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# **Oskarshamn site investigation**

# Hydraulic injection tests in borehole KLX16A, 2007

# Subarea Laxemar

Cristian Enachescu, Stephan Rohs, Philipp Wolf Golder Associates GmbH

October 2007

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*Keywords:* Site/project, Hydrogeology, Hydraulic tests, Injection test, Hydraulic parameters, Transmissivity, Constant head.

This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

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# Abstract

Hydraulic injection tests have been performed in Borehole KLX16A at the Laxemar area, Oskarshamn. The tests are part of the general program for site investigations and specifically for the Laxemar subarea. The hydraulic testing programme has the aim to characterise the rock with respect to its hydraulic properties of the fractured zones and rock mass between them. Data is subsequently delivered for the site descriptive model.

This report describes the results and primary data evaluation of the hydraulic injection tests in borehole KLX16A performed between 12<sup>th</sup> and 19<sup>th</sup> of March 2007.

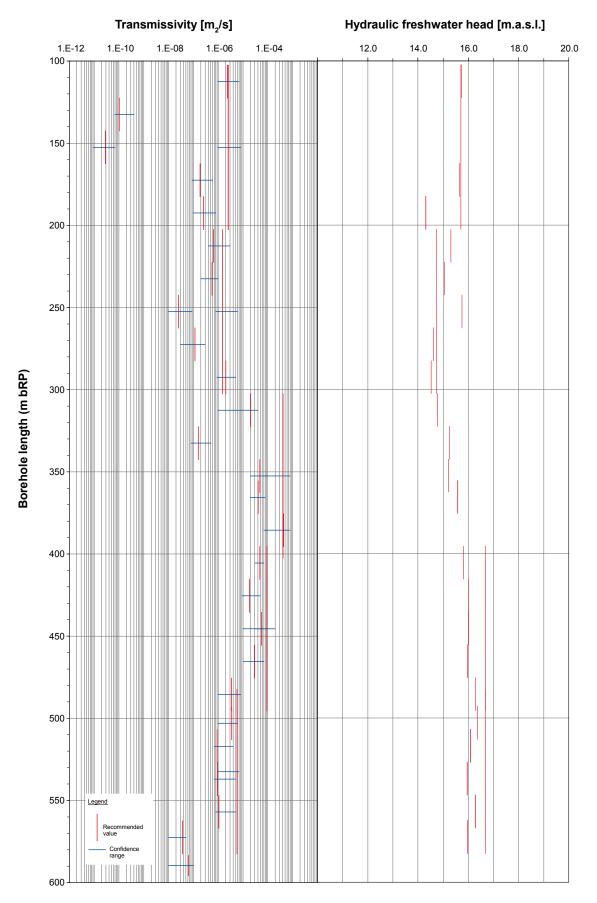
The objective of the hydrotests was to describe the rock around the borehole with respect of hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K) at different measurement scales of 100 m and 20 m sections. Transient evaluation during flow and recovery period provided additional information such as flow regimes, hydraulic boundaries and crossover flows. Constant pressure injection tests were conducted between 12.50–433.55 m below ToC. The results of the test interpretation are presented as transmissivity, hydraulic conductivity and hydraulic freshwater head.

# Sammanfattning

Injektionstester har utförts i borrhål KLX16A i delområde Laxemar, Oskarshamn. Testerna är en del av SKB:s platsundersökningar. Hydraultestprogrammet där injektionstesterna ingår har som mål att karakterisera berget med avseende på dess hydrauliska egenskaper av sprickzoner och mellanliggande bergmassa. Data från testerna används vid den platsbeskrivande modelleringen av området.

Denna rapport redovisar resultaten och utvärderingar av primärdata de hydrauliska injektionstesterna i borrhål KLX16A. Testerna utfördes mellan den 12 till den 23 Mars 2007.

Syftet med hydraultesterna var framförallt att beskriva bergets hydrauliska egenskaper runt borrhålet med avseende på hydrauliska parametrar, i huvudsak transmissvitet (T) och hydraulisk konduktivitet (K) vid olika mätskalor av 100 m och 20 m sektioner. Transient utvärdering under injektions- och återhämtningsfasen gav ytterligare information avseende flödesgeometri, hydrauliska gränser och sprickläckage. Injektionstester utfördes mellan 12,50–433,50 m borrhålslängd. Resultaten av testutvärderingen presenteras som transmissivitet, hydraulisk konduktivitet och grundvattennivå uttryckt i ekvivalent sötvattenpelare (fresh-water head).



Borehole KLX16 A – Summary of results.

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## Appendices attached on CD

Appendix 1 File description table

Appendix 2 Test analyses diagrams

Appendix 3 Test summary sheets

Appendix 4 Nomenclature

Appendix 5 SICADA data tables

# 1 Introduction

A general program for site investigations presenting survey methods has been prepared /SKB 2001/, as well as a site-specific program for the investigations in the Simpevarp area /SKB 2006/. The hydraulic injection tests form part of the site characterization program under item 1.1.5.8 in the work breakdown structure of the execution programme, /SKB 2002/.

Measurements were carried out in borehole KLX16A between 12<sup>th</sup> and 19<sup>th</sup> of March 2007 following the methodology described in SKB MD 323.001 and in the Activity Plan AP PS 400-07-008 (SKB controlling documents). Data and results were delivered to the SKB site characterization database SICADA and are traceable by the Activity Plan number.

The hydraulic testing programme has the aim to characterise the rock with respect to its hydraulic properties of the fractured zones and rock mass between them. This report describes the results and primary data evaluation of the hydraulic injection tests in borehole KLX16A. The commission was conducted by Golder Associates AB and Golder Associates GmbH.

Borehole KLX16A is situated in the Laxemar area approximately 3 km southhwest of the nuclear power plant of Simpevarp, Figure 1-1. The borehole was drilled from November 2006 to January 2007 at 433.55 m length with an inner diameter of 96 mm to a depth of 11.25 m and further on of 76 mm to the bottom of the borehole. The inclination of the borehole is -64.98°. The upper 11.25 m is cased with an outer diameter of 90 mm.

The work was carried out in accordance with Activity Plan AP PS 400-07-008. In Table 1-1 controlling documents for performing this activity are listed. Activity Plan and Method Descriptions are SKB's internal controlling documents. Measurements were conducted utilising SKB's custom made testing equipment PSS2.

Number	Version
AP PS 400-07-008	1.0
Number	Version
SKB MD 320.004e	1.0
SKB MD 323.001e	1.0
SKB MD 600.004	1.0
SKB MD 620.010	1.0
SKB SDPO-003	1.0
SKB SDP-301	1.0
SKB SDP-508	1.0
	Number           SKB MD 320.004e           SKB MD 323.001e           SKB MD 600.004           SKB MD 620.010           SKB SDPO-003           SKB SDP-301

#### Table 1-1. Controlling documents for the performance of the activity.

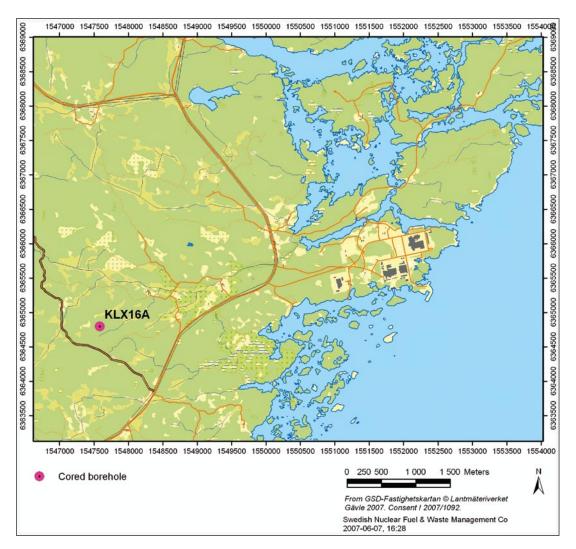


Figure 1-1. The investigation area Laxemar, Oskarshamn with location of borehole KLX16A.

# 2 Objective and scope

The objective of the hydrotests in borehole KLX16A is to describe the rock around the borehole with respect to hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K). This is done at different measurement scales of 100 m and 20 m sections. Among these parameters transient evaluation during the flow and recovery period provides additional information such as flow regimes, hydraulic boundaries and cross-over flows.

The scope of work consisted of preparation of the PSS2 tool which included cleaning of the down-hole tools, calibration and functional checks, injection tests of 100 m and 20 m test sections, analyses and reporting. Furthermore, a single packer test was conducted at a depth of 421.10 m. The used single packer tool consists of a 5 m section but the lower packer was not connected to the pressure lines and therefore not inflated.

Preparation for testing was done according to the Quality plan. This step mainly consists of functions checks of the equipment to be used, the PSS2 tool. Calibration checks and function checks were documented in the daily log and/or relevant documents.

The following hydraulic injection tests were performed between 12th and 19th March 2007.

## 2.1 Borehole

The borehole is telescope drilled with specifications on its construction according to Table 2-2. The reference point of the borehole is the centre of top of casing (ToC), given as elevation in the table below. The Swedish National coordinate system (RT90) is used in the x-y direction and RHB70 in the z-direction. Northing and Easting refer to the top of the boreholes at the ground surface. The borehole diameter in Table 2-2 refers to the final diameter of the drill bit after drilling to full depth.

Table 2-1. Performed inject	ion tests at borehole KLX16A.
-----------------------------	-------------------------------

No. of injection tests*	Interval	Positions	Time/test	Total test time
4	100 m	12.50–426.00 m	125 min	8.3 hrs
21	20 m	13.00–412.00 m	90 min	31.5 hrs
Single Packer**	12.45 m	421.1-433.55	90 min	1.5 hrs
			Total:	41.3 hrs

\* excluding repeated tests;

\*\* conducted with a 5 m tool (bottom packer not inflated).

Title	Value				
Comment:	No comment exists				
Borehole length (m):	433.55				
Reference level:	TOC				
Drilling period (s):	From date	To date	Secup (m)	Seclow (m)	Drilling type
	2006-11-28	2007-01-09	0.30	433.55	Core drilling
Starting point coordinate:	Length (m)	Northing (m)	Easting (m)	Elevation (m.a.s.l.)	Coord system
(centerpoint of TOC)	0.00	6,364,797.69	1,547,584.06	18.85	RT90-RHB70
	3.00	6,364,798.22	1,547,582.90	16.14	RT90-RHB70
Angles:	Length (m)	Bearing	Inclination (- = down)		
	0.00	294.37	-64.98	RT90-RHB70	
Borehole diameter:	Secup (m)	Seclow (m)	Hole diam (m)		
	0.30	11.25	0.096		
	11.25	433.55	0.076		
Core diameter:	Secup (m)	Seclow (m)	Core diam (m)		
	0.30	433.55	0.050		
Casing diameter:	Secup (m)	Seclow (m)	Case in (m)	Case out (m)	
	0.00	11.25	0.077	0.090	
Cone dimensions:	Secup (m)	Seclow (m)	Cone In (m)	Cone out (m)	
Grove milling:	Length (m)	Trace detectable			
	20.00	YES			
	50.00	YES			
	100.00	YES			
	150.00	YES			
	200.00	YES			
	250.00	YES			
	300.00	YES			
	350.00	YES			
	400.00	YES			

#### Table 2-2. Information about KLX16A (from SICADA 2007-01-29).

# 2.2 Injection tests

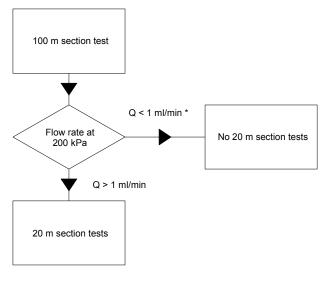
Injection tests were conducted according to the Activity Plan AP PS 400-07-008 and the Method Description for hydraulic injection tests, SKB MD 323.001 (SKB internal documents). Tests were done in 100 m, 20 m test sections between 12.50–426.00 m below ToC (see Table 2-3) and one additional single packer test between 421.10–433.55 m below ToC was performed to describe the lower part of the borehole. The initial criteria for performing injection tests in 20 m sections was a measurable flow of Q > 0.001 L/min in the previous measured 100 m covering the smaller test sections (see Figure 2-1). The measurements were performed with SKB's custom made equipment for hydraulic testing called PSS2.

No other additional measurements except the actual hydraulic tests and related measurements of packer position and water level in annulus of borehole KLX13A were conducted.

Bh ID	Test section (m bToC)	Test type¹	Test no	Test start date, time	Test stop date, time
KLX16A	13.00–133.00	3	1	2007-03-12 20:28	2007-03-13 01:56
KLX16A	13.00–133.00	3	2	2007-03-13 09:41	2007-03-13 12:22
KLX16A	112.00-212.00	3	1	2007-03-13 14:12	2007-03-13 16:02
KLX16A	212.00-312.00	3	1	2007-03-13 17:54	2007-03-13 19:46
KLX16A	312.00-412.00	3	1	2007-03-13 21:41	2007-03-13 23:41
KLX16A	12.50-32.50	3	1	2007-03-14 13:12	2007-03-14 14:38
KLX16A	32.50-52.50	3	1	2007-03-14 15:41	2007-03-14 16:16
KLX16A	32.50-52.50	3	2	2007-03-14 22:12	2007-03-14 23:57
KLX16A	52.50-72.50	3	1	2007-03-15 00:34	2007-03-15 02:39
KLX16A	72.50-92.50	3	1	2007-03-15 06:50	2007-03-15 08:18
KLX16A	91.00-111.00	3	1	2007-03-15 08:52	2007-03-15 10:25
KLX16A	111.00–131.00	3	1	2007-03-15 10:59	2007-03-15 12:22
KLX16A	131.00–151.00	3	1	2007-03-15 13:31	2007-03-15 14:55
KLX16A	150.00–170.00	3	1	2007-03-15 15:35	2007-03-15 17:14
KLX16A	170.00–190.00	3	1	2007-03-15 17:51	2007-03-15 19:24
KLX16A	188.00–208.00	3	1	2007-03-15 20:00	2007-03-15 21:52
KLX16A	207.00-227.00	3	1	2007-03-15 22:44	2007-03-16 00:00
KLX16A	227.00-247.00	3	1	2007-03-16 00:47	2007-03-16 02:13
KLX16A	247.00-267.00	3	1	2007-03-16 07:36	2007-03-16 08:58
KLX16A	267.00-287.00	3	1	2007-03-16 09:32	2007-03-16 10:12
KLX16A	267.00-287.00	3	2	2007-03-16 10:58	2007-03-16 12:19
KLX16A	287.00-307.00	3	1	2007-03-16 13:27	2007-03-16 14:51
KLX16A	307.00-327.00	3	1	2007-03-16 15:27	2007-03-16 17:00
KLX16A	327.00-347.00	4B	1	2007-03-16 17:41	2007-03-16 22:23
KLX16A	347.00-367.00	3	1	2007-03-17 08:35	2007-03-17 10:06
KLX16A	367.00-387.00	3	1	2007-03-17 10:38	2007-03-17 12:14
KLX16A	387.00-407.00	3	1	2007-03-17 12:48	2007-03-17 14:40
KLX16A	406.00-426.00	4B	1	2007-03-17 15:37	2007-03-17 22:20
KLX16A	421.10-433.55	4B	1	2007-03-18 19:10	2007-03-18 22:51

#### Table 2-3. Tests performed.

<sup>1)</sup> 3: Injection test; 4B Pulse injection test.



\* eventually tests performed after specific discussion with SKB

Figure 2-1. Flow chart for test sections.

# 2.3 Control of equipment

Control of equipment was mainly performed according to the Quality plan. The basis for equipment handling is described in the "Mätssystembeskrivning" SKB MD 345.101-123 which is composed of two parts 1) management description, 2) drawings and technical documents of the modified PSS2 tool.

Function checks were performed before and during the tests. Among these pressure sensors were checked at ground level and while running in the hole calculated to the static head. Temperature was checked at ground level and while running in. Leakage checks at joints in the pipe string were done at least every 100 m of running in.

Any malfunction was recorded, and measures were taken accordingly for proper operation. Approval was made according to SKB site manager, or Quality plan and the "Mätssystembeskrivning".

# 3 Equipment

# 3.1 Description of equipment

The equipment called PSS2 (Pipe String System 2) is a highly integrated tool for testing boreholes at great depth (see conceptual drawing in the next figure). The system is built inside a container suitable for testing at any weather. Briefly, the components consists of a hydraulic rig, downhole equipment including packers, pressure gauges, shut-in tool and level indicator, racks for pump, gauge carriers, breakpins, etc shelfs and drawers for tools and spare parts.

There are three spools for a multi-signal cable, a test valve hose and a packer inflation hose. There is a water tank for injection purposes, pressure vessels for injection of packers, to open test valve and for low flow injection. The PSS2 has been upgraded with a computerized flow regulation system. The office part of the container consists of a computer, regulation valves for the nitrogen system, a 24 V back-up system in case of power shut-offs and a flow regulation board.

