1543
28	1544	1545	1546	1547	1548	1549	1550	1551	1552
29	1553	1554	1555	1556	1557	1558	1559	1560	1561
30	1562	1563	1564	1565	1566	1567	1568	1569	1570
31	1571	1572	1573	1574	1575	1576	1577	1578	1579
32	1580	1581	1582	1583	1584	1585	1586	1587	1588
33	1589	1590	1591	1592	1593	1594	1595	1596	1597
34	1598	1599	1600	1601	1602	1603	1604	1605	1606
35	1607	1608	1609	1610	1611	1612	1613	1614	1615
36	1616	1617	1618	1619	1620	1621	1622	1623	1624
37	1625	1626	1627	1628	1629	1630	1631	1632	1633
38	1634	1635	1636	1637	1638	1639	1640	1641	1642
39	1643	1644	1645	1646	1647	1648	1649	1650	1651
40	1652	1653	1654	1655	1656	1657	1658	1659	1660
41	1661	1662	1663	1664	1665	1666	1667	1668	1669
42	1670	1671	1672	1673	1674	1675	1676	1677	1678
43	1679	1680	1681	1682	1683	1684	1685	1686	1687
44	1688	1689	1690	1691	1692	1693	1694	1695	1696
45	1697	1698	1699	1700	1701	1702	1703	1704	1705
46	1706	1707	1708	1709	1710	1711	1712	1713	1714
47	1715	1716	1717	1718	1719	1720	1721	1722	1723
48	1724	1725	1726	1727	1728	1729	1730	1731	1732
49	1733	1734	1735	1736	1737	1738	1739	1740	1741
50	1742	1743	1744	1745	1746	1747	1748	1749	1750



AZ Monitoring s.r.o.
 J. Hery 1215
 434 01 Most
 Czech Rep.

GL02LI NP 7.24.02 9/91
 Datum: 27.03.12
 Strana: 1

DEFORMACE (součtové)

Název akce : IMS1
 Měřicí místo : 0
 Císlo měření : 90
 Srovnání s : 0

Datum měření : 09.03.2012
 Dáv od 1 měření : 0946
 Délka sondy : 5 m
 Max. hloubka : 72 m
 Těsný led : D01C

Označení : 001 0010 0010
 Zpracovatel : SIA/jchrt
 Poznámky : 10-10

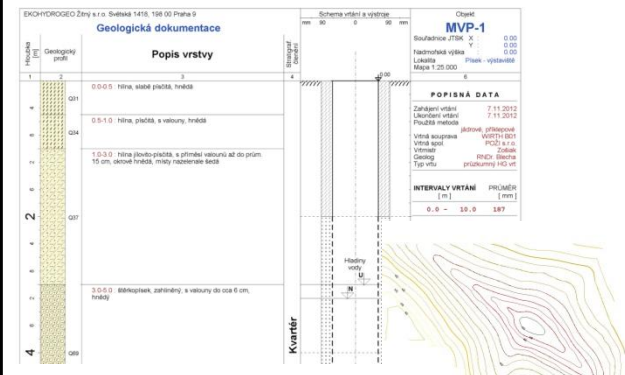
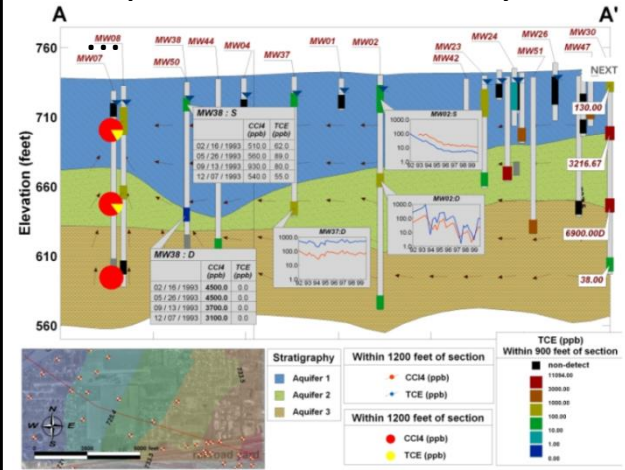
DELTA H : 0 cm
 DELTA A : 0 cm
 DELTA B : 0 cm
 COK : 0 cm
 Oprava KPT : 0 m

Simus-Faktor X : 1
 Konstanta A : 0 1/10 mm/m
 Konstanta B : 0 1/10 mm/m
 Uhel 0 > 0 : 0 °

C.	DELTA	DEFORMACE (součtové)	Měření	PRETORANNA -
< m >	A' (cm)	SUM A' (cm)	B' (cm)	RYCHLOST (cm/d)
0	0.00	0.00	1.29	5.19
1	0.58	0.37	0.92	4.66
2	1.00	0.37	0.54	4.13
3	1.50	-0.57	1.11	3.21
4	2.00	-0.11	1.24	0.32
5	2.50	0.10	1.14	-0.15

OUT

tables, graphs, maps, cross-sections, profiles, reports, models, analyses



Existing Environmental Data Management Software

- EQulS from EarthSoft (earthsoft.com),
- WISKI (kisters.net)
- SiteFX from EarthFX (earthfx.com),
- GW-Base from ribeka (ribeka.com),
- EnviroData from Geotech Computer Systems,
- ESdat (esdat.net)
- Oasis-montaj from GeoSoft (geosoft.com),
- HydroManager from Schlumberger Water Services (swstechnology.com)
and 7 more



HgIS

www.dataearth.cz

Input

 LIMS

 Geofond

 gdBase

 tables

 Geobanka

 inclinometry

 dataloggers ...

Information system



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Output

  tables, graphs

    borehole profiles

  geological cross-sections

 GIS  maps

(all on the web or by e-mail)

Data flows

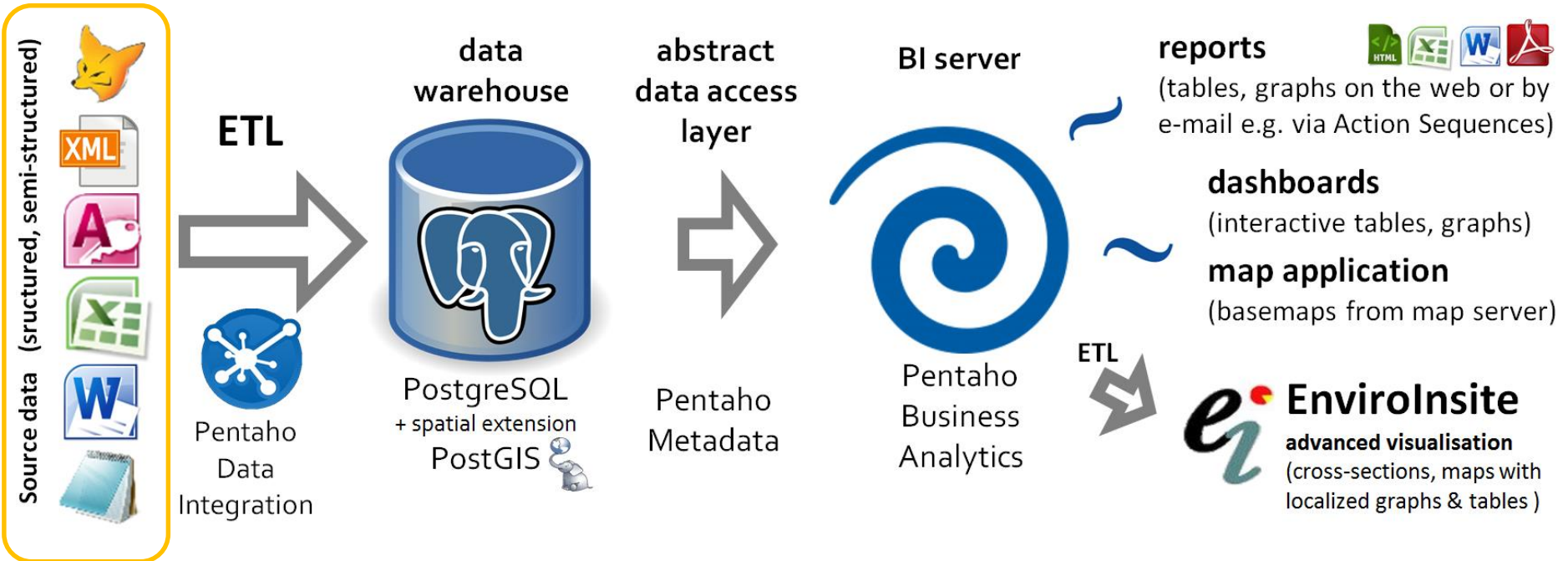
data sorted from structured to unstructured

BI
GIS

Data source	→	Storage	→	Usage	Content	
Structured and semi-structured data – observations (databases, files)		Data warehouse		Reporting, visualization incl. geological profiles and cross sections, export	Data	
Spatial interpretation of data, other geodata		Standard-based storage		Maps, GIS		
Documents		Stored with metadata		Ad hoc		Know-ledge
Other files		Storage, accessibility				



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- Analyses from LIMS Labsystém
(provided as 2 xBase files),



- Boreholes and groundwater chemism from Czech Geological Survey (provided as MS Access files and XML files in eEarth format),

- Exploratory boreholes



(provided as MS Word documents created by a software from Data-PC Sokolov),

- Flat files with precipitation and temperature served via FTP
from a watershed authority (Povodí Ohře s. p.)



- Original database format of EnviroInsite (MS Access, MS Excel),

- General cross-table (MS Excel) and



- Formats from some other data vendors (groundwater pumping, river discharges etc.)



Source data: MS Word

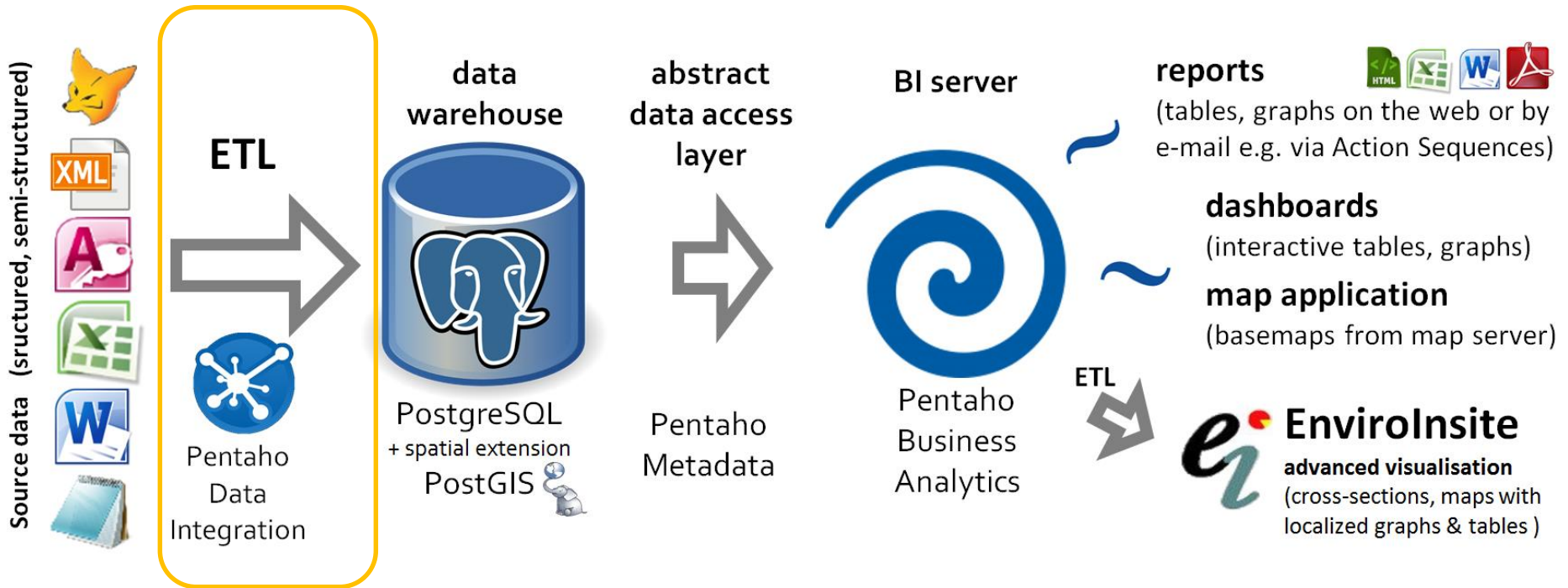


DATA-PC Sokolov © 1999

PROFIL VRTU		SCE55 /G3	
<i>Obec:</i> Střimice		<i>Datum provedení:</i> 29.9. - 4.10.1984	
<i>Adresa:</i> 24989		<i>Katastr:</i> 482	
<i>Souřadnice: x</i>	986 246.79	<i>N.výška</i>	236.91 m n.m.
<i>y</i>	789 212.79	<i>B.p.v.:</i>	482
<i>Úkol:</i> Geotechnický průzkum Bedřich 1984			
<i>Provádějící organizace:</i>		<i>Mapa SMO 1 : 5000</i> Most 5 - 3	
<i>Způsob vrtání:</i> rotačně jádrový	<i>Vrtmistr:</i> Blecha M.	<i>Zaměřil:</i> OMG DLM	
<i>Typ soupravy:</i> SKB 60	<i>Vzorkař:</i> Zlochová V.	<i>Profiloval:</i> Ing. Kružík Fr.	