PSS2 is documented in photographs 1-6.

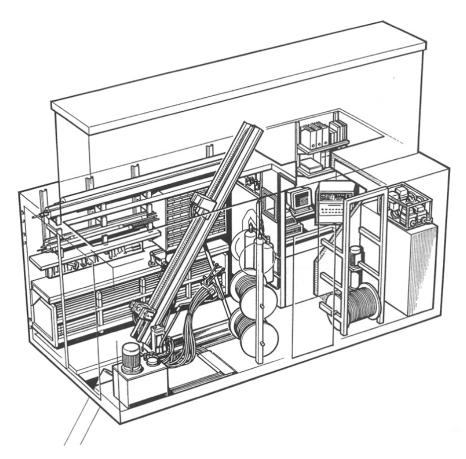


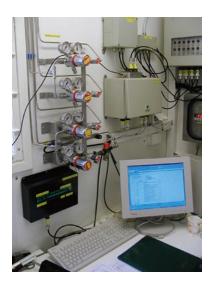
Figure 3-1. A view of the layout and equipment of PSS2.



Photo 1. Hydraulic rig.



*Photo 2. Rack for pump, down-hole equipment, workbench and drawers for tools.* 



*Photo 3. Computer room, displays and gas regulators.* 



*Photo 4. Pressure vessels for test valve, packers and injection.* 



*Photo 5. Positioner, bottom end of down-in-hole string.* 



Photo 6. Packer and gauge carrier.

The down-hole equipment consists from bottom to top of the following equipment:

- Level indicator SS 630 mm pipe with OD 73 mm with 3 plastic wheels connected to a Hallswitch.
- Gauge carrier SS 1.5 m carrying bottom section pressure transducer and connections from positioner.
- Lower packer SS and PUR 1.5 m with OD 72 mm, stiff ends, tightening length 1.0 m, maximum pressure 6.5 MPa, working pressure 1.6 MPa.
- Gauge carrier with breakpin SS 1.75 m carrying test section pressure transducer, temperature sensor and connections for sensors below. Breakpin with maximum load of 47.3 (± 1.0) kN. The gauge carrier is covered by split pipes and connected to a stone catcher on the top.
- Pop joint SS 1.0 or 0.5 m with OD 33 mm and ID 21 mm, double O-ring fittings, trapezoid thread, friction loss of 3kPa/m at 50 L/min.
- Pipe string SS 3.0 m with OD 33 mm and ID 21 mm, double O-ring fittings, trapezoid thread, friction loss of 3kPa/m at 50 L/min.
- Contact carrier SS 1.0 m carrying connections for sensors below.
- Upper packer SS and PUR 1.5 m with OD 72 mm, fixed ends, seal length 1.0 m, maximum pressure 6.5 MPa, working pressure 1.6 MPa.
- Breakpin SS 250 mm with OD 33.7 mm. Maximum load of 47.3 ( $\pm$  1.0) kN.
- Gauge carrier SS 1.5 m carrying top section pressure transducer, connections from sensors below. Flow pipe is double bent at both ends to give room for sensor equipment. The pipe gauge carrier is covered by split pipes.
- Shut-in tool (test valve) SS 1.0 m with a OD of 48 mm, Teflon coated valve piston, friction loss of 11 kPa at 10 L/min (260 kPa–50L/min). Working pressure 2.8–4.0 MPa. Breakpipe with maximum load of 47.3 (± 1.0) kN. The shut-in tool is covered by split pipes and connected to a stone catcher on the top.

The tool scheme is presented in Figure 3-2.

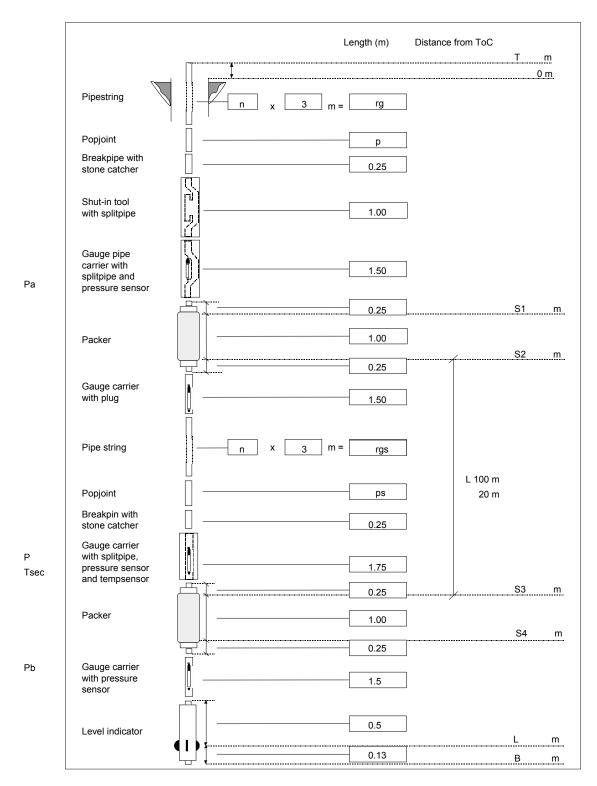


Figure 3-2. Schematic drawing of the down-hole equipment in the PSS2 system.

# 3.2 Sensors

Keyword	Sensor	Name	Value/Range	Unit	Comments
P <sub>sec,a,b</sub>	Pressure	Druck PTX 162-1464abs	9–30	VDC	
			4–20 0–13.5 ± 0.1	mA MPa % of FS	
T <sub>sec,surf,air</sub>	Temperature	BGI	18–24	VDC	
			4–20	mA	
			0–32	°C	
			± 0.1	°C	
$Q_{big}$	Flow	Micro motion	0–100	kg/min	Massflow
		Elite sensor	± 0.1	%	
Q <sub>small</sub>	Flow	Micro motion	0–1.8	kg/min	Massflow
		Elite sensor	± 0.1	%	
p <sub>air</sub>	Pressure	Druck PTX 630	9–30	VDC mA KPa	
			4–20		
			0–120	% of FS	
			± 0.1		
O <sub>pack</sub>	Pressure	Druck PTX 630	9–30	VDC	
			4–20	mA MPa	
			0–4	MPa % of FS	
			± 0.1		
O <sub>in,out</sub>	Pressure	Druck PTX 1400	9–28	VDC mA MPa % of FS	
			4–20		
			0–2.5		
			± 0.15		
L	Level Indicator				Length correction

### Table 3-1. Technical specifications of sensors.

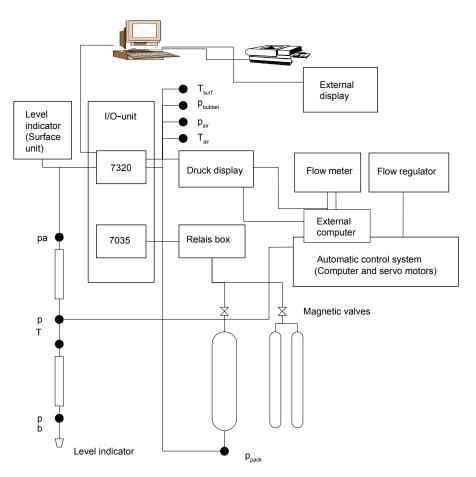
## Table 3-2. Sensor positions and wellbore storage (WBS) controlling factors.

Borehole information				Sensors		Equipment affecting WBS coefficient		
ID	Test section (m)	Volume in test section (m <sup>3</sup> )	Туре	Position (m fr ToC)	Position	Function	Outer diameter (mm)	
KLX16A		0.454	pa		Test	Signal cable	9.1	
		section	Pump string	33				
			p₀ L	113.70 116.25		Packer line	6	
KLX16A	P	A 12.50–32.50	Test	Signal cable	9.1			
			р Т	31.60 31.35	section	Pump string	33	
			p₀ L	33.20 35.75		Packer line	6	

# 3.3 Data acquisition system

The data acquisition system in the PSS2 container contains a stationary PC with the software Orchestrator, pump- and injection test parameters such as pressure, temperature and flow are monitored and sensor data collected. A second laptop PC is connected to the stationary PC through a network containing evaluation software, Flowdim. While testing, data from previously tested section is converted with IPPlot and entered in Flowdim for evaluation.

The data acquisition system starts and stops the test automatically or can be disengaged for manual operation of magnetic and regulation valves within the injection/pumping system. The flow regulation board is used for differential pressure and valve settings prior testing and for monitoring valves during actual test. An outline of the data acquisition system is outlined in Figure 3-3.



*Figure 3-3. Schematic drawing of the data acquisition system and the flow regulation control system in PSS2.* 

# 4 Execution

# 4.1 Preparations

Following preparation work and functional checks were conducted prior to starting test activities:

- Place pallets and container, lifting rig up, installing fence on top of container, lifting tent on container.
- Clean and disinfect of Multikabel and hoses for packer and test valve. Clean the tubings with hot steam.
- Filling injection tank with water (water provided by SKB).
- Filling buffer tank with water and tracer it with Uranin; take water sample.
- Filling vessels.
- Filling the hoses for test valve and packer.
- Entering calibration constants to system and regulation unit.
- Synchronize clocks on all computers.
- Function check of shut-in tool both ends, overpressure by 900 kPa for 5 min (OK).
- Check pressure gauges against atmospheric pressure and than on test depth against column of water.
- Translate all protocols into English (where necessary).
- Filling packers with water and de-air.
- Measure and assemble test tool.

# 4.2 Length correction

By running in with the test tool, a level indicator is incorporated at the bottom of the tool. The level indicator is able to record groves milled into the borehole wall. The depths of these groves are given by SKB in the Activity Plan (see Table 2-2) and the measured depth is counter checked against the number/length of the tubes build in. The achieved correction value, based on linear interpolation between the reference marks, is used to adjust the location of the packers for the test sections to avoid wrong placements and minimize elongation effects of the test string.

# 4.3 Execution of field work

## 4.3.1 Test principle

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a shut-in pressure recovery (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

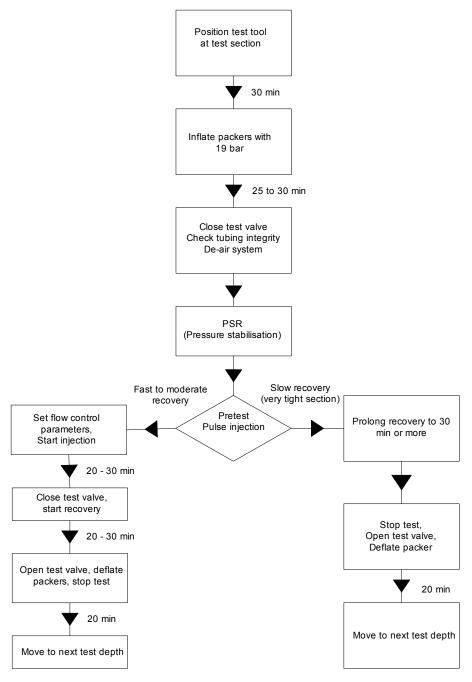


Figure 4-1. Flow chart for test performance.

## 4.3.2 Test procedure

A typical test cycle includes the following phases: 1) Transfer of down-hole equipment to the next section. 2) Packer inflation. 3) Pressure stabilisation. 4) Preliminary Pulse injection. 5) Constant head injection. 6) Pressure recovery. 7) Packer deflation.

The preliminary pulse injection (Step 4) derives the first estimations of the formation transmissivity. It is conducted by applying a pressure difference of approx. 200 kPa to the static formation pressure. If the pulse recovery indicates a very low transmissivity (flow probably below 1 mL/min) the pulse recovery is prolonged and no constant head injection test is performed. The decision to continue the pulse or to conduct an injection tests is based on the pressure response of the pulse recovery. A pressure recovery less than 50% during the first ten minutes of the pulse indicates a low transmissivity. In such a case no injection test will be conducted. The pressure static recovery (PSR) after packer inflation and before the pulse gives a direct measure of the magnitude of the packer compliance. A steep PSR indicates extremely low test section transmissivity. In such a case the packer compliance would influence the subsequent pulse test too much and introduce very large uncertainties. Therefore tests with this behaviour would be stopped after PSR phase.

If the preliminary pulse injection test indicates a formation transmissivity with a flow above 1 mL/min a constant head injection test (Step 5 and 6) is carried out. It is applied with a constant injection pressure of approx. 200 kPa (20 m water column) above the static formation pressure in the test section. Before start of the injection tests, approximately stable pressure conditions prevailed in the test section. After the injection period, the pressure recovery in the section is measured. In cases, where small flow rates were expected, the automatic regulation unit was switched off and the test was performed manually (determined by the preliminary pulse injection). In those cases, the constant difference pressure was usually unequal to 200 kPa.

In cases when the derived transmissivity of a test section influences the subsequent test program the constant head injection was conducted even if the preliminary pulse indicates a very tight section (e.g. flow below 1 mL/min). The injection phase is then performed to verify the results of the pulse and a flow below 1 mL/min.

The duration for each phase is presented in Table 4-1.

# 4.4 Data handling/post processing

The data handling followed several stages. The data acquisition software (Orchestrator) produced an ASCII raw data file (\*.ht2) which contains the data in voltage and milliampere format plus calibration coefficients. The \*.ht2 files were processed to \*.dat files using the SKB program called IPPlot. These files contain the time, pressure, flow rate and temperature data. The \*.dat files were synthesised in Excel to a \*.xls file for plotting purposes. Finally, the test data to be delivered to SKB were exported from Excel in \*.csv format. These files were also used for the subsequent analysis (field and final) of the injection phase (CHi). The synthesised data of the recovery phase (CHir) was used for the field analysis and to receive preliminary results for concistency reviews.

Step	Phase	Time
1	Position test tool to new test section (correct position using the borehole markers).	Approx. 30 min.
2	Inflate packers with appr. 1,900 kPa.	25 min.
3	Close test valve.	10 min.
	Check tubing integrity with appr. 800 kPa.	5 min.
	De-air system.	2 min.
4	Pretest, pulse injection (duration depends on the formation transmissivity).	
5*	Set automatic flow control parameters or setting for manual test.	5 min.
	Start injection.	20 to 45 min.
6*	Close test valve, start recovery.	20 min. or more
	Open test valve.	10 min.
7	Deflate packers.	25 min.
	Move to next test depth.	

 Table 4-1. Durations for packer inflation, pressure stabilisation, injection and recovery phase and packer deflation.

\* Step 5 and 6 conducted if the preliminary pulse indicates a formation transmissivity with a sufficient flow.

# 4.5 Analyses and interpretations

#### 4.5.1 Analysis software

The tests were analysed using a type curve matching method. The analysis was performed using Golder's test analysis program FlowDim. FlowDim is an interactive analysis environment allowing the user to interpret constant pressure, constant rate and slug/pulse tests in source as well as observation boreholes. The program allows the calculation of type-curves for homogeneous, dual porosity and composite flow models in variable flow geometries from linear to spherical.

## 4.5.2 Analysis approach

Constant pressure tests are analysed using a rate inverse approach. The method initially known as the /Jacob and Lohman 1952/ method was further improved for the use of type curve derivatives and for different flow models.

Constant pressure recovery tests are analysed using the method described by /Gringarten 1986, Bourdet et al. 1989/ by using type curve derivatives calculated for different flow models.

Pulse tests are analysed by using the pressure deconvolution method described by /Peres et al. 1989/ with improvements introduced by /Chakrabarty and Enachescu 1997/.

## 4.5.3 Analysis methodology

Each of the relevant test phases is subsequently analyzed using the following steps:

- Injection Tests
  - Identification of the flow model by evaluation of the derivative on the log-log diagnostic plot. Initial estimates of the model parameters are obtained by conventional straight-line analysis.
  - Superposition type curve matching in log-log coordinates. A non-linear regression algorithm is used to provide optimized model parameters in the latter stages.
  - Non-linear regression in semi-log coordinates (superposition HORNER plot; /Horner 1951/. In this stage of the analysis, the static formation pressure is selected for regression.

The test analysis methodology is best explained in /Horne 1990/.

#### • Pre-test for the Injection Tests

The test cycle always starts with a pulse injection phase with the aim of deriving a first estimation of the formation transmissivity. In cases when the pulse recovery is slow (indicating low transmissivity) the pulse phase is extended and analysed as the main phase of the test.

The transmissivity derived from a pulse test is strongly influenced by the wellbore storage coefficient used as an input in the analysis. The wellbore storage coefficient is calculated as C = dV/dP where dV is the volume difference injected during the brief flow period of the pulse and dP is the initial pressure difference of the pulse. dV is directly measured either by using the flowmeter readings or water level measurements in the injection vessel.

It should be noted though that there is large uncertainty connected with the determination of the wellbore storage coefficient (probably one order of magnitude), which will implicitly translate into uncertainty in the derived transmissivity. Figure 4-2 below show an example of a typical pressure versus time evolution for such a tight section.

 Flow model identification and type curve analysis in the deconvolution Peres Plot /Peres et al. 1989, Chakrabarty and Enachescu 1997/. A non-linear regression algorithm is used to provide optimized model parameters in the later stages. An example of type curves is presented in Figure 4-3.

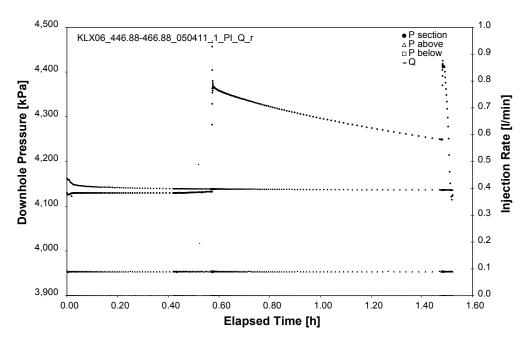


Figure 4-2. Typical pressure versus time plot of a Pulse injection test.

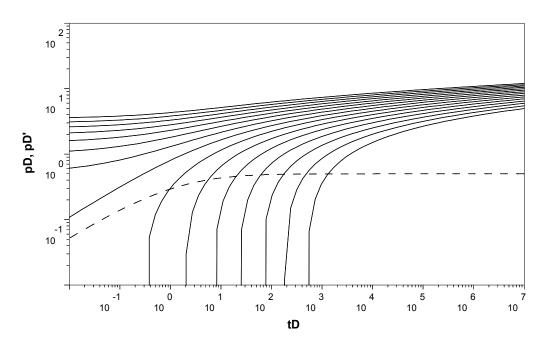


Figure 4-3. Deconvolution type curve set for pulse test analysis.

#### 4.5.4 Correlation between storativity and skin factor

For the analysis of the conducted hydraulic tests below 100 m depth a storativity of  $1 \cdot 10^{-6}$  and for hydraulic tests above 100 m a storativity of  $1 \cdot 10^{-3}$  is assumed (SKB MD 320.004e). Based on this assumption the skin will be calculated. In the following the correlation between storativity and skin for the relevant test phases will be explained in greater detail.

#### • Injection phase (CHi)/Pulse tests (Pi)

Due to the fact that the early time data of the CHi and Pi phases, respectively, is not available or too noisy (attributed to the automatic regulation system) the storativity and the skin factor become correlated. Consequently they cannot be solved independently any more. In this case as a result of the analysis one determines the correlation group  $e^{2s}/S$ . This means that in such cases the skin factor can only be calculated when assuming the storativity as known.

#### • Recovery phase (CHir)

The wellbore storage coefficient (C) is determined by matching the early time data with the corresponding type curve. The derived C-value is introduced in the equation of the type curve parameter:

$$(C_D e^{2s})_M = \frac{C \rho g}{2\pi r_w^2 S} e^{2s}$$

The equation above has two unknowns, the storativity (S) and the skin factor (s) which expresses the fact that for the case of constant rate and pressure recovery tests the storativity and the skin factor are 100% correlated. Therefore, the equation can only be either solved for skin by assuming that the storativity is known or solved for storativity by assuming the skin as known.

# 4.5.5 Determination of the ri-index and calculation of the radius of influence (ri)

The analysis provides also the radius of influence and the ri-index, which describes the late time behaviour of the derivative.

#### **Ri-index**

The determination of the ri-index is based on the shape of the derivative plotted in log-log coordinates and describes the behaviour of the derivative after the time  $t_2$ , representing the end of the near wellbore response. The ri-index also describes the flow regime at the end of the test. Following ri-indices can be assigned:

- ri-index = 0: The middle and late time derivative shows a horizontal stabilization. This pressure response indicates that the size of the hydraulic feature is greater than the radius of influence. The calculated radius of influence is based on the entire test time  $t_P$ .
- ri-index = 1: The derivative shows an upward trend at late times, indicating a decrease of transmissivity or a barrier boundary at some distance from the borehole. The size of the hydraulic feature near the borehole is estimated as the radius of influence based on  $t_2$ .
- ri-index = -1: The derivative shows a downward trend at late times, indicating an increase of transmissivity or a constant head boundary at some distance from the borehole. The size of the hydraulic feature near the borehole is estimated as the radius of influence based on t<sub>2</sub>.

Figure 4-4 presents the relationship between the shape of derivative and the ri-index.

If no radial flow stabilization can be observed the ri-index is based on the flow regime at the end of the test: i.e. ri-index = 1 for tests with a derivative showing an upward trend at the end and a ri-index=-1 for tests with a derivative showing a downward trend. In such cases the calculated radius of influence is based on the entire test time  $t_{p}$ .

The assignment of the ri-index is based on /Rhén 2005/.

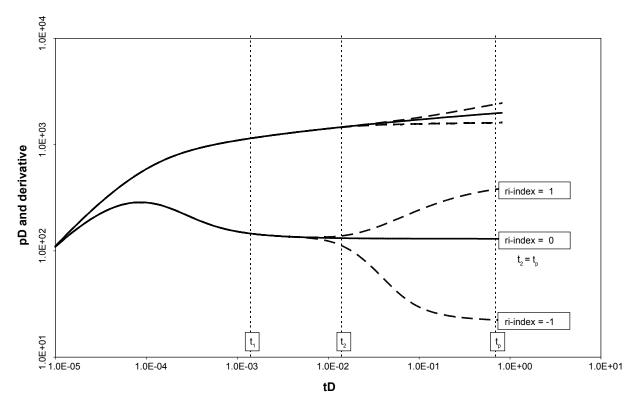


Figure 4-4. Schematic plot of the assignments for the ri-indices.

#### Calculation of the radius of influence

The radius of influence (ri) is calculated as follows:

$$ri = 1.89 \times \sqrt{\frac{T_T}{S_T} \times t_2}$$
 [m]

- $T_T$  recommended inner zone transmissivity [m<sup>2</sup>/s].
- t<sub>2</sub> time when hydraulic formation properties changes (see previous chapter) [s].
- $S_T$  for the calculation of the ri the storage coefficient (S) is estimated from the transmissivity /Rhén et al. 1997/:

 $S_{\rm T} = 0.0007 \times T_{\rm T}^{-0.5} \ [-]$ 

#### 4.5.6 Steady state analysis

In addition to the type curve analysis, an interpretation based on the assumption of stationary conditions was performed as described by /Moye 1967/.

#### 4.5.7 Flow models used for analysis

The flow models used in analysis were derived from the shape of the pressure derivative calculated with respect to log time and plotted in log-log coordinates.

In several cases the pressure derivative suggests a change of transmissivity with the distance from the borehole. In such cases a composite flow model was used in the analysis.

If there were different flow models matching the data in comparable quality, the simplest model was preferred.

The flow dimension displayed by the test can be diagnosed from the slope of the pressure derivative. A slope of 0.5 indicates linear flow, a slope of 0 (horizontal derivative) indicates radial flow and a slope of -0.5 indicates spherical flow. The flow dimension diagnosis was commented for each of the tests. At tests where a flow regime could not clearly identified from the test data, we assume in general a radial flow regime as the most simple flow model available. The value of p\* was then calculated according to this assumption.

In cases when the infinite acting radial flow (IARF) phase was not supported by the data the derivative was extrapolated using the most conservative assumption, which is that the derivative would stabilise short time after test end. In such cases the additional uncertainty was accounted for in the estimation of the transmissivity confidence ranges.

# 4.5.8 Calculation of the static formation pressure and equivalent freshwater head

The static formation pressure (p\*) measured at transducer depth, was derived from the pressure recovery (CHir) following the constant pressure injection phase by using:

- (1) straight line extrapolation in cases infinite acting radial flow (IARF) occurred.
- (2) type curve extrapolation in cases infinite acting radial flow (IARF) is unclear or was not reached.

The equivalent freshwater head (expressed in metres above sea level) was calculated from the extrapolated static formation pressure (p\*), corrected for athmospheric pressure measured by the surface gauge and corrected for the vertical depth considering the inclination of the drill hole, by assuming a water density of 1,000 kg/m<sup>3</sup> (freshwater). The equivalent freshwater head is the static water level an individual test interval would show if isolated and connected to the surface by tubing full of freshwater. Figure 4-4 shows the methodology schematically.

The freshwater head in metres above sea level is calculated as following:

$$head = \frac{(p*-p_{atm})}{\rho \cdot g}$$

which is the p\* value expressed in a water column of freshwater.

With consideration of the elevation of the reference point (RP) and the gauge depth (Gd), the freshwater head  $h_{iwf}$  is:

$$h_{iwf} = RP_{elev} - Gd + \frac{(p^* - p_{atm})}{\rho \cdot g}$$

# 4.5.9 Derivation of the recommended transmissivity and the confidence range

In most of the cases more than one analysis was conducted on a specific test. Typically both test phases were analysed (CHi and CHir) and in some cases the CHi or the CHir phase was analysed using two different flow models. The parameter sets (i.e. transmissivities) derived from the individual analyses of a specific test usually differ. In the case when the differences are small (which is typically the case) the recommended transmissivity value is chosen from the test phase that shows the best data and derivative quality.

In cases when the difference in results of the individual analyses was large (more than half order of magnitude) the test phases were compared and the phase showing the best derivative quality was selected.

The confidence range of the transmissivity was derived using expert judgement. Factors considered were the range of transmissivities derived from the individual analyses of the test as

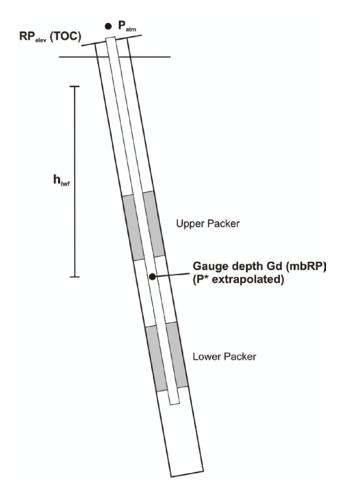


Figure 4-5. Schematic methodologies for calculation of the freshwater head.

well as additional sources of uncertainty such as noise in the flow rate measurement, numeric effects in the calculation of the derivative or possible errors in the measurement of the wellbore storage coefficient. No statistical calculations were performed to derive the confidence range of transmissivity.

In cases when changing transmissivity with distance from the borehole (composite model) was diagnosted, the transmissivity of the zone, which was showing the better derivative quality, was recommended.

In cases when the infinite acting radial flow (IARF) phase was not supported by the data the additional uncertainty was accounted for in the estimation of the transmissivity confidence ranges.

## 4.6 Nonconformities

No nonconformities occurred during the performance of the hydraulics tests in KLX16A.

# 5 Results

In the following, results of all tests are presented and analysed. Chapters 5.1, 5.2 and 5.3 present the 100 m, 20 m and the single packer tests, respectively. The results are given as general comments to test performance, the identified flow regimes and calculated parameters and finally the parameters which are considered as most representative are chosen and justification is given. All results are also summarised in Table 6-1 and 6-2 of the Summary chapter. In addition, the results are presented in appendices 3 and 5.

The results are stored in the primary data base (SICADA). The SICADA data base contains data that will be used for further interpretation (modelling). The data are traceable in SICADA by the Activity Plan number (AP PS 400-07-008; SKB controlling document).

# 5.1 100 m single-hole injection tests

In the following, the 100 m section tests conducted in borehole KLX16A are presented and analysed.

#### 5.1.1 Section 13.00–113.00 m, test no. 1 and 2, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test in test no.1 indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) without a preliminary pulse test was conducted. The SIT did not work during this injection test. Therefore the valve was replaced and the injection test was repeated in test 2. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 162 kPa. No hydraulic connection to the adjacent sections was observed during the CHi phase. The injection rate decreased from 39.9 L/min at start of the CHi phase to 22.1 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the CHi phase shows a derivative with a continuous upward slope throughout the test time, indicating a decrease of transmissivity at some distance from the borehole. A two shell composite model with radial flow was chosen for the analysis of the CHi phase. The derivative of the CHi phase shows, after a short period of horizontal stabilization at early times, also a continuous upward slope at middle and late times. A two shell composite model with radial flow, wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-1.

#### Selected representative parameters

The recommended transmissivity of  $7.2 \cdot 10^{-5}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (inner zone), which shows a short time of horizontal stabilization and good data and derivative quality. The confidence range for the interval transmissivity is estimated to be

 $1.0 \cdot 10^{-5}$  m<sup>2</sup>/s to  $3.0 \cdot 10^{-4}$  m<sup>2</sup>/s. The flow dimension during the test was assumed to be 2 (radial flow). The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,038.2 kPa.

The analyses of the CHi and CHir phases show good consistency. No further analysis is recommended.

#### 5.1.2 Section 112.00-212.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 54 kPa. No hydraulic connection to the adjacent sections was observed during the CHi phase. The injection rate decreased from 39.1 L/min at start of the CHi phase to 33.8 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a derivative with a horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The response of the CHir phase is a bit noisy but indicates a transition from wellbore storage and skin dominated flow to pure formation flow. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-2.

#### Selected representative parameters

The recommended transmissivity of  $1.6 \cdot 10^{-4}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase, which shows a better horizontal stabilization than the CHi phase. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-5}$  m<sup>2</sup>/s to  $4.0 \cdot 10^{-4}$  m<sup>2</sup>/s. The flow dimension displayed during the test was 2. The static pressure measured at transducer depth, was derived from the CHir phase using type curve extrapolation in the Horner plot to a value of 1,900.3 kPa.

The analyses of the CHi and CHir phases show good consistency. No further analysis is recommended.

#### 5.1.3 Section 212.00-312.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a relatively high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 195 kPa. No hydraulic connection to the adjacent sections was observed during the CHi phase. The injection rate decreased from

32.4 L/min at start of the CHi phase to 17.0 L/min at the end, indicating a relatively high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test, both phases (CHi and CHir) show a derivative with a short horizontal part at early time followed by a downward slope at middle time, which finally tends to horizontal stabilization at late times, indicating radial flow. The CHi phase was analysed using a two shell composite radial flow model with an increasing transmissivity at some distance to the borehole. Similar to the CHi phase, a composite radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-3.

#### Selected representative parameters

The recommended transmissivity of  $5.0 \cdot 10^{-5}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (outer zone), which shows a good horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $2.0 \cdot 10^{-5}$  m<sup>2</sup>/s to  $8.0 \cdot 10^{-5}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,784.4 kPa.

The analyses of the CHi and CHir phases show good consistency. No further analysis is recommended.

#### 5.1.4 Section 312.00–412.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 198 kPa. A slight hydraulic connection to the adjacent sections was observed during the CHi phase. With the start of the injection, the pressure in the section below increased by 8 kPa and kept following its general downward trend since inflating the packers. The pressure graph of the section above the interval shows three small peaks (up to 20 kPa) 10–15 min after start of the injection. The injection rate decreased from 0.40 L/min at start of the CHi phase to 0.17 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a derivative with an upward slope at early and middle times, which finally tends to horizontal stabilization at late times, indicating radial flow. The CHi phase was analysed using a two shell composite radial flow model with a decreasing transmissivity at some distance to the borehole. Similar to the CHi phase, the CHir phase shows an upward trend but does not reach horizontal stabilization finally. A composite radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-4.

#### Selected representative parameters

The recommended transmissivity of  $6.4 \cdot 10^{-8}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (outer zone), which shows a better derivative quality than the CHi phase. The confidence range for the interval transmissivity is estimated to be  $1.0 \cdot 10^{-8}$  m<sup>2</sup>/s to  $2.0 \cdot 10^{-07}$  m<sup>2</sup>/s. The flow dimension displayed during the test was 2. The static pressure measured at transducer depth, was derived from the CHir phase using type curve extrapolation in the Horner plot to a value of 3,645.8 kPa.

The analyses of the CHi and CHir phases show good consistency. No further analysis is recommended.

# 5.2 20 m single-hole injection tests

In the following, the 20 m section tests conducted in borehole KLX16A are presented and analysed.

## 5.2.1 Section 12.50-32.50 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 187 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 38.9 L/min at start of the CHi phase to 26.0 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the CHi phase shows a derivative with a continuous upward slope throughout the test phase and does not reach a horizontal stabilization. The CHi phase was analysed using a two shell composite radial flow model with a decreasing transmissivity at some distance to the borehole. Similar to the CHi phase, the CHir phase shows an upward trend without reaching horizontal stabilization. A composite radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-5.

#### Selected representative parameters

The recommended transmissivity of  $6.2 \cdot 10^{-5}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase (inner zone), which gives the best hint of the interval transmissivity because neither derivative shows horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $1.0 \cdot 10^{-5}$  m<sup>2</sup>/s to  $2.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension during the test was assumed to be 2. The static pressure measured at transducer depth, was derived from the CHir phase using type curve extrapolation in the Horner plot to a value of 335.2 kPa.

The analyses of the CHi and CHir phases show some inconsistency.