<i>Poř. číslo</i>	<i>Mocnost v m</i>	<i>Popis hornin a stratigraficko - tektonických horizontů</i>	<i>Celková hloubka v m</i>	<i>Nadm. výška v m</i>
1.	0.50	hlína jílovitá s úlomky uhlí a příměsí uhelného mouru	0.50	236.41
2.	0.50	jíl tmavě šedohnědý až černý, s příměsí uhelného mouru	1.00	235.91
3.	1.00	jíl hnědošedý, slabě písčitý, s úlomky zuhelnatělé rostlinné drtě	2.00	234.91
4.	2.00	jíl písčitý, světle hnědý, s úlomky pelokarbonátu do ø 200 mm	4.00	232.91
5.	3.50	jíl tmavě šedohnědý, s úlomky zuhelnatělé rostlinné drtě až s uhelnou příměsí a s úlomky pelokarbonátu do ø 200 mm	7.50	229.41

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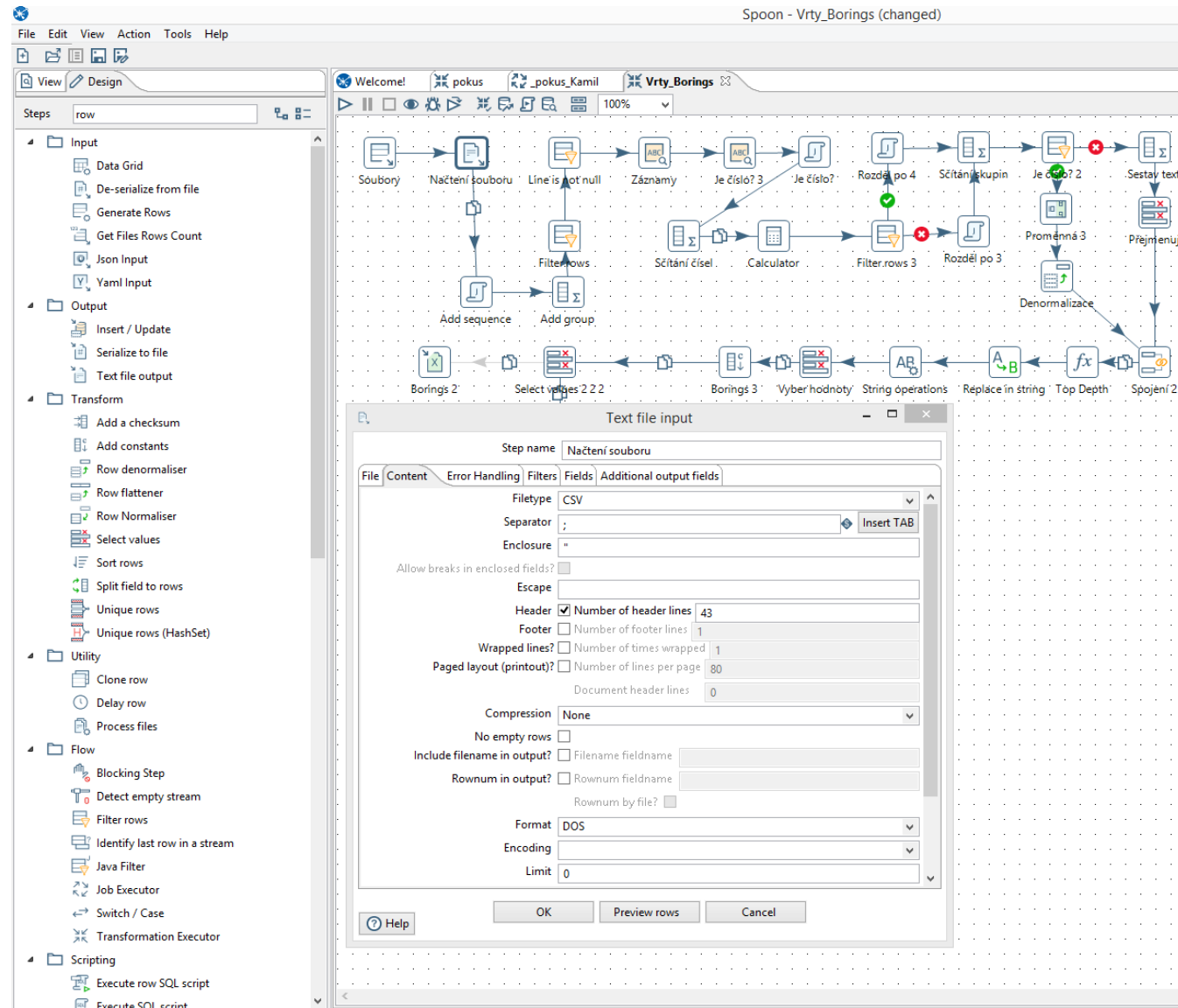


ETL
Extract
Transform
Load

Kettle
aka.



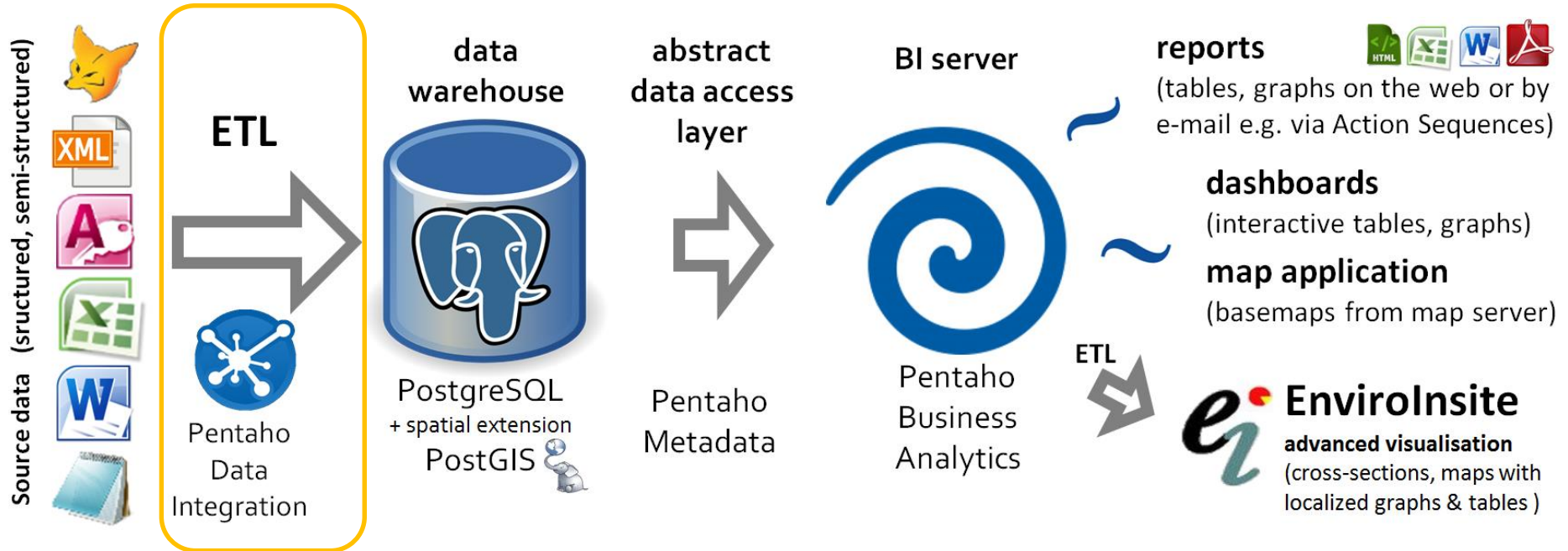
community.pentaho.com



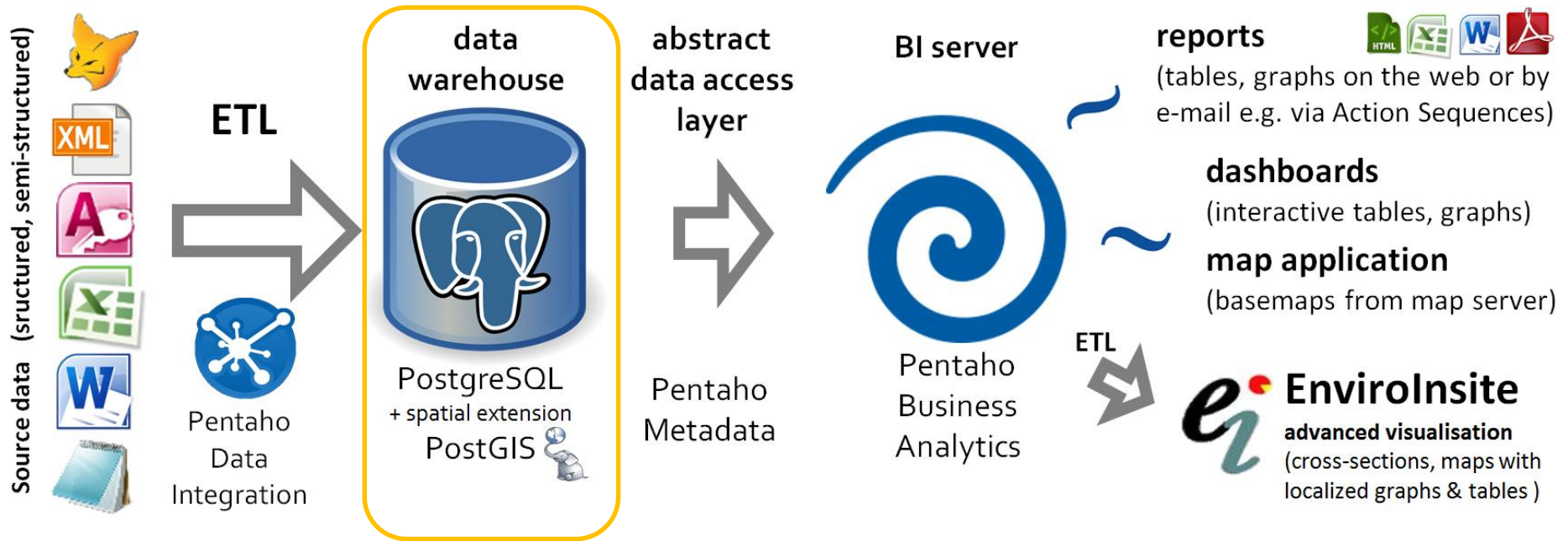
The screenshot displays the Pentaho Kettle Spoon interface for a workflow named 'Vrty_Borings (changed)'. The workflow consists of several steps connected by arrows, including 'Soubory', 'Načtení souboru', 'Line is not null', 'Záznamy', 'Je číslo? 3', 'Je číslo?', 'Rozdělení po 4', 'Sčítání skupin', 'Je číslo? 2', 'Sestava text', 'Filter rows', 'Sčítání čísel', 'Calculator', 'Filter rows 3', 'Rozdělení po 3', 'Proměnná 3', 'Přejmenování', 'Denormalizace', 'Borings 2', 'Select values 2 2 2', 'Borings 3', 'Vyber hodnoty', 'String operations', 'Replace in string', 'Top Depth', and 'Spojení 2'. A 'Text file input' dialog box is open in the foreground, showing the configuration for the 'Načtení souboru' step. The dialog includes tabs for 'File', 'Content', 'Error Handling', 'Filters', 'Fields', and 'Additional output fields'. The 'Content' tab is active, showing settings for Filetype (CSV), Separator (;), Enclosure ("), Header (Number of header lines: 43), Footer (Number of footer lines: 1), Wrapped lines (Number of times wrapped: 1), Paged layout (Number of lines per page: 80), Compression (None), No empty rows, Include filename in output?, Rownum in output?, Format (DOS), Encoding, and Limit (0). Buttons for 'Help', 'OK', 'Preview rows', and 'Cancel' are visible at the bottom of the dialog.