#### 5.2.2 Section 32.50–52.50 m, test no. 1 and 2, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. Test one was repeated due to a leakage in a packer line. Test 2 was conducted without problems. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. The first injection phase of the second test was very noisy. Therefore this injection phase was stopped and a second injection was conducted. Only the CHi and CHir phases of the second injection were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 203 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.73 L/min at start of the CHi phase to 0.25 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase data and derivative are noisy throughout the test phase. An average of the derivative can be considered as horizontal stabilization, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The CHir phase shows a transition from wellbore storage and skin dominated flow to pure formation flow and reaches horizontal stabilization at late times. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-6.

#### Selected representative parameters

The recommended transmissivity of  $5.4 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase, which shows the better derivative quality. The confidence range for the interval transmissivity is estimated to be  $3.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $7.0 \cdot 10^{-7}$  m<sup>2</sup>/s. The flow dimension displayed during the test was 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 496.3 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

## 5.2.3 Section 52.50–72.50 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 198 kPa. No hydraulic connection to the adjacent sections was observed. The system needed some time to get stable pressure conditions. The early time data of the Chi phase are not analysable. The injection rate decreased from 96 mL/min at start of the CHi phase to 88 mL/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the CHi phase derivative is quite noisy throughout the test phase. An average of the derivative can be considered as horizontal stabilization, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The pressure response of the CHir phase shows wellbore storage and skin dominated flow but does not reach horizontal stabilization. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-7.

#### Selected representative parameters

The recommended transmissivity of  $2.3 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase, which shows the better derivative quality. The confidence range for the interval transmissivity is estimated to be  $6.0 \cdot 10^{-8}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-7}$  m<sup>2</sup>/s. A flow dimension of 2 was assumed for the test. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 663.8 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

### 5.2.4 Section 72.50–92.50 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 200 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.34 L/min at start of the CHi phase to 0.24 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase derivative is noisy but shows a trend to horizontal stabilization throughout the test phase, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The CHir phase shows a transition from wellbore storage and skin dominated flow to pure formation flow with horizontal stabilization at late time. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-8.

#### Selected representative parameters

The recommended transmissivity of  $5.1 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a more continuous horizontal stabilization than the CHir phase. The confidence range for the interval transmissivity is estimated to be  $2.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $8.0 \cdot 10^{-7}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 840.8 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

### 5.2.5 Section 91.00–111.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. A first injection was aborted due to a malfunction of the regulation unit. After a restart the system worked properly. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 228 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.99 L/min at start of the CHi phase to 0.51 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is noisy but shows a horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows a downward trend at late times. This indicates a transition from wellbore storage and skin dominated flow to pure formation flow. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-9.

#### Selected representative parameters

The recommended transmissivity of  $5.5 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $2.0 \cdot 10^{-07}$  m<sup>2</sup>/s to  $8.0 \cdot 10^{-7}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,001.7 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

#### 5.2.6 Section 111.00–131.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 199 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.14 L/min at start of the CHi phase to 0.10 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is noisy but shows a horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows a flattening downward trend which tends to horizontal stabilization at late times. This indicates a transition from wellbore storage and skin dominated flow to pure formation flow. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-10.

#### Selected representative parameters

The recommended transmissivity of  $1.6 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a better horizontal stabilization although the derivative is a bit noisy. The confidence range for the interval transmissivity is estimated to be  $8.0 \cdot 10^{-6}$  m<sup>2</sup>/s to  $4.0 \cdot 10^{-7}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,180.6 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

#### 5.2.7 Section 131.00–151.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 68 kPa. A slight hydraulic connection to the section below the interval was observed. The pressure increased 4 kPa during the injection. The pressure in the section above the interval kept rising slowly since packers had been set. No influence of the injection was observed. The injection rate decreased from 37.8 L/min at start of the CHi phase to 33.5 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is noisy but shows a horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. Despite being noisy, the derivative of the CHir phase shows a horizontal stabilization at late times. This indicates pure formation, radial flow. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-11.

#### Selected representative parameters

The recommended transmissivity of  $2.0 \cdot 10^{-4}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a better horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $4.0 \cdot 10^{-4}$  m<sup>2</sup>/s to  $9.0 \cdot 10^{-4}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,358.9 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.8 Section 150.00–170.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. A first injection was aborted due to a malfunction of the regulation unit. After a restart the system worked properly. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 217 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.90 L/min at start of the CHi phase to 0.41 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

# Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the derivative of the CHi phase is horizontal at early time and steps down to a continuous downward slope at middle and late times. The step occurs due to regulation effects of the injection system. The CHi phase was analysed using a two shell composite radial flow model with an increasing transmissivity at some distance to the borehole. The CHir phase shows a downward trend with a slight change in inclination. This indicates a transition from wellbore storage and skin dominated flow to pure formation flow. A composite radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-12.

# Selected representative parameters

The recommended transmissivity of  $5.9 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase (inner zone), which gives the best hint of the interval transmissivity because neither derivative shows horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $1.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $2.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension during the test was assumed to be 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,525.4 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.9 Section 170.00–190.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 244 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.87 L/min at start of the CHi phase to 0.53 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the derivative of the CHi phase shows a downward slope at early and middle times and tends to horizontal stabilization at late time. The CHi phase was analysed using a two shell composite radial flow model with an increasing transmissivity at some distance to the borehole. Similar to the CHi phase, the CHir phase shows a downward slope at middle time and noisy trend of horizontal stabilization at late time. This indicates a change from wellbore storage and skin dominated flow to pure formation flow. A composite radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-13.

### Selected representative parameters

The recommended transmissivity of  $1.7 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (inner zone), which gives the best hint of the interval transmissivity because both derivatives show only an indistinctive horizontal stabilization at late time. The confidence range for the interval transmissivity is estimated to be  $5.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension during the test was assumed to be 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,704.5 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.10 Section 188.00-208.00 m, test no. 1, injection

### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 38.0 mL/min at start of the CHi phase to 14.0 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

#### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is noisy but shows a faint horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows steep downward slope at middle and late times, which is consistent with a high positive skin factor. A homogeneous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-13.

#### Selected representative parameters

The recommended transmissivity of  $1.2 \cdot 10^{-8}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows the better derivative quality. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $6.0 \cdot 10^{-8}$  m<sup>2</sup>/s. The flow dimension displayed during the

test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 1,865.2 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.11 Section 207.00-227.00 m, test no. 1, injection

### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 198 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 26.5 L/min at start of the CHi phase to 20.1 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase is a little noisy but shows a trend of horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. Similar to the CHi phase, the CHir phase shows a noisy trend of horizontal stabilization at late time. A homogenous radial flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-15.

#### Selected representative parameters

The recommended transmissivity of  $5.3 \cdot 10^{-5}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows the best horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $2.0 \cdot 10^{-5}$  m<sup>2</sup>/s to  $9.0 \cdot 10^{-5}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,032.5 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.12 Section 227.00-247.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 197 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 1.63 L/min at start of the CHi phase to 0.79 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The Chir phase shows very fast recovery; therefore the early time data of this phase are not analysable. Both phases show no problems and are adequate for quantitative analysis.

## Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivatives of the CHi and the CHir phase are a little noisy but show a horizontal stabilization at middle and late times, indicating radial flow. Both phases were analysed using homogeneous radial flow models. The analysis is presented in Appendix 2-16.

#### Selected representative parameters

The recommended transmissivity of  $1.8 \cdot 10^{-6}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows the better derivative quality. The confidence range for the interval transmissivity is estimated to be  $8.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,209.9 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.13 Section 247.00-267.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 200 kPa. A slight hydraulic connection to the section below the interval was observed. The pressure increased by 4 kPa after the start of the injection and kept constant for the rest of the CHi phase. Hydraulic connection to the section above was not observed. The injection rate decreased from 1.55 L/min at start of the CHi phase to 1.25 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows fast recovery. However, the middle and late time data are adequate for quantitative analysis. The Chi phase shows no problems.

# Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivatives of the CHi and the CHir phase are a little noisy but show a horizontal stabilization at middle and late times, indicating radial flow. Both phases were analysed using homogeneous radial flow models. The analysis is presented in Appendix 2-17.

#### Selected representative parameters

The recommended transmissivity of  $2.1 \cdot 10^{-6}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows the better derivative quality. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,385.5 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.14 Section 267.00-287.00 m, test no. 1 and 2, injection

### Comments to test

The first test was aborted due to a leakage in the pipe string. After replacing the damaged pipe the test was repeated. The second test was composed of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases of the second test were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 200 kPa. A hydraulic connection to the section below the interval was observed. During injection the pressure increased to a total of 57 kPa. Hydraulic connection to the section above was not observed. The injection rate decreased from 27.0 L/min at start of the CHi phase to 15.1 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivatives of the CHi phase shows horizontal stabilization at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows a downward slope at middle time, tending to a horizontal stabilization at late time. This indicates a transition from wellbore storage and skin dominated flow to pure formation flow. A two shell composite model with increasing transmissivity was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-18.

#### Selected representative parameters

The recommended transmissivity of  $2.2 \cdot 10^{-5}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a better horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-6}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-5}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,561.4 kPa.

The analyses of the CHi and CHir phases show some inconsistency regarding the chosen flow models. This may attributed to the relative noisy derivative of the CHi phase, which may hide a change of transmissivity in the early time data. The resulting transmissivities of the CHi phase and the CHir phase (outer zone) are consistent. No further analysis is recommended.

# 5.2.15 Section 287.00-307.00 m, test no. 1, injection

#### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 187 kPa. No hydraulic connection to the adjacent zones was observed. The system needed some time to get stable pressure conditions. The injection rate decreased from 2.94 L/min at start of the CHi phase to 0.70 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The middle and late time data of the Chi phase and all data of the CHir phase show no problems and are adequate for quantitative analysis.

### Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a relative flat derivative at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows a downward trend at middle and late times. This is indicative for a transition from wellbore storage and skin dominated flow to pure formation flow. The CHir phase was analysed using a homogeneous radial flow model with wellbore storage and skin. The analysis is presented in Appendix 2-19.

#### Selected representative parameters

The recommended transmissivity of  $1.9 \cdot 10^{-6}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-7}$  m<sup>2</sup>/s to  $5.0 \cdot 10^{-6}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,740.5 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.16 Section 307.00-327.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 204 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 85.0 mL/min at start of the CHi phase to 34.0 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

# Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi and the CHir phase show relatively flat and horizontal derivatives at middle and late times, indicating radial flow. Both phases were analysed using a homogeneous radial flow model. The analysis is presented in Appendix 2-20.

#### Selected representative parameters

The recommended transmissivity of  $1.1 \cdot 10^{-8}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase, which shows a better derivative quality. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-9}$  m<sup>2</sup>/s to  $3.0 \cdot 10^{-8}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 2,911.7 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.17 Section 327.00-347.00 m, test no. 1, pulse injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was prolonged and analysed.

Prior the pulse injection the pressure in the test section rose by 10 kPa within 13 min. During the brief injection phase of the pulse injection a total volume of about 26.3 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 271 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to  $9.7 \cdot 10^{-11}$  m<sup>3</sup>/Pa. It should be noted though that there is uncertainty connected with the determination of the wellbore storage coefficient, which will implicitly translate into uncertainty in the derived transmissivity.

# Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the deconvolved PI pressure derivative shows an upward trend with a horizontal stabilisation at late times. The PI phase was analysed using a composite model with radial flow, wellbore storage and skin. The analysis is presented in Appendix 2-21.

# Selected representative parameters

The recommended transmissivity of  $3.9 \cdot 10^{-11}$  m<sup>2</sup>/s was derived from the analysis of the Pi phase (inner zone). The confidence range for the interval transmissivity is estimated to be  $2.0 \cdot 10^{-11}$  to  $2.0 \cdot 10^{-10}$  m<sup>2</sup>/s. The analysis was conducted using a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

# 5.2.18 Section 347.00-367.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 200 kPa. A hydraulic connection to the zone below the section was observed. The pressure increased during the whole CHi phase up to a total of 24 kPa and began to decrease slowly after the start of the recovery phase. No hydraulic connection to the zone above the section was observed. The injection rate decreased from 0.19 L/min at start of the CHi phase to 0.09 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

# Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the CHi phase shows a relative flat derivative at middle and late times, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows a slight downward trend at middle and late times without reaching horizontal stabilization. This is indicative for

a transition from wellbore storage and skin dominated flow to pure formation flow. The CHi phase was analysed using a homogeneous radial flow model with wellbore storage and skin. The analysis is presented in Appendix 2-22.

## Selected representative parameters

The recommended transmissivity of  $6.7 \cdot 10^{-8}$  m<sup>2</sup>/s was derived from the analysis of the CHi phase, which shows a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $3.0 \cdot 10^{-8}$  m<sup>2</sup>/s to  $8.0 \cdot 10^{-8}$  m<sup>2</sup>/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3,254.3 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.19 Section 367.00-387.00 m, test no. 1, injection

### Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 188 kPa. No hydraulic connection to the adjacent sections was observed. The injection rate decreased from 0.46 L/min at start of the CHi phase to 0.08 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

# Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the derivative of the CHi phase shows an upward slope at early and middle times, indicating a decreasing transmissivity at some distance from the borehole. A short time of horizontal stabilization is followed by a downward slope at late time. The CHi phase was analysed using a two shell composite radial flow model. The pressure response of the CHir phase is consistent to the CHi phase. Therefore a composite radial flow model with wellbore storage, skin and a decreasing transmissivity at some distance from the borehole was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-23.

# Selected representative parameters

The recommended transmissivity of  $2.9 \cdot 10^{-7}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (inner zone), which gives the best hint of the interval transmissivity because both derivatives don't reach horizontal stabilization at late time. The confidence range for the interval transmissivity is estimated to be  $9.0 \cdot 10^{-8}$  m<sup>2</sup>/s to  $7.0 \cdot 10^{-7}$  m<sup>2</sup>/s. The flow dimension during the test was assumed to be 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3,425.7 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.20 Section 387.00-407.00 m, test no. 1, injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the recovery of the pulse test indicated a medium to low formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted with a pressure difference of 211 kPa. A very slight hydraulic connection to the section below was observed. The injection rate decreased from 41.6 mL/min at start of the CHi phase to 16.5 L/min at the end, indicating a medium to low interval transmissivity (consistent with the pulse recovery). Both phases show no problems and are adequate for quantitative analysis.

# Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the derivative of the CHi phase shows noisy early time data and a continuous upward slope at middle and late times. The CHi phase was analysed using a two shell composite radial flow model with a decreasing transmissivity at some distance from the borehole. The pressure response of the CHir phase shows a downward hump at middle times followed by a horizontal stabilisation at late times. Therefore a composite radial flow model with wellbore storage, skin and a decreasing transmissivity at some distance from the borehole was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-24.

# Selected representative parameters

The recommended transmissivity of  $1.5 \cdot 10^{-8}$  m<sup>2</sup>/s was derived from the analysis of the CHir phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be  $8.0 \cdot 10^{-9}$  m<sup>2</sup>/s to  $4.0 \cdot 10^{-8}$  m<sup>2</sup>/s. The flow dimension displayed during the test was 2. The static pressure measured at transducer depth, was derived from the CHir phase using straight line extrapolation in the Horner plot to a value of 3,629.4 kPa.

The analyses of the CHi and CHir phases show consistency. No further analysis is recommended.

# 5.2.21 Section 406.00-426.00 m, test no. 1, pulse injection

# Comments to test

The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The very slow recovery of the pulse test indicated a very low formation transmissivity. Based on this result no constant pressure injection test was performed. Instead, the recovery of the pulse injection test was prolonged and analysed.

Prior the pulse injection the pressure in the test section rose by 8 kPa within 15 min. During the brief injection phase of the pulse injection a total volume of about 7.6 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 231 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to  $3.3 \cdot 10^{-11}$  m<sup>3</sup>/Pa. It should be noted though that there is uncertainty connected with the determination of the wellbore storage coefficient, which will implicitly translate into uncertainty in the derived transmissivity. Due to a low transmissivity in the lower part of the borehole (see single packer test) a squeeze occurred in the section below as packers were set. At the start of the pulse test the pressure in the section below increased by 54 kPa. Most likely this was another squeeze and the pressure response was just a mirror of what happened in the test section. Similar effects or hydraulic connection to the section above were not observed.

## Flow regime and calculated parameters

For the interpretation a flow dimension of 2 (radial flow) was assumed. In case of the present test the Pi pressure derivative shows a continuous upward trend with a slight change of inclination throughout the test. Horizontal stabilisation was not reached. The Pi phase was analysed using a composite model with radial flow, wellbore storage and skin. The analysis is presented in Appendix 2-25.

#### Selected representative parameters

The recommended transmissivity of  $9.3 \cdot 10^{-12}$  m<sup>2</sup>/s was derived from the analysis of the Pi phase (inner zone). The confidence range for the interval transmissivity is estimated to be  $5.0 \cdot 10^{-12}$  to  $5.0 \cdot 10^{-11}$  m<sup>2</sup>/s. The analysis was conducted using a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

# 5.3 Single packer injection test

In the following the single packer test conducted in borehole KLX 16A is presented and analysed.

# 5.3.1 Section 421.10–433.55 m, single packer, test no. 1, pulse injection

# Comments to test

For the single packer test the tool was build like a double packer system with 5 m interval length. The inflation line for the bottom packer has been plugged so only the top packer was inflated. The test design consisted of a preliminary pulse injection test conducted with the goal of deriving a first estimate of the formation transmissivity. The pressure response and the very slow recovery of the pulse test indicated a very low formation transmissivity. Therefore the recovery of the pulse injection test was prolonged and analysed.

Prior the pulse injection the pressure in the test section rose by 4 kPa within 9 min. During the brief injection phase of the pulse injection a total volume of about 7.3 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 247 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to  $3.0 \cdot 10^{-11}$  m<sup>3</sup>/Pa. It should be noted though that there is uncertainty connected with the determination of the wellbore storage coefficient, which will implicitly translate into uncertainty in the derived transmissivity. Subsequently a constant pressure injection phase (CHi) was conducted with a pressure difference of 261 kPa. No hydraulic connection to the section above was observed. During injection the rate decreased from 28.7 mL/min at start of the CHi phase and dropped below 1.0 mL/min at the end, indicating a very low interval transmissivity (consistent with the pulse recovery). The recovery phase (CHir) could not be conducted because the shut-in tool did not work. Most likely it was stuck due to mud in the lowest part of the borehole. Therefore, only the PI phase was analysed quantitatively.

# Flow regime and calculated parameters

The flow dimension is interpreted from the slope of the semi-log derivative plotted in log-log coordinates. In case of the present test the Pi pressure derivative shows an upward trend at early and middle times and a horizontal stabilisation at late times, indicating radial flow. The Pi phase was analysed using a radial flow composite model with wellbore storage and skin. The analysis is presented in Appendix 2-26.

## Selected representative parameters

The recommended transmissivity of  $5.4 \cdot 10^{-11}$  m<sup>2</sup>/s was derived from the analysis of the Pi phase (outer zone) which shows horizontal stabilization. The confidence range for the interval transmissivity is estimated to be  $3.0 \cdot 10^{-11}$  to  $1.0 \cdot 10^{-10}$  m<sup>2</sup>/s and encompasses the inner zone transmissivity. The flow dimension displayed during the test was 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

# 6 Summary of results

This chapter summarizes the basic test parameters and analysis results. In addition, the correlation between steady state and transient transmissivities as well as between the matched and the theoretical wellbore storage (WBS) coefficient are presented and discussed.

# 6.1 General test data and results

Table 6-1. General test data from hydraulic tests in KLX16A (for nomenclature see appendix 4 and below).	
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Borehole sec up [m bToC]	Borehole sec low [m bToC]	Date and Time for test start YYMMDD hh:mm	Date and Time for test stop YYMMDD hh:mm	Q <sub>p</sub> (m³/s)	Q <sub>m</sub> (m³/s)	t <sub>p</sub> (s)	t <sub>F</sub> (s)	p₀ (kPa)	p <sub>i</sub> (kPa)	p <sub>p</sub> (kPa)	p <sub>⊧</sub> (kPa)	te <sub>w</sub> (°C)	Test phases measured, Analysed test phases marked bold
13.00	113.00	070313 09:41	070313 12:22	3.69E-04	4.51E-04	1,800	3,600	1,023	1,031	1,193	1,062	8.3	CHi / <b>CHir</b>
112.00	212.00	070313 14:12	070313 16:02	5.63E-04	5.84E-04	1,800	1,800	1,901	1,900	1,954	1,902	9.6	CHi / CHir
212.00	312.00	070313 17:54	070313 19:46	2.85E-04	2.95E-04	1,800	1,800	2,788	2,789	2,984	2,785	11.0	CHi / CHir
312.00	412.00	070313 21:41	070313 23:41	2.95E-06	3.67E-06	1,800	1,800	3,671	3,668	3,866	3,693	12.3	CHi / CHir
12.50	32.50	070314 13:12	070314 14:38	4.37E-04	5.02E-04	1,200	1,200	314	315	502	359	7.8	CHi / CHir
32.50	52.50	070314 22:12	070314 23:57	4.10E-06	4.50E-06	1,200	1,200	487	493	696	496	7.4	CHi / CHir
52.50	72.50	070315 00:34	070315 02:39	1.47E-06	1.52E-06	1,200	3,600	668	668	866	668	7.5	CHi / CHir
72.50	92.50	070315 06:50	070315 08:18	4.12E-06	4.27E-06	1,200	1,200	846	841	1,041	845	7.7	CHi / CHir
91.00	111.00	070315 08:52	070315 10:25	8.47E-06	9.15E-06	1,200	1,200	1,010	1,009	1,237	1,009	7.9	CHi / CHir
111.00	131.00	070315 10:59	070315 12:22	1.72E-06	1.78E-06	1,200	1,200	1,187	1,186	1,385	1,186	8.2	CHi / CHir
131.00	151.00	070315 13:31	070315 14:55	5.58E-04	5.76E-04	1,200	1,200	1,365	1,364	1,432	1,365	8.5	CHi / CHir
150.00	170.00	070315 15:35	070315 17:14	6.97E-06	7.33E-06	1,200	1,200	1,529	1,533	1,750	1,532	8.8	CHi / CHir
170.00	190.00	070315 17:51	070315 19:24	8.88E-06	9.17E-06	1,200	1,200	1,710	1,705	1,949	1,709	9.1	CHi / CHir
188.00	208.00	070315 20:00	070315 21:52	2.17E-07	2.50E-07	1,200	2,400	1,866	1,866	2,066	1,865	9.4	CHi / CHir
207.00	227.00	070315 22:44	070316 00:00	3.36E-04	3.43E-04	1,200	1,200	2,034	2,036	2,234	2,033	9.7	CHi / CHir
227.00	247.00	070316 00:47	070316 02:13	1.32E-05	1.35E-05	1,200	1,200	2,215	2,214	2,411	2,214	10.0	CHi / CHir
247.00	267.00	070316 07:36	070316 08:58	2.08E-05	2.17E-05	1,200	1,200	2,393	2,386	2,586	2,383	10.3	CHi / CHir
267.00	287.00	070316 10:58	070316 12:19	2.55E-04	2.63E-04	1,200	1,200	2,582	2,563	2,763	2,564	10.3	CHi / CHir
287.00	307.00	070316 13:27	070316 14:51	1.18E–05	1.27E-05	1,200	1,200	2,741	2,746	2,933	2,746	10.9	CHi / CHir
307.00	327.00	070316 15:27	070316 17:00	5.67E-07	6.83E-07	1,200	1,200	2,919	2,923	3,127	2,947	11.2	CHi / CHir
327.00	347.00	070316 17:41	070316 22:23	#NV	#NV	10	14,400	3,101	3,108	3,380	3,114	11.4	Pi
347.00	367.00	070317 08:35	070317 10:06	1.60E-06	1.77E-06	1,200	1,200	3,276	3,269	3,469	3,281	11.7	CHi / CHir
367.00	387.00	070317 10:38	070317 12:14	1.42E-06	1.75E–06	1,200	1,200	3,444	3,446	3,634	3,463	12.0	CHi / CHir
387.00	407.00	070317 12:48	070317 14:40	2.67E-07	3.22E-07	1,200	2,400	3,621	3,627	3,838	3,642	12.3	CHi / CHir
406.00	426.00	070317 15:37	070317 22:20	#NV	#NV	10	21,600	3,794	3,802	4,042	3,872	12.5	Pi
421.10	433.55	070318 19:10	070318 22:51	#NV	#NV	10	9,420	3,788	3,792	4,053	3,806	12.5	Pi

Nomenclature	
Q <sub>p</sub>	Flow in test section immediately before stop of flow [m³/s].
Q <sub>m</sub>	Arithmetical mean flow during perturbation phase [m <sup>3</sup> /s].
t <sub>p</sub>	Duration of perturbation phase [s].
t <sub>f</sub>	Duration of recovery phase [s].
p <sub>0</sub>	Pressure in borehole before packer inflation [kPa].
pi	Pressure in test section before start of flowing [kPa].
p <sub>p</sub>	Pressure in test section before stop of flowing [kPa].
p <sub>F</sub>	Pressure in test section at the end of the recovery [kPa].
Te <sub>w</sub>	Temperature in test section.
Test phases	CHi Constant Head injection phase.
	CHir: Recovery phase following the constant head injection phase.
	Pi: Pulse injection phase.
#NV	not analysed/no values.

Interval	position		-	Transient	analysis													
	parame		parameters		Flow regime		Formation parameters						Static conditions					
up m btoc	low m btoc	Q/s m²/s	T <sub>M</sub> m²/s	Perturb. Phase	Recovery Phase	T <sub>f1</sub> m²/s	T <sub>f2</sub> m²/s	T <sub>s1</sub> m²/s	T <sub>s2</sub> m²/s	T⊤ m²/s	T <sub>TMIN</sub> m²/s	Τ <sub>τΜΑΧ</sub> m²/s	C m³/Pa	ξ _	dt₁ min	dt₂ min	p* kPa	h <sub>wif</sub> m.a.s.l.
13.00	113.00	2.2E-05	2.9E-05	22	WBS22	5.5E-05	9.1E–06	7.2E–05	1.2E–05	7.2E–05	1.0E–05	3.0E-04	3.4E-09	1.6	0.14	0.50	1,038.2	12.82
112.00	212.00	1.0E–04	1.3E–04	2	WBS2	2.2E-04	#NV	1.6E–04	#NV	1.6E–04	9.0E-05	4.0E-04	1.8E–08	-0.3	1.06	11.10	1,900.3	11.31
212.00	312.00	1.4E-05	1.9E–05	22	WBS22	1.7E–05	5.1E–05	8.5E-06	5.0E–05	5.0E–05	2.0E-05	8.0E-05	6.7E–09	-3.9	5.12	17.88	2,784.4	11.31
312.00	412.00	1.5E–07	1.9E-07	22	WBS22	1.6E–07	6.9E–08	2.5E-07	6.4E–08	6.4E–08	1.0E-08	2.0E-07	4.7E-10	-2.5	#NV	#NV	3,645.8	9.36
12.50	32.50	2.3E-05	2.4E-05	22	WBS22	6.2E–05	7.0E-06	2.1E-04	1.9E–05	6.2E–05	1.0E-05	2.0E-06	1.0E-07	8.6	#NV	#NV	335.2	14.04
32.50	52.50	2.0E-07	2.1E–07	2	WBS2	1.6E–07	#NV	5.4E-07	#NV	5.4E-07	3.0E-07	7.0E–07	2.9E-10	12.1	1.66	8.09	496.3	12.34
52.50	72.50	7.3E-08	7.6E–08	2	WBS2	1.9E–07	#NV	2.3E-07	#NV	2.3E-07	6.0E-08	5.0E-07	4.2E-10	17.6	#NV	#NV	663.8	11.31
72.50	92.50	2.2E-07	2.1E–07	2	WBS2	5.1E–07	#NV	8.6E-07	#NV	5.1E–07	2.0E-07	8.0E-07	6.8E-07	12.5	0.15	10.26	840.8	11.24
91.00	111.00	3.8E-07	3.6E-07	2	WBS2	5.5E-07	#NV	1.6E-06	#NV	5.5E-07	2.0E-07	8.0E-07	5.0E-09	5.9	1.67	14.58	1,001.7	10.92
111.00	131.00	8.5E-08	8.9E-08	2	WBS2	1.6E–07	#NV	2.0E-07	#NV	1.6E–07	8.0E-06	4.0E-07	2.1E–11	5.2	2.48	15.84	1,180.6	11.07
131.00	151.00	8.1E-05	8.4E-05	2	WBS2	2.0E-04	#NV	1.5E-04	#NV	2.0E-04	4.0E-04	9.0E-04	1.6E–08	5.6	0.95	15.42	1,358.9	11.16
150.00	170.00	3.2E-07	3.3E-07	22	WBS22	5.9E-07	1.2E-06	5.1E–07	1.2E–06	5.9E-07	1.0E–07	2.0E-06	8.3E-10	4.8	#NV	#NV	1,525.4	10.98
170.00	190.00	3.6E-07	3.7E-07	22	WBS22	4.1E-07	1.3E–06	1.7E–07	1.1E–06	1.7E-07	5.0E-07	5.0E-06	1.3E-10	-1.9	0.06	0.37	1,704.5	11.18
188.00	208.00	1.1E–08	1.1E–08	2	WBS2	1.2E–08	#NV	4.7E-08	#NV	1.2E-08	9.0E-07	6.0E–08	5.2E–11	1.6	1.5	17.8	1,865.2	11.34
207.00	227.00	1.7E–05	1.7E–05	2	WBS2	5.3E–05	#NV	5.8E-05	#NV	5.3E-05	1.0E–05	9.0E-05	5.1E–11	10.5	0.97	19.98	2,032.5	11.27
227.00	247.00	6.6E-07	6.7E-07	2	WBS2	1.8E-06	#NV	4.1E-06	#NV	1.8E-06	8.0E-07	5.0E-06	7.1E–11	9.7	0.86	14.10	2,209.9	11.32
247.00	267.00	1.0E-06	1.1E–06	2	WBS2	2.1E-06	#NV	6.4E-06	#NV	2.1E-06	9.0E-07	5.0E-06	6.2E-11	6.1	0.46	15.18	2,385.5	11.19
267.00	287.00	1.3E–05	1.3E-05	2	WBS22	2.2E-05	#NV	3.8E-06	1.9E–05	2.2E-05	9.0E-06	5.0E-05	3.2E-10	2.4	0.56	18.48	2,561.4	11.08
287.00	307.00	6.2E-07	6.5E-07	2	WBS2	1.9E-06	#NV	2.7E-06	#NV	1.9E–06	9.0E-07	5.0E-06	2.5E-09	11.9	1.30	15.72	2,740.5	11.34
307.00	327.00	2.7E-08	2.9E-08	2	WBS2	1.4E-08	#NV	1.1E–08	#NV	1.1E–08	9.0E-09	3.0E-08	3.9E-11	-1.9	2.05	18.30	2,911.7	10.80
327.00	347.00	#NV	#NV	#NV	22	#NV	#NV	4.3E-10	3.9E–11	3.9E–11	2.0E-11	2.0E-10	9.7E–11	-0.2	#NV	#NV	#NV	#NV
347.00	367.00	7.9E-08	8.2E-08	2	WBS2	6.7E–08	#NV	4.2E-08	#NV	6.7E–08	3.0E-08	8.0E-08	9.7E-10	-0.5	0.57	17.04	3,254.3	9.84
367.00	387.00	7.4E-08	7.7E–08	22	WBS22	2.4E-07	4.4E-08	2.9E-07	3.3E-08	2.9E-07	9.0E-08	7.0E-07	7.4E–11	1.3	0.17	0.34	3,425.7	9.35
387.00	407.00	1.2E-08	1.3E–08	22	WBS22	1.1E–08	4.8E-09	1.5E–08	8.4E-09	1.5E–08	8.0E-09	4.0E-08	5.7E–11	0.2	0.17	0.32	3,629.4	12.17
406.00	426.00	#NV	#NV	#NV	22	#NV	#NV	9.3E-12	3.5E-12	9.3E-12	5.0E-12	5.0E-11	3.3E–11	-1.4	#NV	#NV	#NV	#NV
421.10	433.55	#NV	#NV	#NV	22	#NV	#NV	9.9E-11	5.4E-11	5.4E-11	3.0E-11	1.0E-10	3.0E-11	0.2	12.88	48.07	#NV	#NV

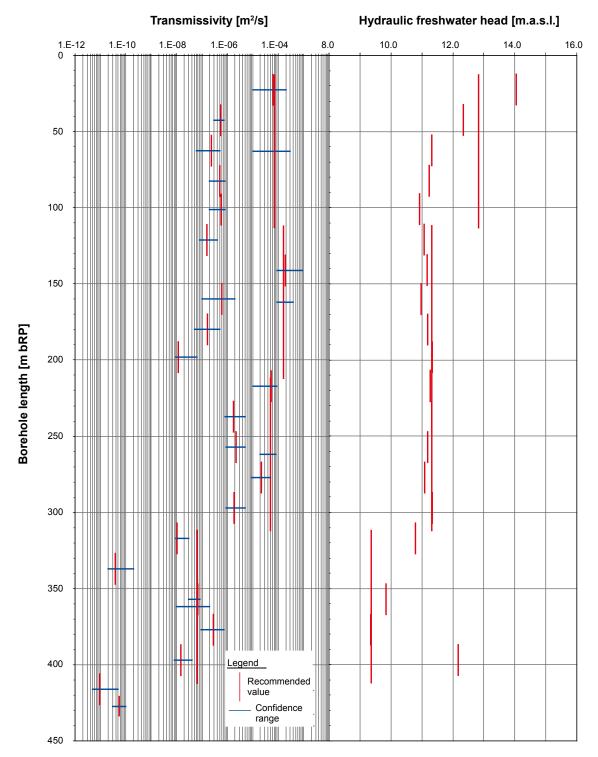
# Table 6-2. Results from analysis of hydraulic tests in KLX16A (for nomenclature see appendix 4 and below).