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Data in the database

- observation objects
(wells, boreholes, sampling points with coordinates and detailed description),
- characterization of geological layers
(description of boring logs and its interpretation – stratigraphy),
- technical construction of wells *(casing, screen and fill of annular space),*
- definition of observed quantities *(units, chemical formulae etc.),*
- standards *(action levels, regulatory limits),*
- definition of vertical intervals *(well screen or sample interval in boring log),*
- measurements tied to vertical intervals
(e.g. chemical analyses or head measurements),
- measurements tied to specific depth *(e.g. geophysical logging),*
- samples *(metadata about measurements and sets of measurements – sampling methods, conditions, etc.),*
- anti-aliasing *(e.g. a quantity has different names in different data sources),*
- conversion of units *(e.g. mg to g)* and quantities *(e.g. nitrate to nitrogen),*
- time intervals, lookup tables etc.

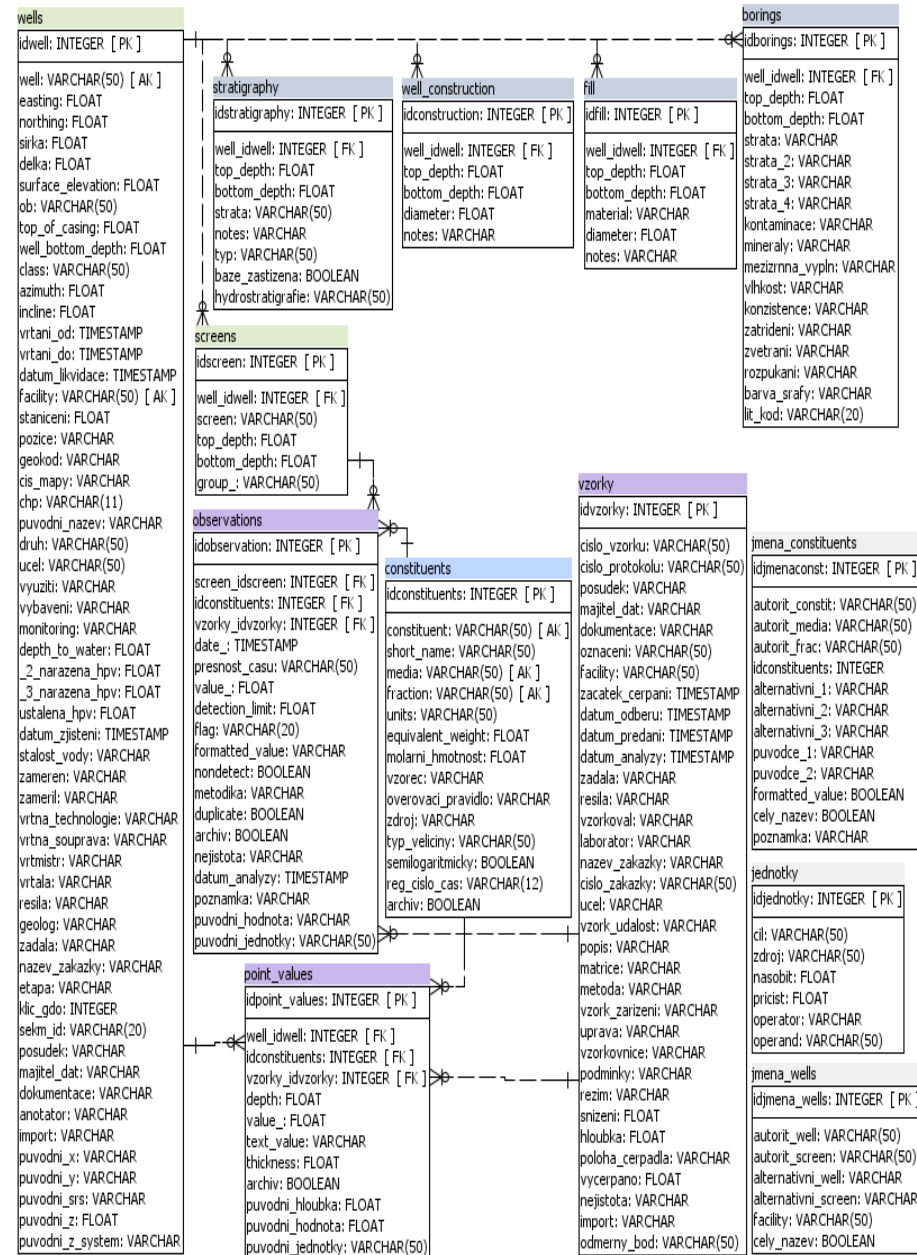
DWH/OLAP in star/snowflake schema

Facts

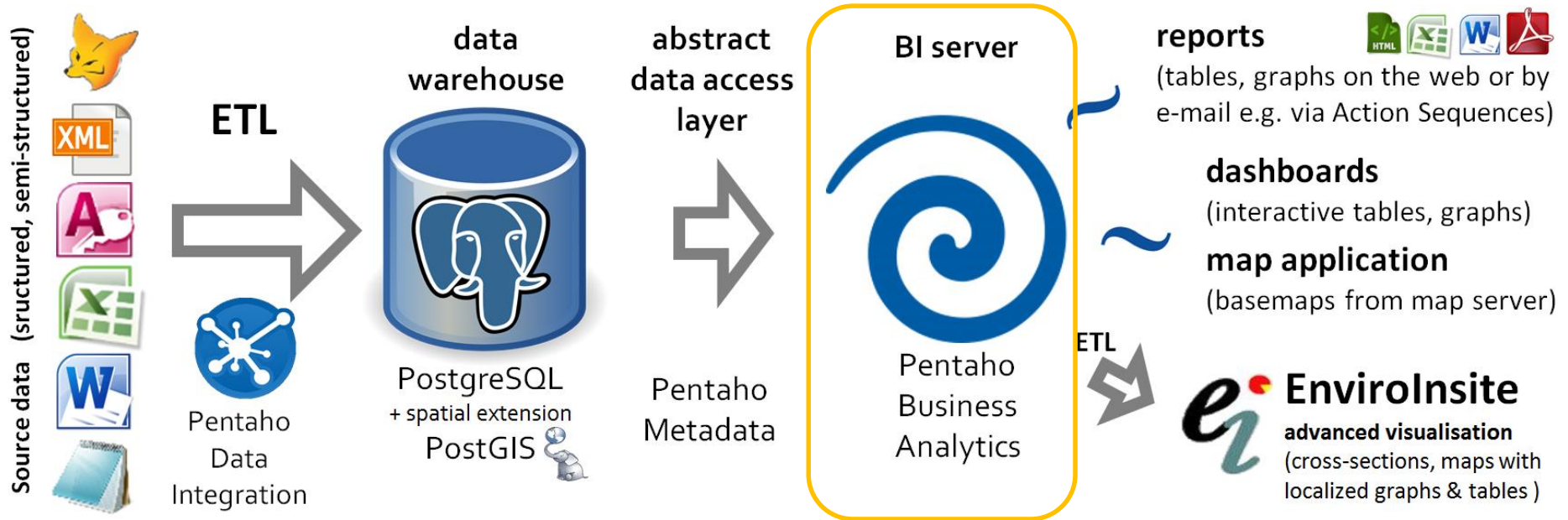
- Measured values (time series)

Dimensions

- Spatial (normalized: observation objects → depth intervals)
- Temporal (degenerated dimension: timestamp)
- Quantities
iron – in water – filtered
precipitation – monthly – maximum
etc.



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 - [ZAVOD k nacteni](#)
 - [ZAVOD nacteno](#)
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Files

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- [Eutrofizace excel](#)
- [Profil vrtu](#)
- [Průběh veličin](#)
- [Redox procesy](#)

File Actions

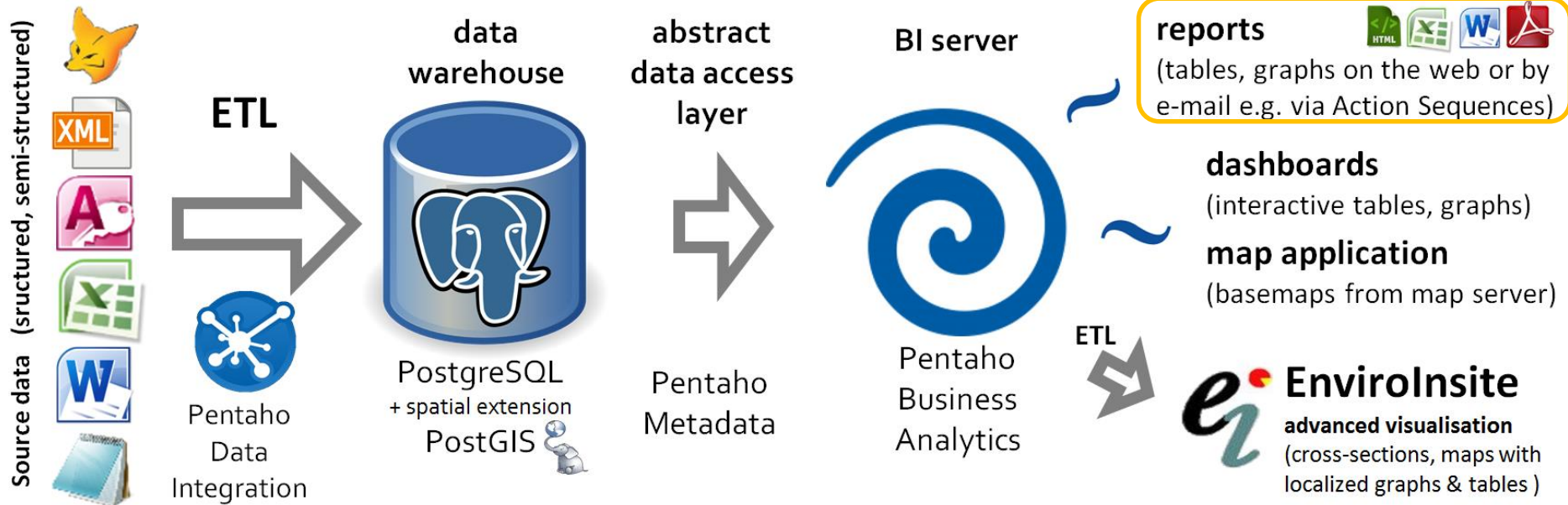
- [Open](#)
- [Open in a new window](#)
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pentaho reporting

Pentaho Report Designer - Vrty - CAD1_Uni\MAREKrejch\2014-09-03\Vrty.rpt

File Edit View Insert Format Data Extras Window Help

125%

Report Header

PROFIL VRTU well

Group Header

Obec: geokod	Datum provedení: vrtani_od	Adresa:
Souřadnice x: northing Souřadnice y: easting	Nadmořská výška v m. n. m. surface_elevation	Katastr:
Úkol: nazev_zakazky	Provádějící organizace:	Mapa SMO 1:5000 cis_mapy
Způsob vrtání: vrtna_technologie	Vrtmistr: vrtmistr	Zaměřil: zameril
Typ soupravy: vrtna_souprava	Vzorkař:	Profiloval: geolog

Details Header

Pořadí	Mocnost	Popis hornin a stratigraficko - tektonických horizontů	Celková hloubka v metrech	Nadmořská výška v m. n. m.
text-field	number-f	strata_3	bottom_depth	number-field

Details

Structure Data

- horizontal-line
- Ab label: Souřadnice y:
- ST text-field: well
- Ab label: Provádějící organizace:
- ST number-field: easting
- ST number-field: northing
- ST date-field: vrtani_od
- ST text-field: geokod
- Ab label: PROFIL VRTU
- Ab label: Katastr:
- Ab label: Adresa:
- Ab label: Zaměřil:
- Ab label: Mapa SMO 1:5000
- Ab label: Nadmořská výška v m. n. m.
- Ab label: Datum provedení:
- Ab label: Vrtmistr:
- Ab label: Souřadnice x:
- Ab label: Způsob vrtání:
- Ab label: Úkol:

Style Attributes

Name	Value	Expr
common		
hide-on-canvas	false	
type	group-header	
name		
style-class		
id		
table		
col-span		
row-span		
query-meta...		
data-format		
style-format		
enable-style-bold		
enable-style-italics		
enable-style-und...		
enable-style-stri...		
enable-style-font		
enable-style-fon...		