#### Nomenclature

Q/s	Specific capacity.
T <sub>M</sub>	Transmissivity according to /Moye 1967/.
Flow regime	The flow regime description refers to the recommended model used in the transient analysis. WBS denotes wellbore storage and skin and is followed by a set of numbers describing the flow dimension used in the analysis (1 = linear flow, 2 = radial flow, 3 = spherical flow). If only one number is used (e.g. WBS2 or 2) a homogeneous flow model (1 composite zone) was used in the analysis, if two numbers are given (WBS22 or 22) a 2 zones composite model was used.
T <sub>f</sub>	Transmissivity derived from the analysis of the perturbation phase (CHi). In case a homogeneous flow model was used only one $T_f$ value is reported, in case a two zone composite flow model was used both $T_{f1}$ (inner zone) and $T_{f2}$ (outer zone) are given.
Ts	Transmissivity derived from the analysis of the recovery phase (CHir or Pi). In case a homogeneous flow model was used only one $T_s$ value is reported, in case a two zone composite flow model was used both $T_{s1}$ (inner zone) and $T_{s2}$ (outer zone) are given.
T <sub>T</sub>	Recommended transmissivity.
$T_{TMIN}$	Confidence range lower limit.
T <sub>TMAX</sub>	Confidence range upper limit.
С	Wellbore storage coefficient.
ξ	Skin factor [calculated based on a Storativity of $1\cdot 10^{-6}$ (for tests below 100 m ToC) and on a Storativity of $1\cdot 10^{-3}$ (for tests above 100 m ToC).
dt <sub>1</sub>	Estimated start time of evaluation.
dt <sub>2</sub>	Estimated stop time of evaluation.
p*	The parameter p* denoted the static formation pressure (measured at transducer depth) and was derived from the HORNER plot of the CHir phase using straight line or type-curve extrapolation.
h <sub>wif</sub>	Fresh-water head (based on transducer depth and p*).
#NV	Not analysed/no values.

Borehole secup	Borehole seclow	Recommended Transmissivity	ri-index	Time t₂ for radius of influence calculation	Radius of Influence
[m b ToC]	[m b ToC]	Tt [m²/s]	[-]	[s]	ri [m]
13.00	113.00	7.2E–05	1	30.00	36.04
112.00	212.00	1.6E–04	0	1,800.00	341.39
212.00	312.00	5.0E-05	0	1,800.00	254.33
312.00	412.00	6.4E-08	-1	1,800.00	48.16
12.50	32.50	6.2E–05	1	#NV	#NV
32.50	52.50	5.4E–07	0	1,200.00	66.99
52.50	72.50	2.3E-07	0	3,600.00	93.86
72.50	92.50	5.1E–07	0	1,200.00	66.16
91.00	111.00	5.5E–07	0	1,200.00	67.45
111.00	131.00	1.6E–07	0	1,200.00	49.34
131.00	151.00	2.0E-04	0	1,200.00	293.91
150.00	170.00	5.9E–07	-1	#NV	#NV
170.00	190.00	1.7E–07	-1	22.00	6.79
188.00	208.00	1.2E-08	0	1,200.00	25.90
207.00	227.00	5.3E-05	0	1,200.00	211.34
227.00	247.00	1.8E-06	0	1,200.00	90.26
247.00	267.00	2.1E-06	0	1,200.00	94.65
267.00	287.00	2.2E-05	0	1,200.00	169.48
287.00	307.00	1.9E-06	0	1,200.00	91.51
307.00	327.00	1.1E–08	0	1,200.00	25.05
327.00	347.00	3.9E-11	-1	14,400.00	21.42
347.00	367.00	6.7E–08	0	1,200.00	39.78
367.00	387.00	2.9E-07	1	20.40	7.47
387.00	407.00	1.5E–08	1	19.20	3.44
406.00	426.00	9.3E-12	1	#NV	#NV
421.10	433.55	5.4E–11	-1	9,420.00	18.82

Table 6-3. Results from the ri-index calculation of hydraulic tests in KLX16A (see Chapter 4.5.5 for details and nomenclature).



The Figures 6-1 to 6-3 present the transmissivity, conductivity and hydraulic freshwater head pofiles.

Figure 6-1. Results summary – profiles of transmissivity and equivalent freshwater head extrapolated.

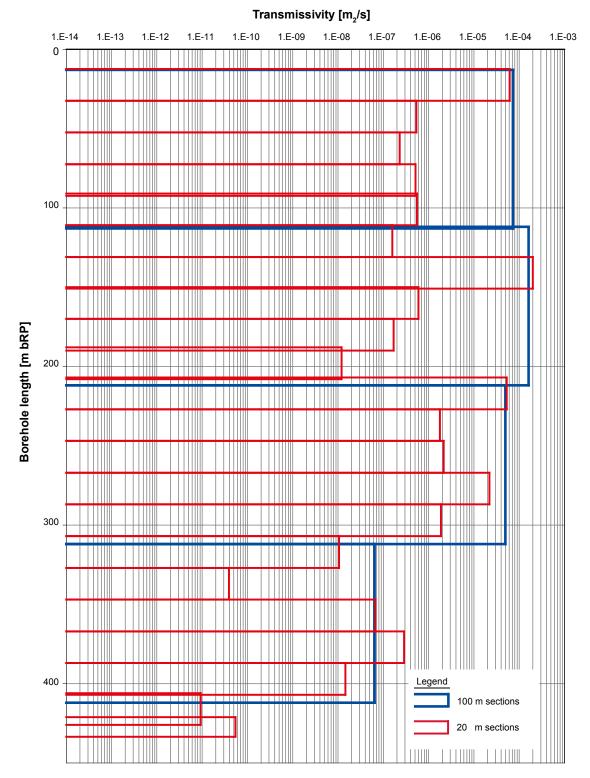


Figure 6-2. Results summary – profile of transmissivity.

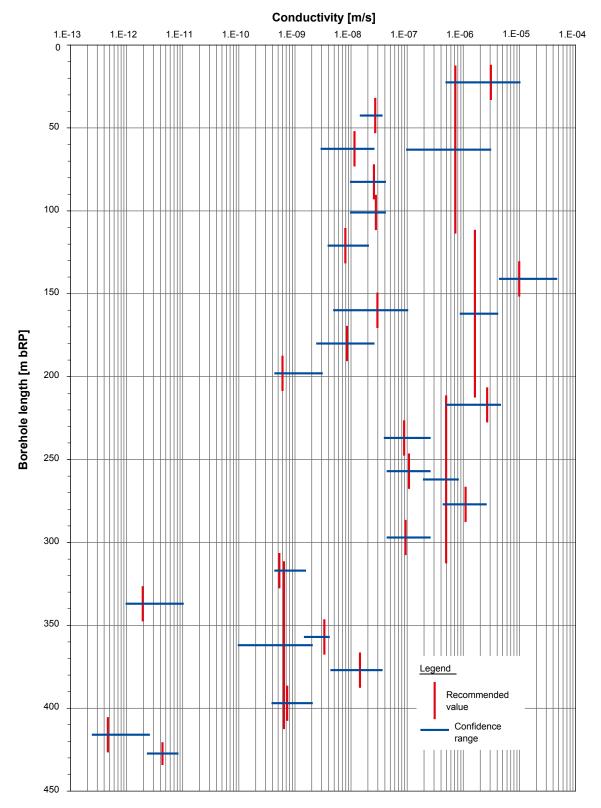


Figure 6-3. Results summary – profile of hydraulic conductivity.

# 6.2 Correlation analysis

A correlation analysis was used with the aim of examining the consistency of results and deriving general conclusion regarding the testing and analysis methods used.

# 6.2.1 Comparison of steady state and transient analysis results

The steady state derived transmissivities  $(T_M)$  and specific capacities (Q/s) were compared in a cross-plot with the recommended transmissivity values derived from the transient analysis (see following figure).

The correlation analysis shows that the transmissivities derived from the steady state analysis differ by less than one order of magnitude from the transmissivities derived from the transient analysis.

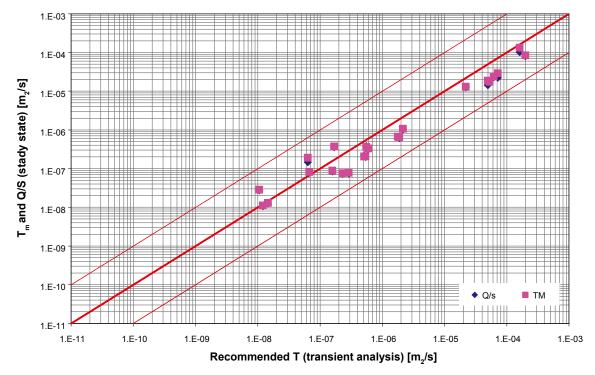


Figure 6-4. Correlation analysis of transmissivities derived by steady state and transient methods.

# 6.2.2 Comparison between the matched and theoretical wellbore storage coefficient

The wellbore storage coefficient describes the capacity of the test interval to store fluid as result to an unit pressure change in the interval. For a closed system (i.e. closed downhole valve) the theoretical value of the wellbore storage coefficient is given by the product between the interval volume and the test zone compressibility. The interval volume is calculated from the borehole radius and interval length. There are uncertainties concerning the interval volume calculation. Cavities or high transmissivity fractures intersecting the interval may enlarge the effective volume of the interval.

The test zone compressibility is given by the sum of compressibilities of the individual components present in the interval (water, packer elements, other test tool components, and the borehole wall). The water compressibility depends on the temperature and salinity. However, for temperature and salinity values as encountered at the Oskarshamn site the water compressibility varies only slightly between  $4.5 \cdot 10^{-10}$  and  $5.0 \cdot 10^{-10}$  1/Pa.

A water compressibility of  $5 \cdot 10^{-10}$  1/Pa and a rock compressibility of  $1 \cdot 10^{-10}$  1/Pa was assumed for the analysis. In addition, the test zone compressibility is influenced by the test tool (packer compliance). The test tool compressibility was calculated as follow:

$$c = \frac{\Delta V}{\Delta p} \times \frac{1}{V} [1/Pa]$$

- $\Delta V$  Volume change of 2 Packers (The volume change was estimated at 7.10<sup>-7</sup> m<sup>3</sup>/100 kPa based on the results of laboratory tests conducted by GEOSIGMA) [m<sup>3</sup>].
- $\Delta p$  Pressure change in test section (usually 2.10<sup>5</sup> Pa) [Pa].
- V Volume in test section [m<sup>3</sup>].

The following table presents the calculated compressibilities for each relevant section length. The average value for the test tool compressibility based on different section length is  $1 \cdot 10^{-10}$  1/Pa.

Length of test section [m]	Volume in test section [m³]	Compressibility [1/Pa]
20	0.091	8·10 <sup>-11</sup>
100	0.454	2·10 <sup>-11</sup>
Average compressibility:		5·10 <sup>-11</sup>

Table 6-4. Test tool compressibility values based on packer displacement.

The sum of the compressibilities (water, rock, test tool) leads to a test zone compressibility with a value of  $7 \cdot 10^{-10}$  1/Pa. This value is used for the calculation of the theoretical wellbore storage coefficient.

The matched wellbore storage coefficient is derived from the transient type curve analysis by matching the unit slope early times derivative plotted in log-log coordinates.

The following figure presents a cross-plot of the matched and theoretical wellbore storage coefficients.

It can be seen that the matched wellbore storage coefficients differ up to three orders of magnitude from the theoretical. This phenomenon was already observed at the previous boreholes. A two or three orders of magnitude increase is difficult to explain by volume uncertainty. Even if large fractures are connected to the interval, a volume increase by two orders of magnitude does not seem probable. This discrepancy is not fully understood, but following hypotheses may be formulated:

- Increased compressibility of the packer system.
- As shown by previous work conducted at site, the phenomenon of increased wellbore storage coefficients can be explained by turbulent flow induced by the test in the vicinity of the borehole. Considering the fact that deviations concerning the wellbore storage rather occur in test sections with a higher transmissivity (which can lead to turbulent flow) seems to rest upon this hypothesis.

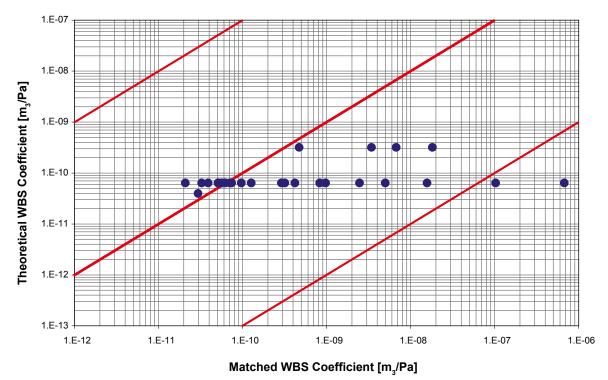


Figure 6-5. Correlation analysis of theoretical and matched wellbore storage coefficients.

# 7 Conclusions

# 7.1 Transmissivity

Figure 6-1 presents a profile of transmissivity, including the confidence ranges derived from the transient analysis. The method used for deriving the recommended transmissivity and its confidence range is described in Section 4.5.9.

Whenever possible, the transmissivities derived are representative for the "undisturbed formation" further away from the borehole. The borehole vicinity was typically described by using a skin effect.

If the conducted preliminary pulse injection (PI) showed a slow recovery the pulse test was prolonged and no further injection test was performed. The pulse test was used for a quantitative analysis. In three cases the preliminary pulse was prolonged and the recommended transmissivities are  $3.9 \cdot 10^{-11} \text{ m}^2/\text{s}$  (Section 327.00-347.00 m),  $9.3 \cdot 10^{-12} \text{ m}^2/\text{s}$  (Section 406.00-426.00 m) and  $5.4 \cdot 10^{-11} \text{ m}^2/\text{s}$  (Section 421.10-433.55 m).

The recommended transmissivities derived from the conducted injection tests (CHi and CHir) range from  $6.4 \cdot 10^{-8}$  m<sup>2</sup>/s to  $1.6 \cdot 10^{-4}$  m<sup>2</sup>/s for 100 m tests and  $1.1 \cdot 10^{-8}$  m<sup>2</sup>/s to  $2.0 \cdot 10^{-4}$  m<sup>2</sup>/s for the 20 m tests.

In two cases the 20 m sections show a higher transmissivity than the appropriate 100 m section. These differences are very small and are covered by the confidence range

# 7.2 Equivalent freshwater head

Figure 6-1 presents a profile of the derived equivalent freshwater head expressed in metres above sea level. The method used for deriving the equivalent freshwater head is described in Section 4.5.8.

The head profile shows a freshwater head that ranges from 9.35 m to 14.04 m.

In general, the uncertainty related to the derived freshwater heads is dependent on the test section transmissivity. Due to the relatively short pressure recovery phase, the static pressure extrapolation becomes increasingly uncertain at lower transmissivities.

# 7.3 Flow regimes encountered

The flow models used in analysis were derived from the shape of the pressure derivative calculated with respect to log time and plotted in log-log coordinates.

In several cases the pressure derivative suggests a change of transmissivity with the distance from the borehole. In such cases a composite flow model was used in the analysis.

If there were different flow models matching the data in comparable quality, the simplest model was preferred.

In some cases very large skins has been observed. This is unusual and should be further examined. There are several possible explanations to this behaviour:

- If the behaviour is to be completely attributed to changes of transmissivity in the formation, this indicates the presence of larger transmissivity zones in the borehole vicinity, which could be caused by steep fractures that do not intersect the test interval, but are connected to the interval by lower transmissivity fractures. The fact that in many cases the test derivatives of adjacent test sections converge at late times seems to support this hypothesis.
- A further possibility is that the large skins are caused by turbulent flow taking place in the tool or in fractures connected to the test interval. This hypothesis is more difficult to examine. However, considering the fact that some high skins were observed in sections with transmissivities as low as 1.10<sup>-8</sup> m<sup>2</sup>/s (which imply low flow rates) seems to speak against this hypothesis.

The flow dimension displayed by the test can be diagnosed from the slope of the pressure derivative. A slope of 0.5 indicates linear flow, a slope of 0 (horizontal derivative) indicates radial flow and a slope of -0.5 indicates spherical flow. The flow dimension diagnosis was commented for each of the tests. In all of the cases it was possible to get a good match quality by using radial flow geometry. In no cases an alternative analysis with a flow dimension unequal to two was performed. The analyses are presented in appendix 2.

# 8 References

**Bourdet D, Ayoub J A, Pirard Y M, 1989.** Use of pressure derivative in well-test interpretation. Coc. Of Petroleum Engineers, SPE Formation Evaluation. pp. 293–302.

**Chakrabarty C, Enachescu C, 1997.** Using the Devolution Approach for Slug Test Analysis: Theory and Application. Ground Water Sept.–Oct. 1997. pp. 797–806.

Gringarten A C, 1986. Computer-aided well-test analysis. SPE Paper 14099.

Horne R N, 1990. Modern well test analysis. Petroway, Inc., Palo Alto, Calif.

Horner D R, 1951. Pressure build-up in wells. Third World Pet. Congress, E.J. Brill, Leiden II, pp. 503–521.

**Jacob C E, Lohman S W, 1952.** Nonsteady flow to a well of constant drawdown in an extensive aquifer. Transactions, American Geophysical Union, Volume 33, No 4, pp. 559–569.

**Moye D G, 1967.** Diamond drilling for foundation exploration. Civil Eng. Trans., Inst. Eng. Australia, Apr. 1967, pp. 95–100.

**Peres A M M, Onur M, Reynolds A C, 1989.** A new analysis procedure for determining aquifer properties from slug test data. Water Resour. Res. v. 25, no. 7, pp. 1591–1602.

**Rhén I, Gustafson G, Wikberg P, 1997**. Äspö HRL – Geoscientific evaluation evaluation 1997/4. Results from pre-investigations and detailed site characterization. Comparisons of predictions and observations. Hydrogeology, groundwater chemistry and transport of solutes. SKB TR-97-05, Svensk Kärnbranslehantering AB.

Rhén I, 2005. Reporting influence radius – proposal (2005-02-09).

**SKB 2001.** Platsundersökningar. Undersökningsmetoder och generellt genomförandeprogram. SKB R-01-10, Svensk Kärnbränslehantering AB.

**SKB 2002.** Execution programme for the initial site investigations at Simpevarp. SKB P-02-06 Svensk Kärnbränslehantering.

**SKB 2006.** Programme for further investigations of bedrock, soil, water and environment in Laxemar subarea. SKB R-06-29, Svensk Kärnbränslehantering AB.

**Theis C V, 1935.** The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage. Trans. Am. Geophys. Union 16:519–524.

Borehole: KLX16 A

# **APPENDIX 1**

File Description Table

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX16A						
TEST- AND FILEPROTOCOL					Testorder dated : 2007-03-12						
Teststart Interval boundaries		es	Name	e of Datafiles	Testtype	Copied to	Plotted	Sign.			
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)			
2007-03-12	20:28	13.00	113.00	KLX16A_0013.00_200703122028.ht2	KLX16A_13.00-113.00_070313_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-13			
2007-03-13	09:41	13.00	113.00	KLX16A_0013.00_200703130941.ht2	KLX16A_13.00-113.00_070313_2_CHir_Q_r.csv	Chir	2007-03-19	2007-03-13			
2007-03-13	14:12	112.00	212.00	KLX16A_0112.00_200703131412.ht2	KLX16A_112.00-212.00_070313_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-13			
2007-03-13	17:54	212.00	312.00	KLX16A_0212.00_200703131754.ht2	KLX16A_212.00-312.00_070313_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-13			
2007-03-13	21:41	312.00	412.00	KLX16A_0312.00_200703132141.ht2	KLX16A_312.00-412.00_070313_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-13			
2007-03-14	13:12	12.50	32.50	KLX16A_0012.50_200703141312.ht2	KLX16A_12.50-32.50_070314_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-14			
2007-03-14	15:41	32.50	52.50	KLX16A_0032.50_200703141541.ht2	KLX16A_32.50-52.50_070314_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-14			
2007-03-14	22:12	32.50	52.50	KLX16A_0032.50_200703142212.ht2	KLX16A_32.50-52.50_070314_2_CHir_Q_r.csv	Chir	2007-03-19	2007-03-14			
2007-03-15	00:34	52.50	72.50	KLX16A_0052.50_200703150034.ht2	KLX16A_52.50-72.50_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	06:50	72.50	92.50	KLX16A_0072.50_200703150650.ht2	KLX16A_72.50-92.50_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	08:52	91.00	111.00	KLX16A_0092.50_200703150852.ht2	KLX16A_91.00-111.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	10:59	111.00	131.00	KLX16A_0111.00_200703151059.ht2	KLX16A_111.00-131.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	13:31	131.00	151.00	KLX16A_0131.00_200703151331.ht2	KLX16A_131.00-151.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	15:35	150.00	170.00	KLX16A_0150.00_200703151535.ht2	KLX16A_150.00-170.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	17:51	170.00	190.00	KLX16A_0170.00_200703151751.ht2	KLX16A_170.00-190.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			
2007-03-15	20:00	188.00	208.00	KLX16A_0188.00_200703152000.ht2	KLX16A_188.00-208.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-15			

HYDROTESTING WITH PSS TEST- AND FILEPROTOCOL				PSS	DRILLHOLE IDENTIFICATION NO.: KLX16A							
				OCOL	Testorder dated : 2007-03-12							
Teststart Interval boundaries		es	Name	of Datafiles	Testtype	Copied to	Plotted	Sign.				
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)				
2007-03-15	22:44	207.00	227.00	KLX16A_0207.00_200703152244.ht2	KLX16A_207.00-227.00_070315_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	00:49	227.00	247.00	KLX16A_0227.00_200703160049.ht2	KLX16A_227.00-247.00_070316_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	07:36	247.00	267.00	KLX16A_0247.00_200703160736.ht2	KLX16A_247.00-267.00_070316_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	09:32	267.00	287.00	KLX16A_0267.00_200703160932.ht2	KLX16A_267.00-287.00_070316_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	10:58	267.00	287.00	KLX16A_0267.00_200703161058.ht2	KLX16A_267.00-287.00_070316_2_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	13:27	287.00	307.00	KLX16A_0287.00_200703161327.ht2	KLX16A_287.00-307.00_070316_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	15:27	307.00	327.00	KLX16A_0307.00_200703161527.ht2	KLX16A_307.00-327.00_070316_1_CHir_Q_r.csv	Chir	2007-03-19	2007-03-16				
2007-03-16	17:41	327.00	347.00	KLX16A_0327.00_200703161741.ht2	KLX16A_327.00-347.00_070316_1_Pi_Q_r.csv	Pi	2007-03-19	2007-03-17				
2007-03-17	08:35	347.00	367.00	KLX16A_0347.00_200703170835.ht2	KLX16A_347.00-367.00_070317_1_Chir_Q_r.csv	Chir	2007-03-19	2007-03-17				
2007-03-17	10:38	367.00	387.00	KLX16A_0367.00_200703171038.ht2	KLX16A_367.00-387.00_070317_1_Chir_Q_r.csv	Chir	2007-03-19	2007-03-17				
2007-03-17	12:48	387.00	407.00	KLX16A_0387.00_200703171248.ht2	KLX16A_387.00-407.00_070317_1_Chir_Q_r.csv	Chir	2007-03-19	2007-03-17				
2007-03-17	15:37	406.00	426.00	KLX16A_0406.00_200703171537.ht2	KLX16A_403.00-423.00_070317_1_Pi_Q_r.csv	Pi	2007-03-19	2007-03-18				
2007-03-18	19:10	421.10	433.55	KLX16A_0421.10_200703181910.ht2	KLX16A_421.10-433.55_070317_1_Pi_Q_r.csv	Pi	2007-03-19	2007-03-19				

Borehole: KLX16A

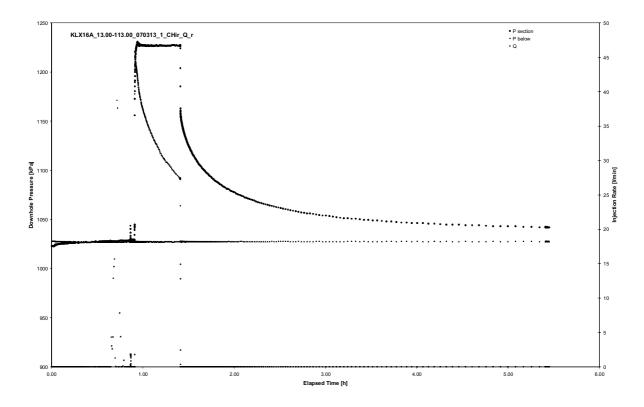
# **APPENDIX 2**

Analysis diagrams

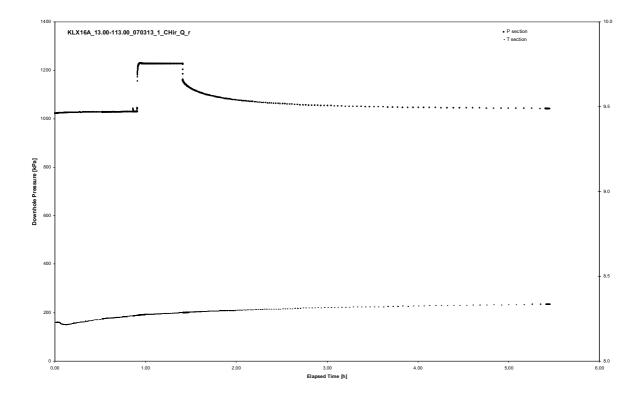
# **APPENDIX 2-1**

Test 13.00 – 113.00 m

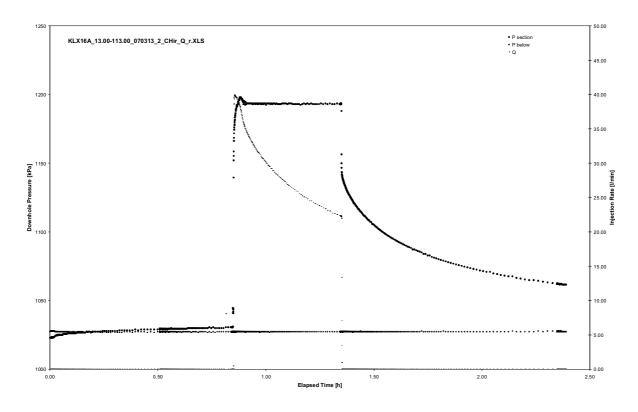
Analysis diagrams



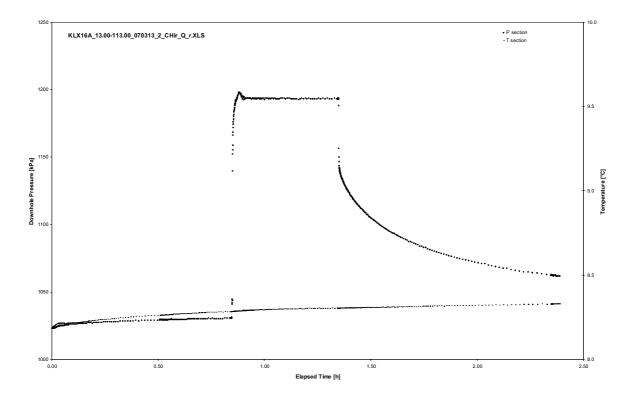
Pressure and flow rate vs. time; cartesian plot (repeated)



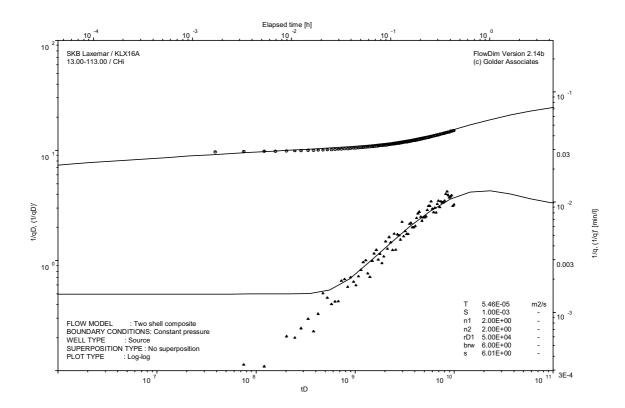
Interval pressure and temperature vs. time; cartesian plot (repeated)



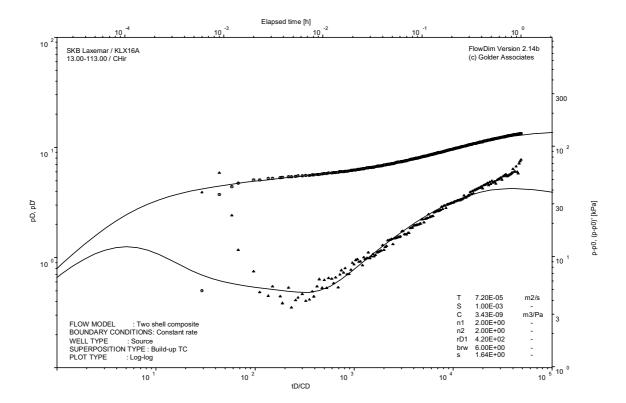
Pressure and flow rate vs. time; cartesian plot



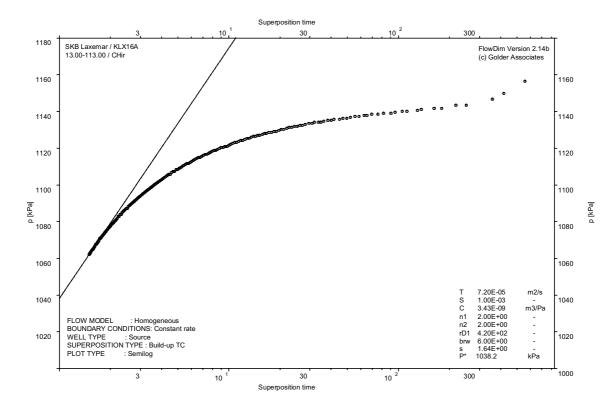
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