117.1 of 158.9 MB



Průběh veličin x

< > 1 / 1

Vyber Constituent

Rozpuštěný kyslík ▾

Vyber Media

w ▾

Vyber Fraction

- ▾

Vyber Well

Vyber vše
JCH-4
JCH-5
JM-14
JM-3

Vyber Screen

16 m
18 m
20 m
-

Vyber Class

Vyber vše

Vyber Facility

Vyber vše
jCh

Vyber Facility 2

Vyber vše

Vyber Druh

Vyber vše
jezero

Vyber Ucel

Vyber vše

Datum od

Jan 4, 2010 ▾

Datum do

Aug 29, 2014 ▾

View Report

 Auto-Submit

Průběh veličin

Constituent: Rozpuštěný kyslík

Media: w

Fraction: -

Vybrané Wells: JCH-4

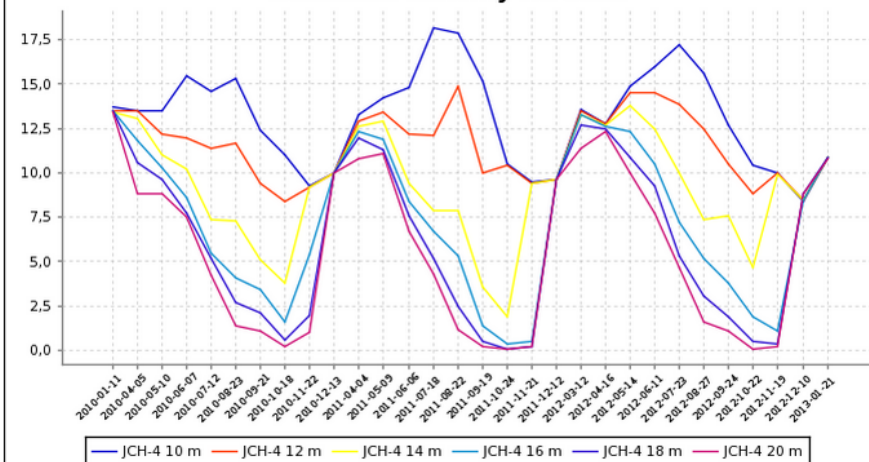
Počet hodnot: 180

Průměr: 8.86

Minimum: 0,1

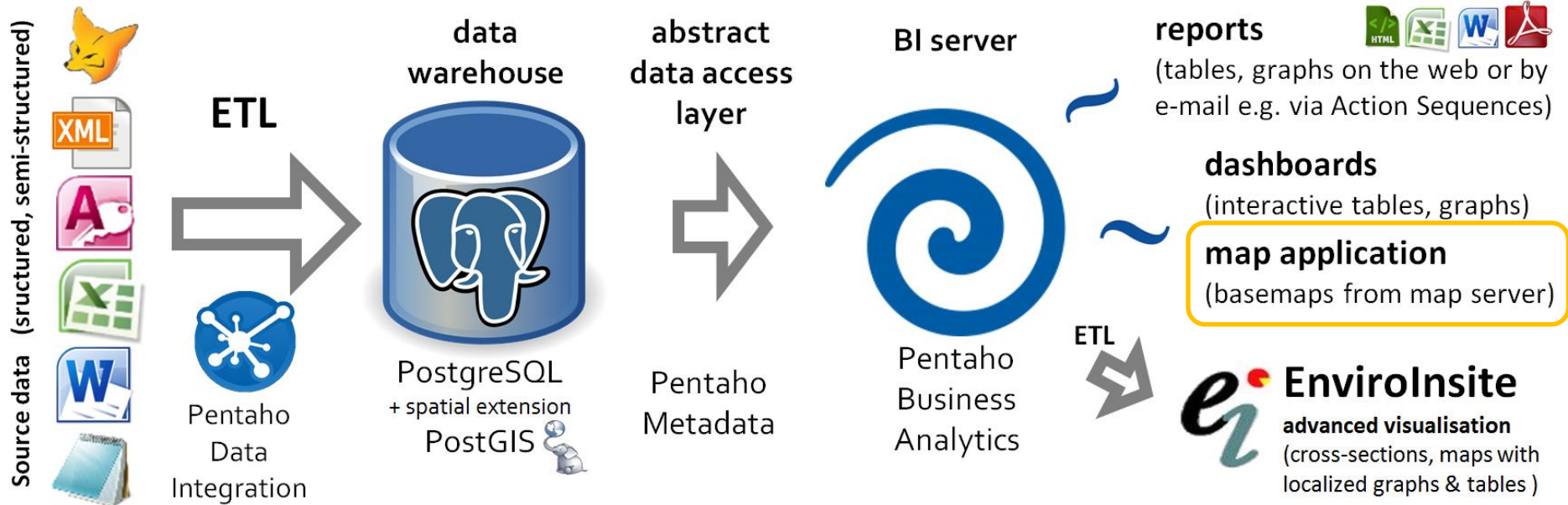
Maximum: 18,2

Závislost veličiny na čase



Hodnota	Well	Screen	Class	Facility	Facility 2	Druh	Účel	Datum
13,7	JCH-4	10 m	-	jCh	-	jezero	-	11.01.2010
13,5	JCH-4	10 m	-	jCh	-	jezero	-	05.04.2010
13,5	JCH-4	10 m	-	jCh	-	jezero	-	10.05.2010

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S-JTSK

WGS 84

Podkladová mapa

- Topografická
- Geomorfologická
- Historická (III. voj. mapování)
- DMÚ 25

Druh objektu

-
- čerpací stanice důlních vod
- chemismus
- geodetický bod
- inklinometrický urt

JCH-4

Název JCH-4

20 m

Od 2009-04-27 rrrr-mm-dd

Do 2013-01-21 rrrr-mm-dd

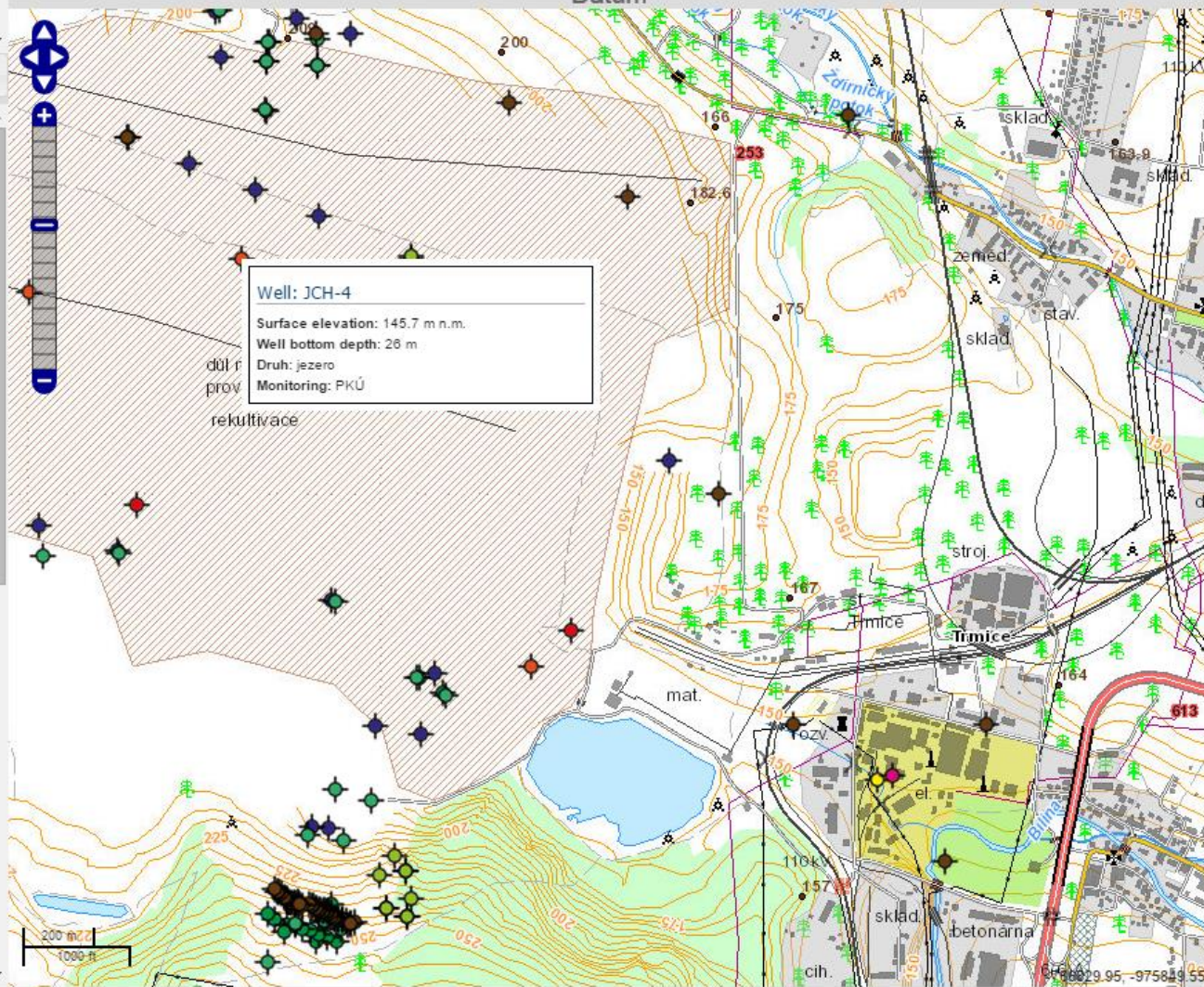
Veličina: Hořčík w -

Další veličina: Rozpuštěný kyslík w -

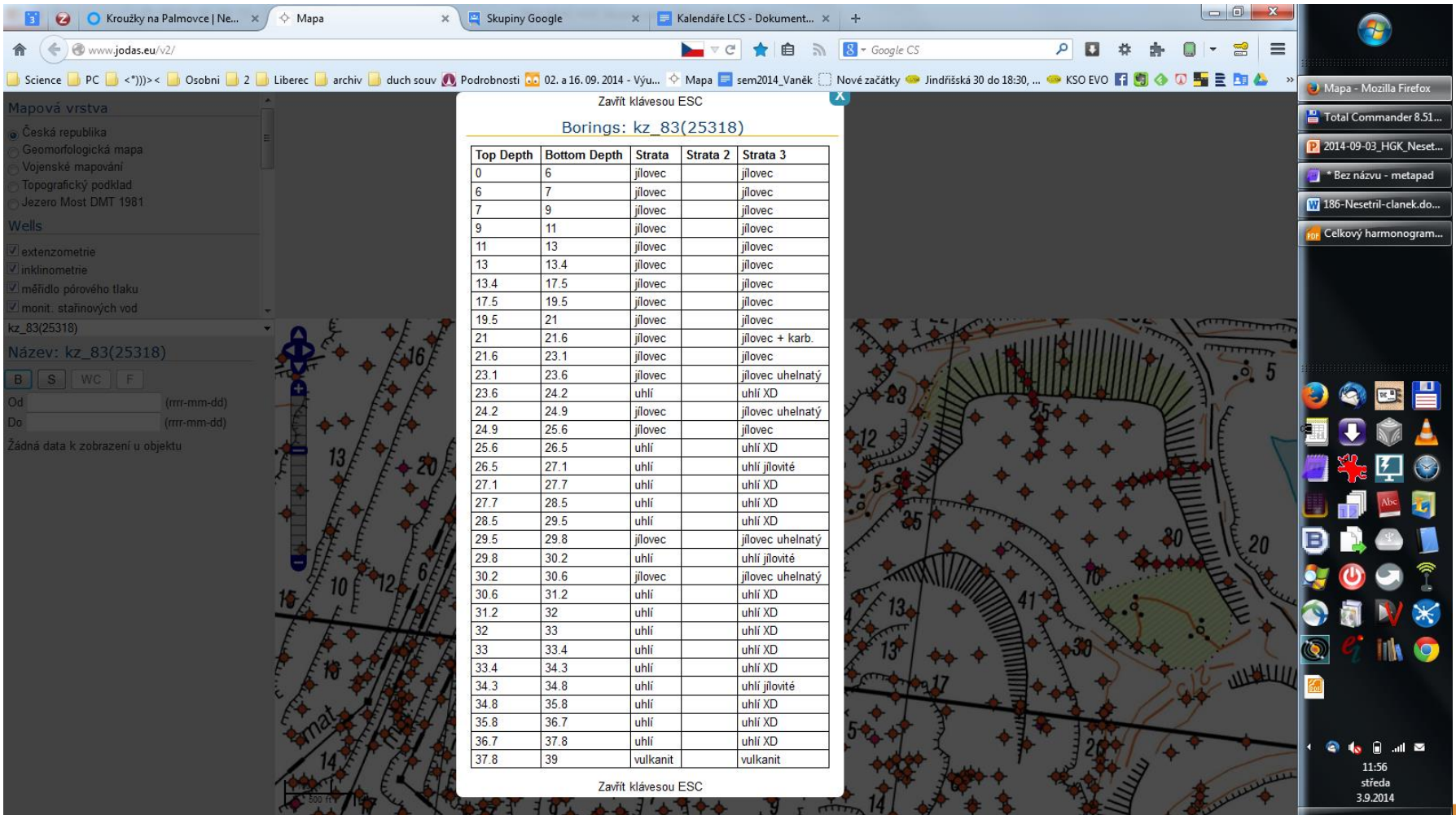
Zobrazit údaje

Datum	Hořčík [mg/l]	Poznámka
09. 11. 2009	34.5	
10. 05. 2010	38.5	
22. 11. 2010	37	
09. 05. 2011	39.5	
21. 11. 2011	41	
14. 05. 2012	42	
19. 11. 2012	42.5	

Datum	Rozpuštěný kyslík [mg/l]	Poznámka
27. 04. 2009	12.2	
22. 06. 2009	7.7	
20. 07. 2009	5.6	
17. 08. 2009	3.6	
14. 09. 2009	1.8	
12. 10. 2009	1	
09. 11. 2009	0.2	
07. 12. 2009	0.5	
11. 01. 2010	13.4	



Simple web viewer

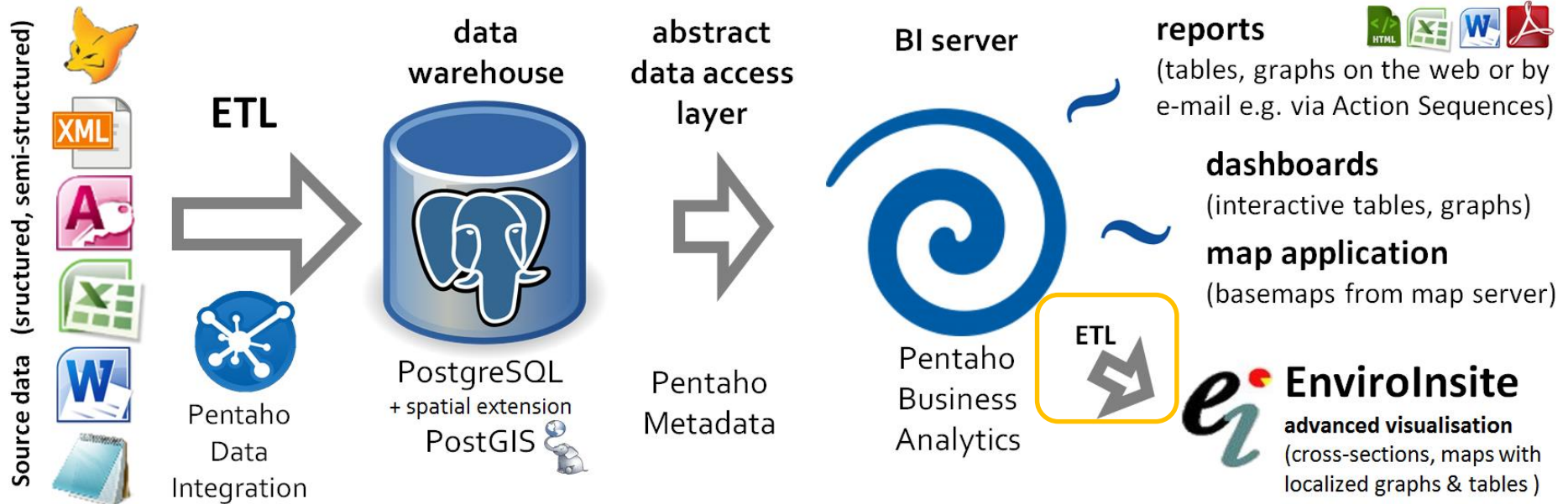


Zavřít klávesou ESC
 Borings: kz_83(25318)

Top Depth	Bottom Depth	Strata	Strata 2	Strata 3
0	6	jilovec		jilovec
6	7	jilovec		jilovec
7	9	jilovec		jilovec
9	11	jilovec		jilovec
11	13	jilovec		jilovec
13	13.4	jilovec		jilovec
13.4	17.5	jilovec		jilovec
17.5	19.5	jilovec		jilovec
19.5	21	jilovec		jilovec
21	21.6	jilovec		jilovec + karb.
21.6	23.1	jilovec		jilovec
23.1	23.6	jilovec		jilovec uhelnatý
23.6	24.2	uhlí		uhlí XD
24.2	24.9	jilovec		jilovec uhelnatý
24.9	25.6	jilovec		jilovec
25.6	26.5	uhlí		uhlí XD
26.5	27.1	uhlí		uhlí jilovité
27.1	27.7	uhlí		uhlí XD
27.7	28.5	uhlí		uhlí XD
28.5	29.5	uhlí		uhlí XD
29.5	29.8	jilovec		jilovec uhelnatý
29.8	30.2	uhlí		uhlí jilovité
30.2	30.6	jilovec		jilovec uhelnatý
30.6	31.2	uhlí		uhlí XD
31.2	32	uhlí		uhlí XD
32	33	uhlí		uhlí XD
33	33.4	uhlí		uhlí XD
33.4	34.3	uhlí		uhlí XD
34.3	34.8	uhlí		uhlí jilovité
34.8	35.8	uhlí		uhlí XD
35.8	36.7	uhlí		uhlí XD
36.7	37.8	uhlí		uhlí XD
37.8	39	vulkanit		vulkanit

Zavřít klávesou ESC

HgIS

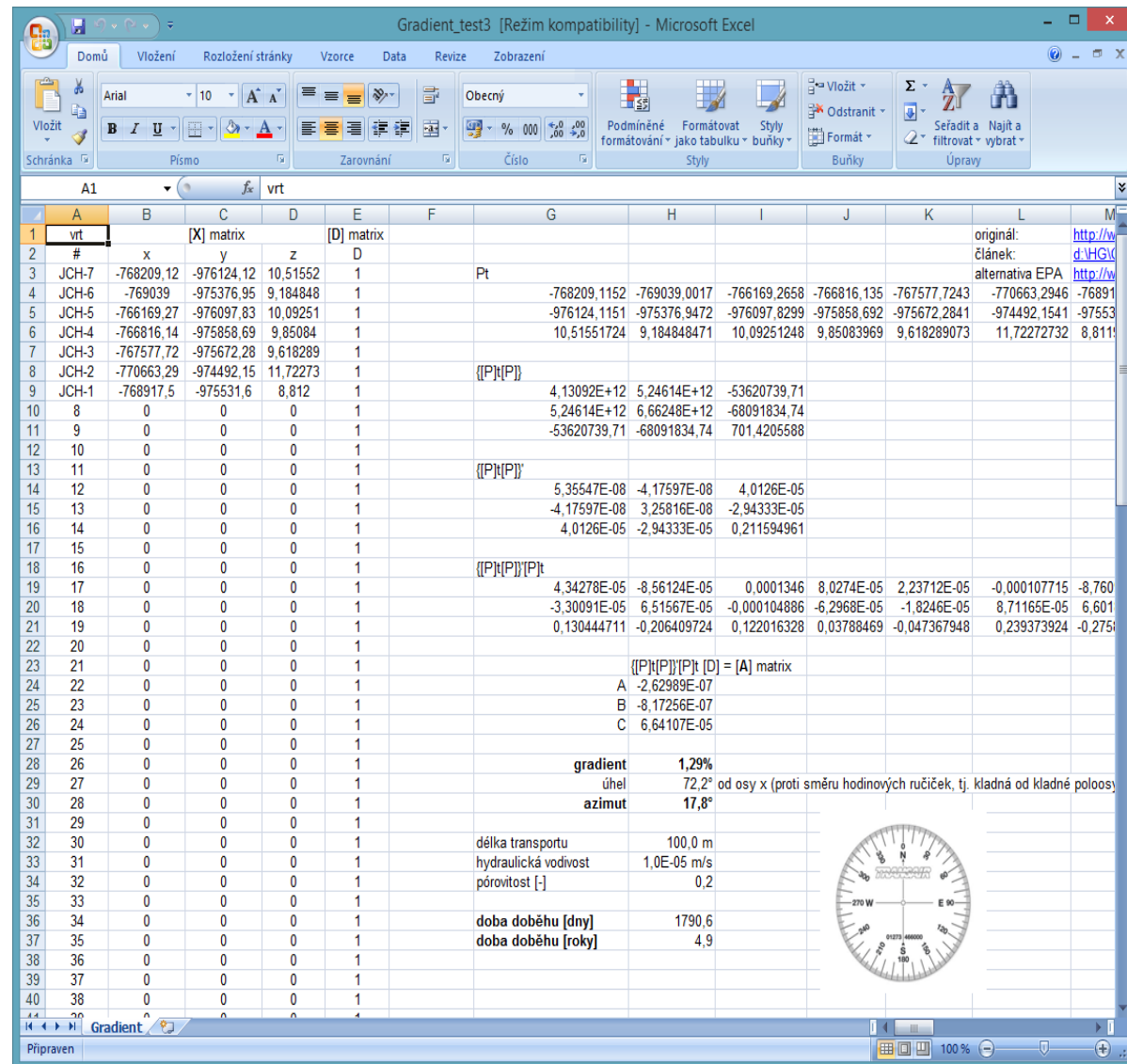


Average hydraulic gradient

calculated from the hydraulic heads of selected boreholes.

→ seepage velocity, retention time

matrix formulas in MS Excel spreadsheet (Devlin 2003)





DEVLIN, J.F., 2003. A spreadsheet method of estimating best-fit hydraulic gradients using head data from multiple wells.


Ground Water 41(3). DOI:10.1111/j.1745-6584.2003.tb02600.x

Computations

- Data aggregation (e.g. total annual precipitation computed from daily precipitation, minimal monthly discharge in a year).
- Computation of the hydrochemical type of water (based on major cations and anions) – e.g. Ca-Mg-HCO₃.

File View Tools Help...
 Opened ▾   admin ▾

Redox procesy x

< > 1 / 9 | 

Vyber Well: Vyber vše (JCH-3, JCH-4, JCH-5)
 Vyber Screen: před hrází (4 m, 8 m, 18 m)
 Vyber Class: Vyber vše (-)
 Vyber Facility: Vyber vše (jCh)
 Vyber Facility 2: Vyber vše (-)
 Vyber Druh: Vyber vše (jezero)
 Vyber Ucel: Vyber vše (-)
 Datum od: 1. 1. 2000
 Datum do: 29. 8. 2014
 Output Type: HTML (Paginated)

View Report Auto-Submit

Identifying Redox Processes in Ground Water

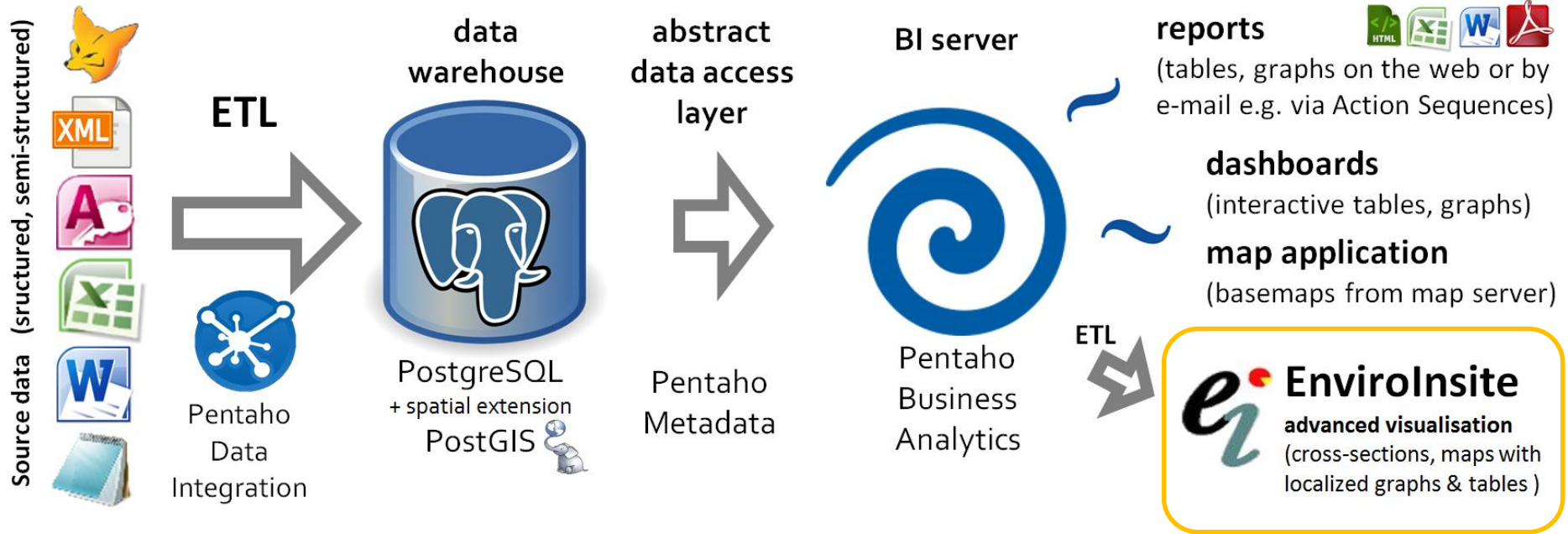
Well	Screen	Class	Facility	Facility 2	Druh	Ucel	Datum
Dissolved oxygen [mg/L]	Nitrate [mg/L]	Mangan.. [mg/L]	Iron [mg/L]	Sulfate [mg/L]		General Redox Category	Redox Process
JCH-5	18 m	-	jCh	-	jezero	-	21.01.2013
10.9	1.5	-	-	260	-	O2>=0.5 mg/L	Unknown
JCH-5	18 m	-	jCh	-	jezero	-	10.12.2012
8.9	1.6	-	-	270	-	O2>=0.5 mg/L	Unknown
JCH-5	18 m	-	jCh	-	jezero	-	19.11.2012
0.4	1	0.7	0.08	270	-	Mixed(anoxic)	NO3-Fe(III)SO4
JCH-5	18 m	-	jCh	-	jezero	-	22.10.2012
0.3	1	-	-	260	-	O2< 0.5 mg/L	Unknown
JCH-5	18 m	-	jCh	-	jezero	-	24.09.2012
2	1.3	-	-	250	-	O2>=0.5 mg/L	Unknown

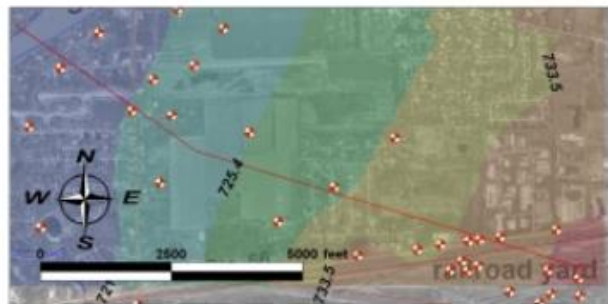
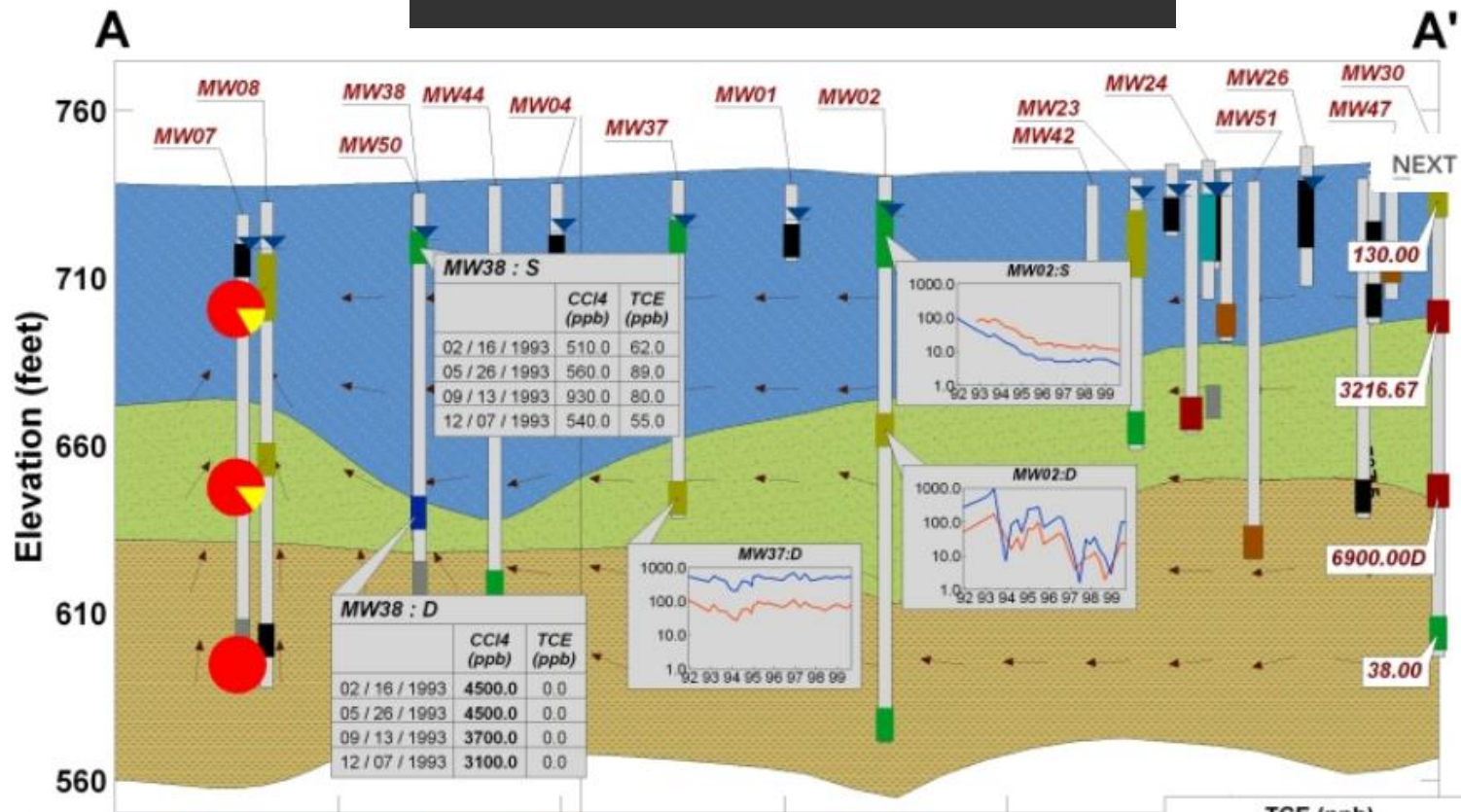
Combination of
Data Integration
+ Reporting

Reusable simple analyses and models

CHAPELLE, F.H. et al. 2009. Distinguishing iron-reducing from sulfate-reducing conditions. *Ground Water* 47(2). DOI: 10.1111/j.1745-6584.2008.00536.x

HgIS





Stratigraphy

- Aquifer 1
- Aquifer 2
- Aquifer 3

Within 1200 feet of section

- CCl4 (ppb)
- TCE (ppb)

Within 1200 feet of section

- CCl4 (ppb)
- TCE (ppb)

TCE (ppb)

Within 900 feet of section

- non-detect
- 11094.00
- 3000.00
- 1000.00
- 100.00
- 10.00
- 1.00
- 0.00

HV1

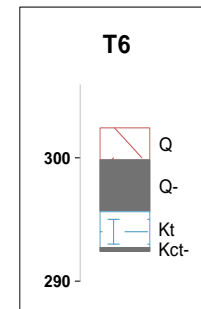
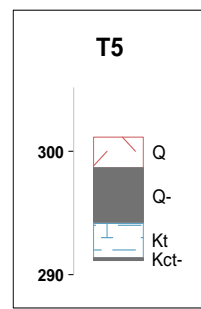
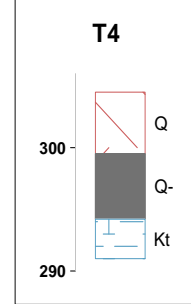
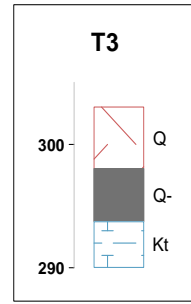
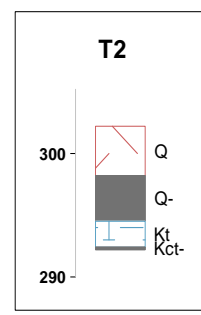
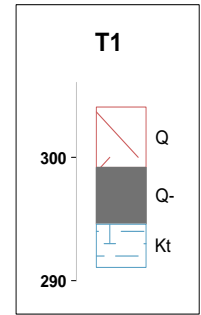
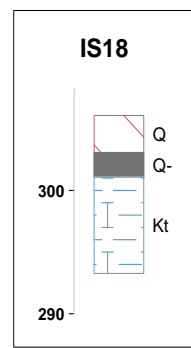
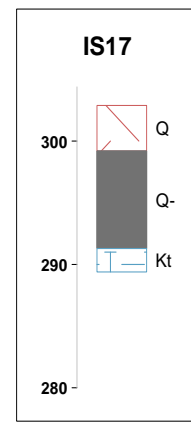
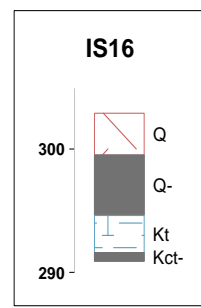
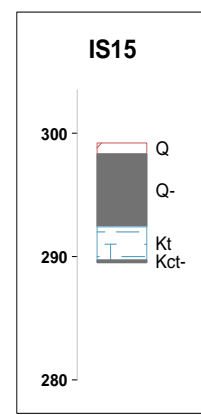
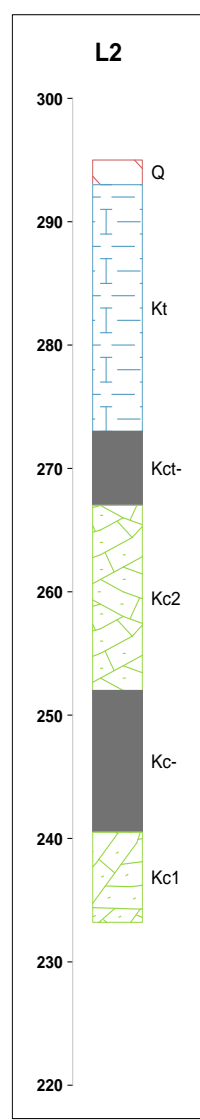
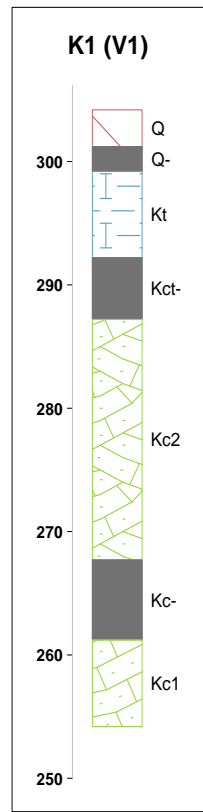
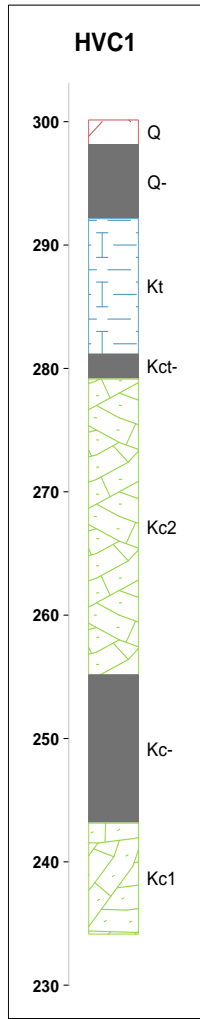
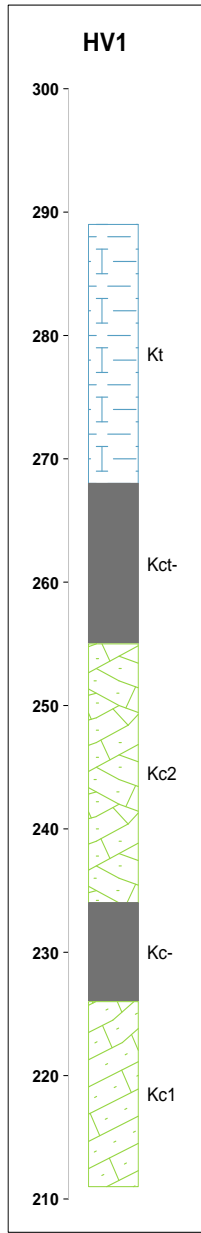
terén: 300.0 m n.m.
hloubka: 78.0 m

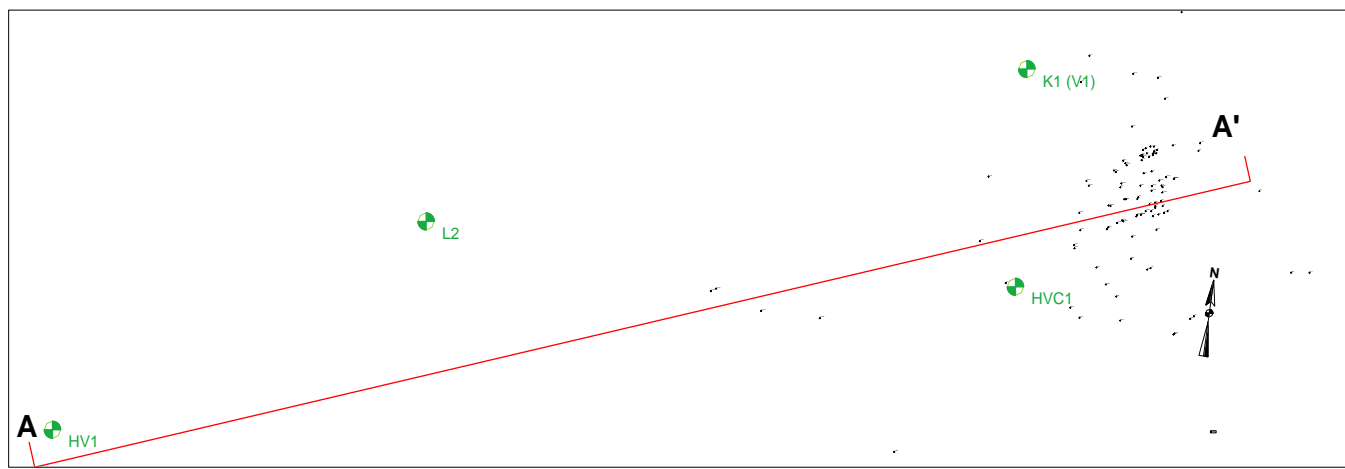
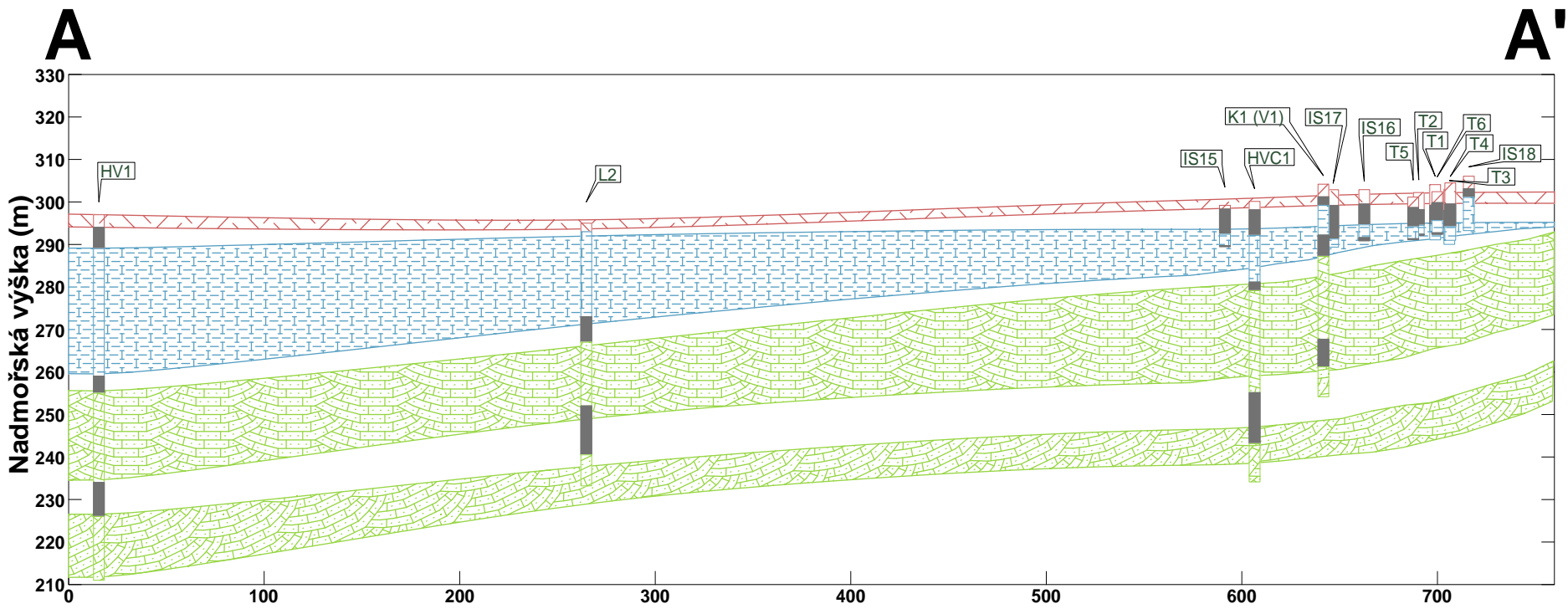
HPV naražená: m
HPV ustálená: m
S. Šeda 1984



TECHNICKÁ UNIVERZITA V LIBERCI
Ústav pro nanomateriály, pokročilé
technologie a inovace

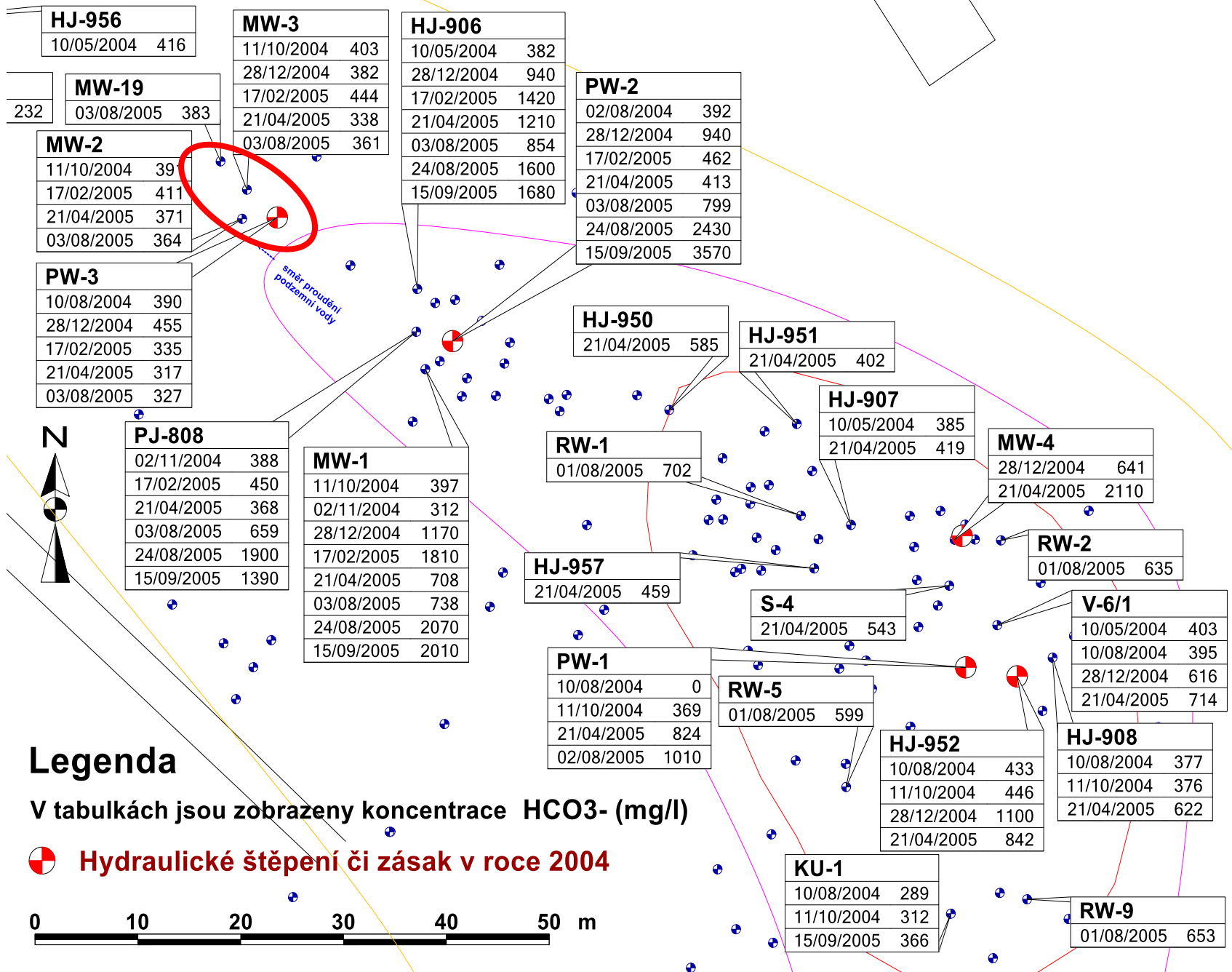
Hloubka [m p.t.]	Zjednodušená litologie	Glaukonit Suché / zvodnělé	Kolektory	Stratigrafie		Geologický popis
				podle popisků v pův. dokumentaci		
0 - 2	hlína			kvartér	hnědá písčitojilovitá zemina	
2 - 6	hlína		Q		světlehnědá jílovitá zemina s malými úlomky pískovce	
6 - 11	hlína				světlehnědá jílovitá zemina	
10						
11 - 15	slín		Kt	spodní turon	šedý smouhovitý navětralý slín	
15 - 32	slínovec				světlehnědé prachovité slínovce	
20						
30						
32 - 34	slínovec				šedé prachovité slínovce s vložkami šedozeleňých glaukonitických písčitých slínovců	
34 - 41	slínovec				šedé slínovce	
40						
41 - 45	jíl				tmavě šedozeleňé glaukonitické jíly	
45 - 47						



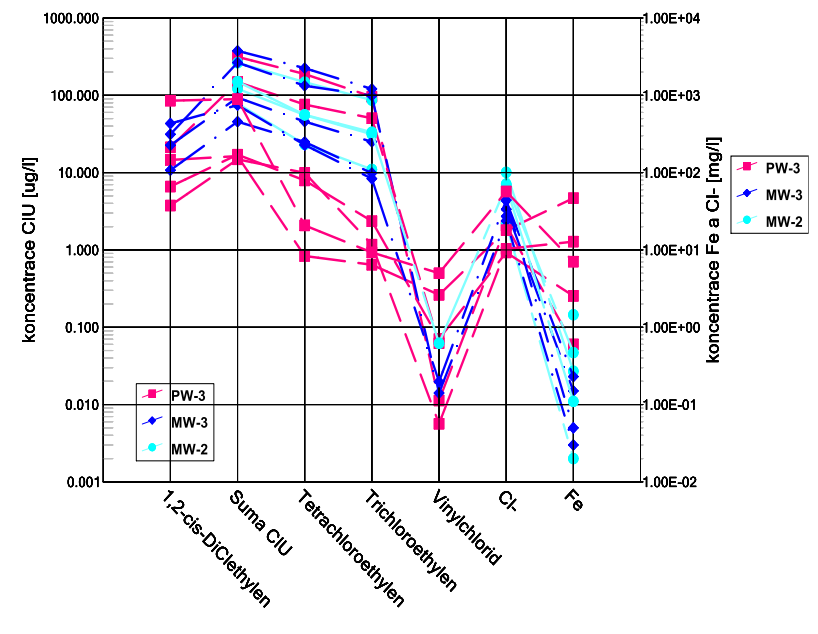
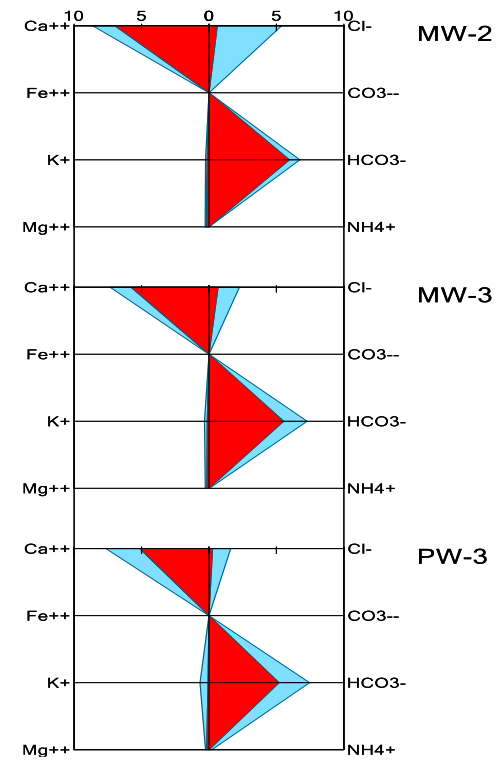
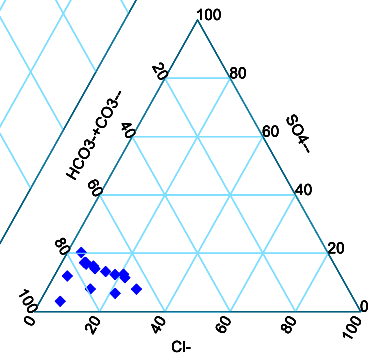
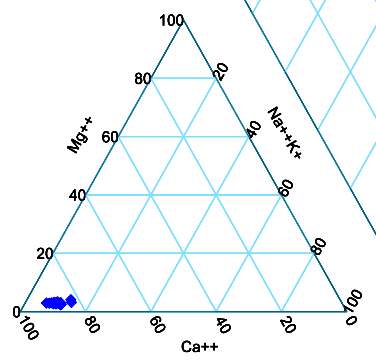
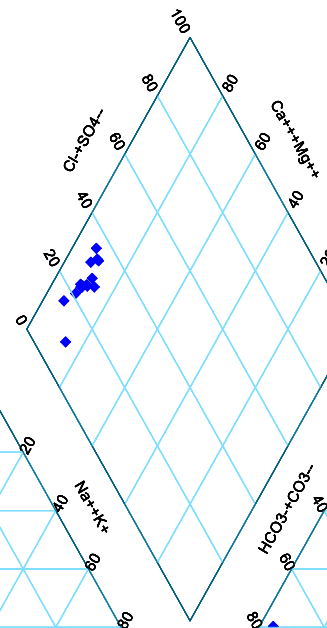
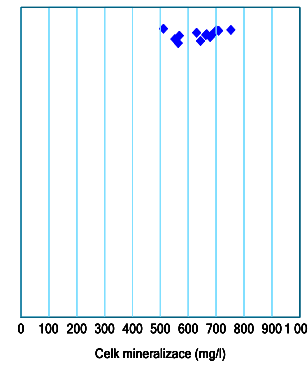
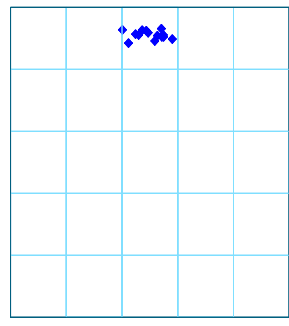
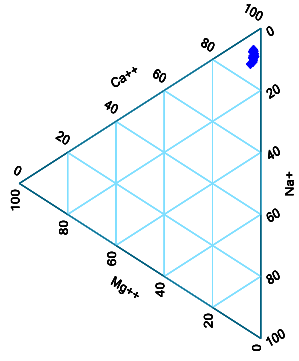
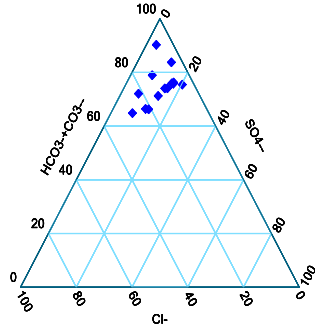


Hydrostratigrafie

- Q
- Q-
- Kt
- Kct-
- Kc2
- Kc-
- Kc1



Durov, Piper, Schöller and Stiff graph



Uniqueness of the technical solution

~ (geo)spatial business intelligence for
hydrogeology

= Business intelligence (BI) +
Geographic information system (GIS)

= *GeoBI for EDM*



Strengths

- Data agnostic
- Database agnostic
- Scalable (parallelization of ETL)
- Interoperable (Weka, R, Tableau)
- Easily extensible (exports) – ETL tool
- Big data

We are working to

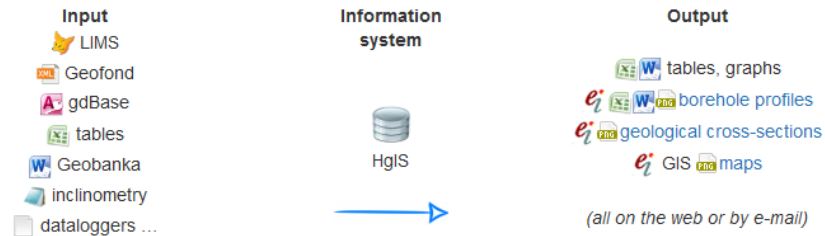
- Automate processes and set event-based reporting with action sequences (.xaction files)
- Map application and interactive dashboards
- Abstract business layer (Pentaho Metadata) to simplify design of reports and dashboards



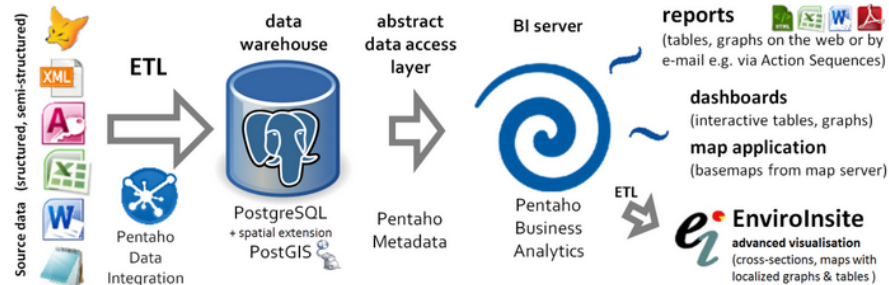
Hydrogeological Information System

For detailed information go to the [Publications](#) section or to the [Czech version](#) of this site.

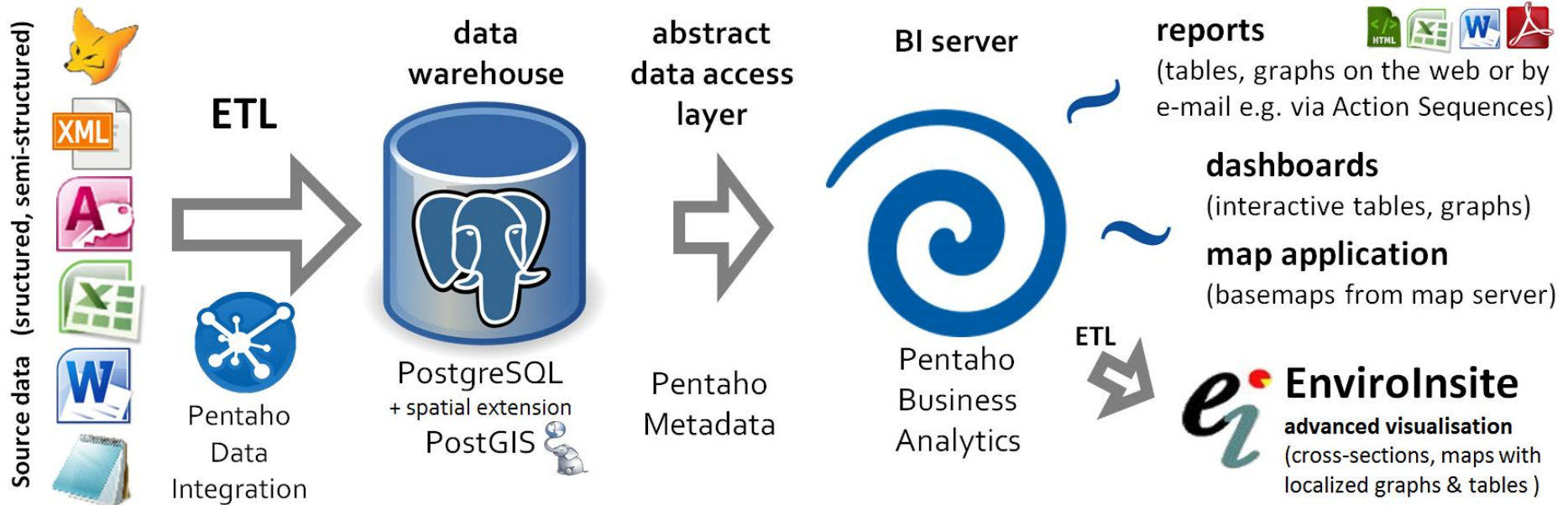
What does HgIS do?



For geeks



Architecture



Thanks for your attention



Existing standards

- Ground Water Markup Language (GWML) from OGC: application schema of GML
- INSPIRE (INfrastructure for SPatial InfoRmation in Europe).
- Hg2O (focused on field experiments data)
- ESRI Groundwater Data Model
(in Arc Hydro Groundwater) extension of ArcGIS
- Data Model of National Groundwater Information System (Australia)
- Open Geoscience data models (British Geological Survey)
- H+ (France)
- BoreholeML (Germany)
- others (EN 14968, Basin of Mexico hydrogeological database)