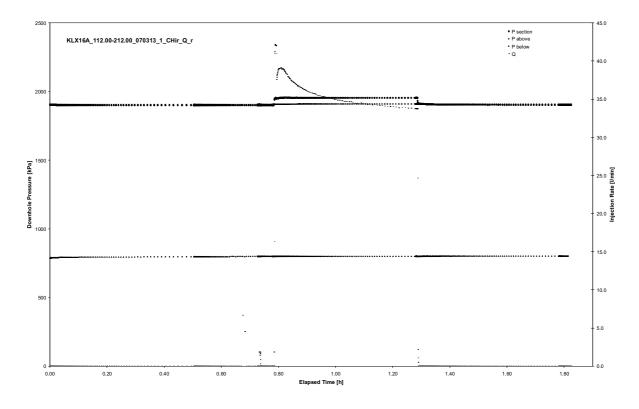


CHIR phase; HORNER match

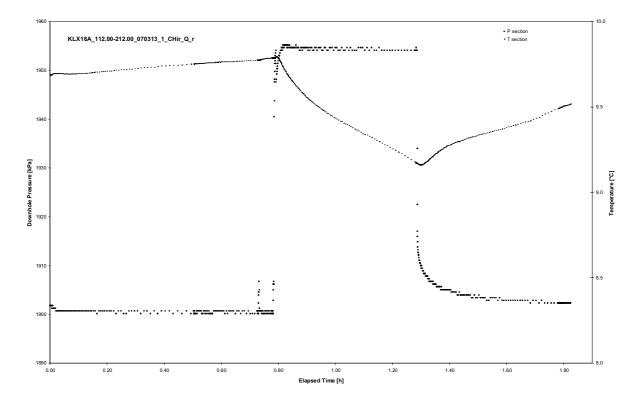
# **APPENDIX 2-2**

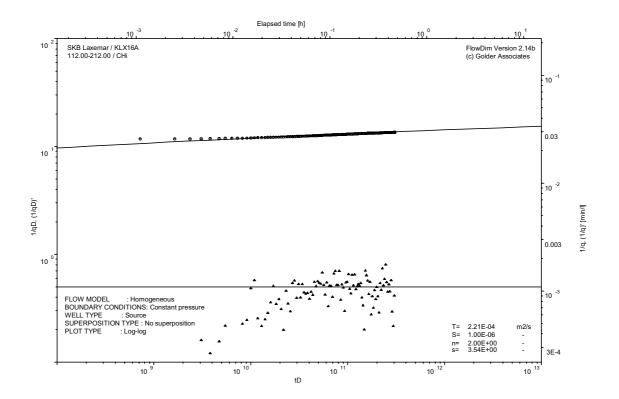
Test 112.00 – 212.00 m

Analysis diagrams

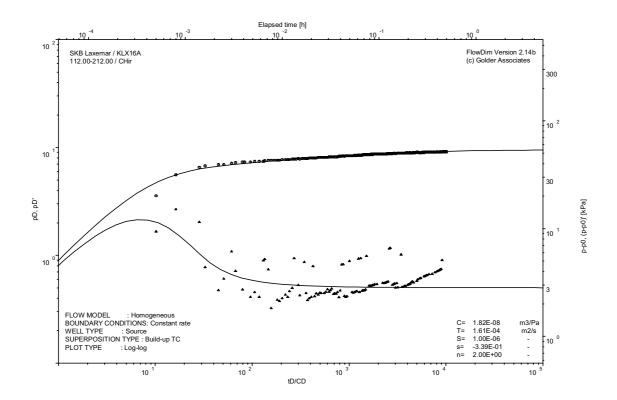


Pressure and flow rate vs. time; cartesian plot

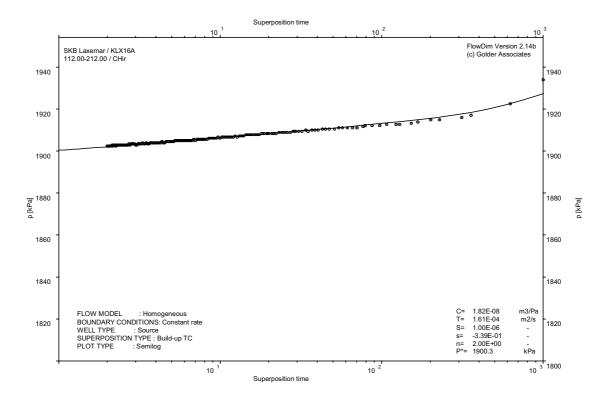




CHI phase; log-log match

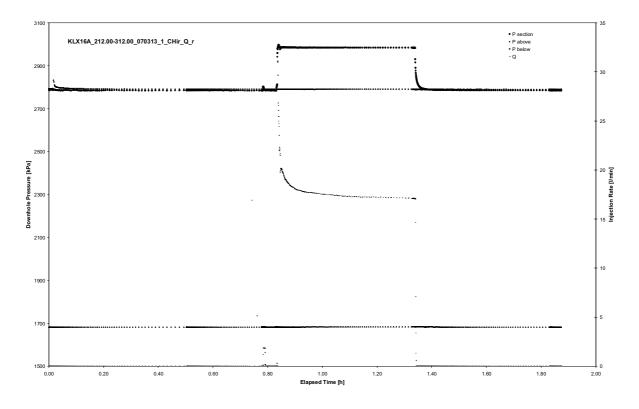


CHIR phase; log-log match

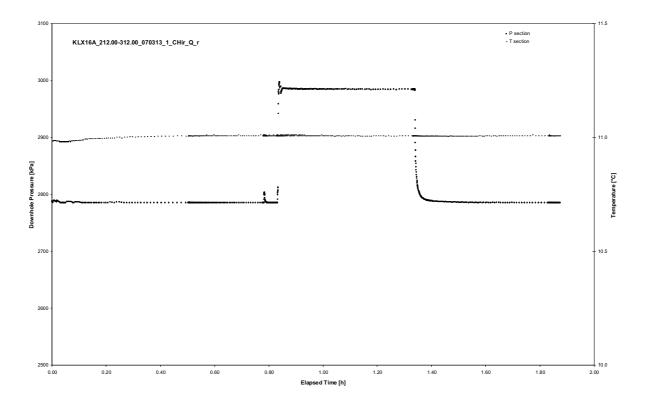


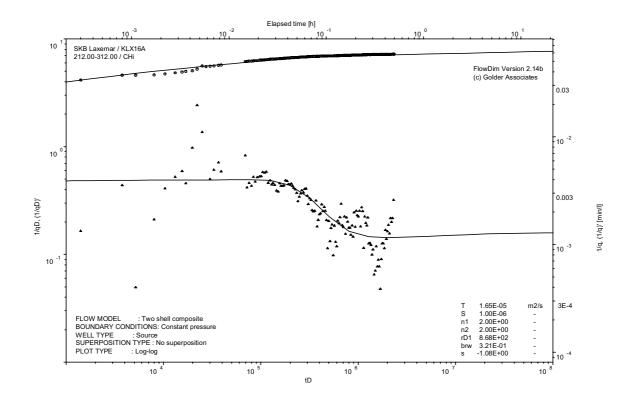
CHIR phase; HORNER match

Test 212.00 – 312.00 m

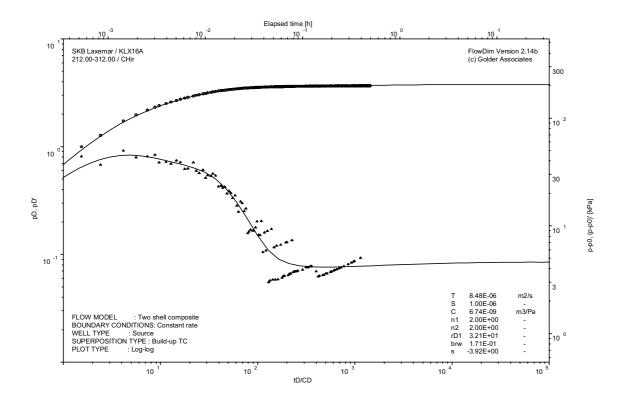


Pressure and flow rate vs. time; cartesian plot

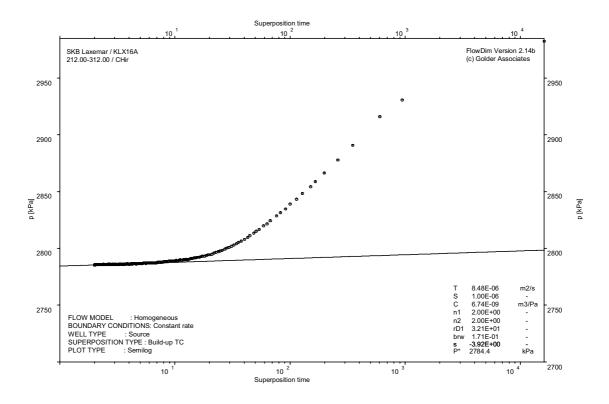




CHI phase; log-log match

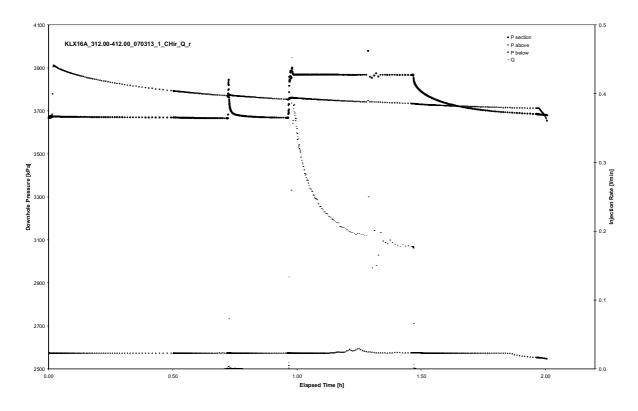


CHIR phase; log-log match

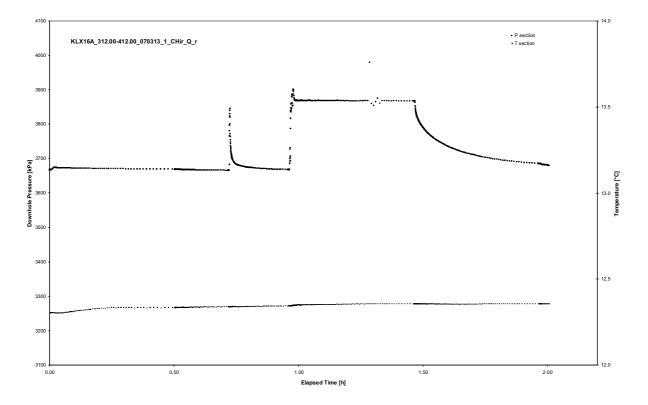


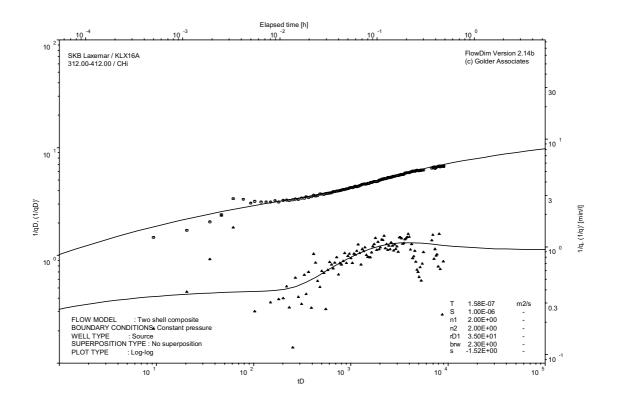
CHIR phase; HORNER match

Test 312.00 – 412.00 m

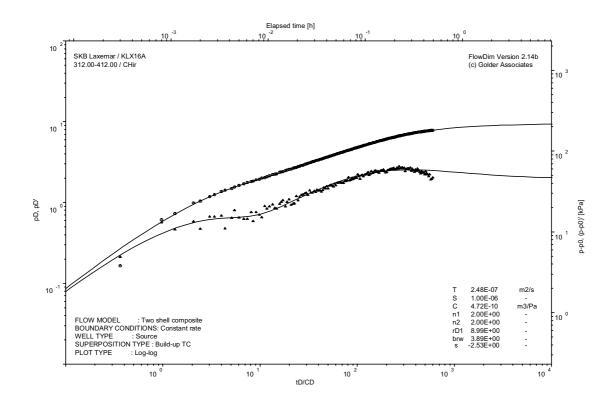


Pressure and flow rate vs. time; cartesian plot

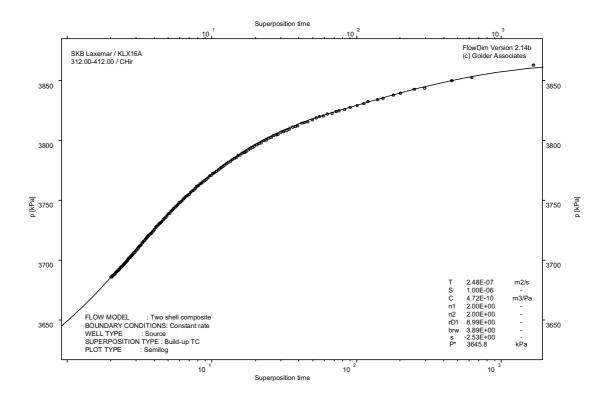




CHI phase; log-log match

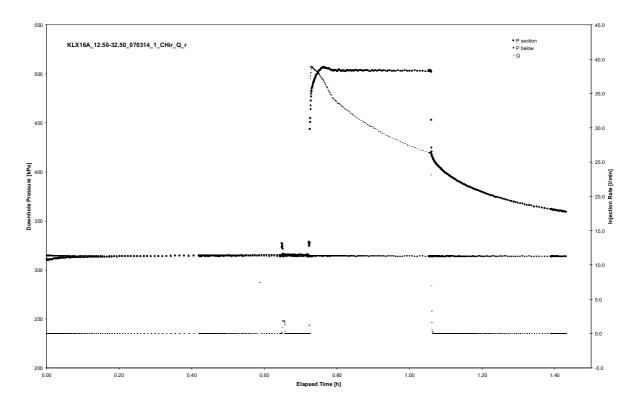


CHIR phase; log-log match

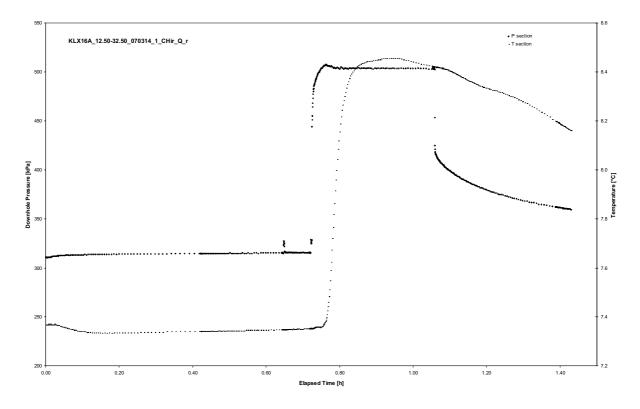


CHIR phase; HORNER match

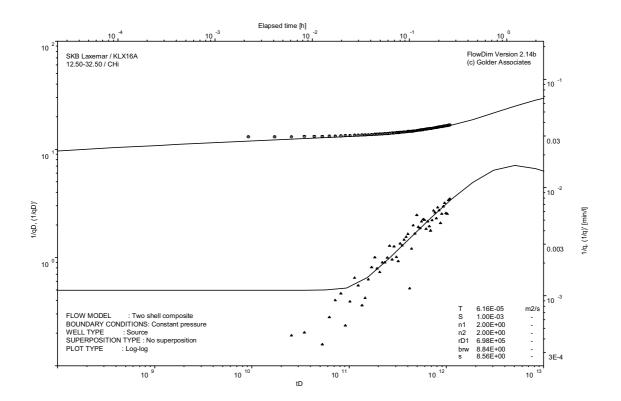
Test 12.50 – 32.50 m



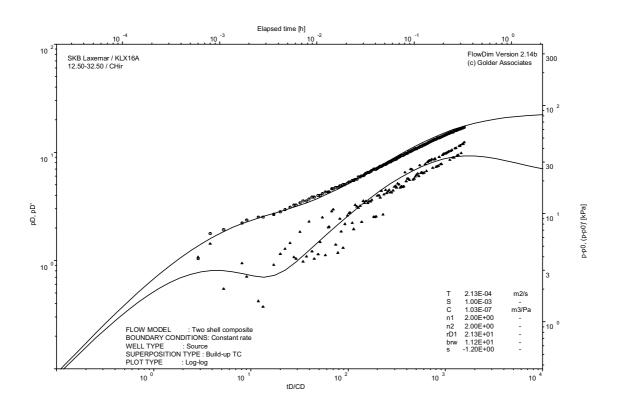
Pressure and flow rate vs. time; cartesian plot



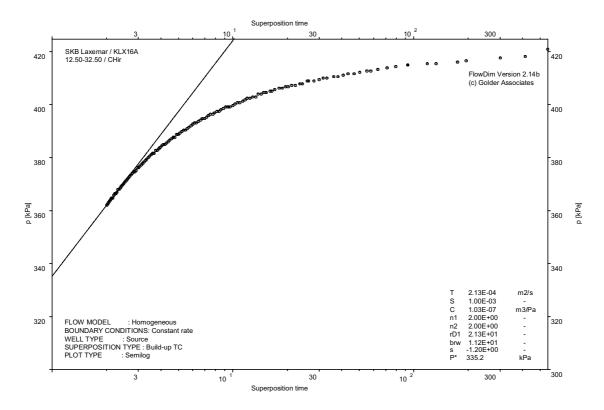
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match

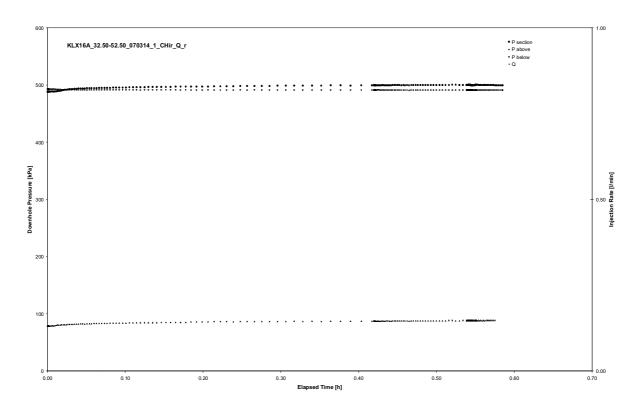


CHIR phase; log-log match

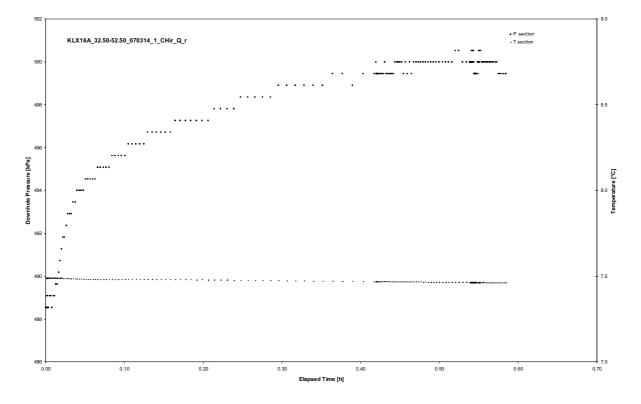


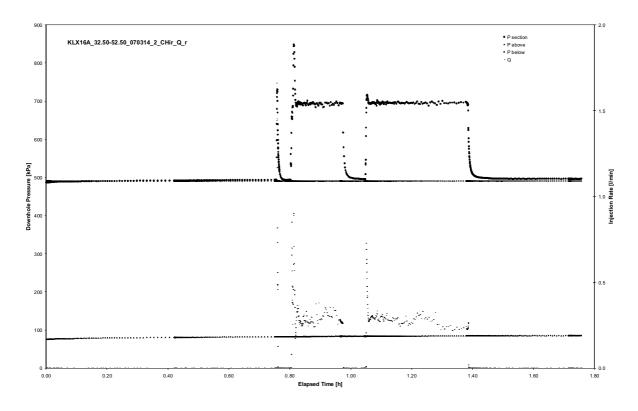
CHIR phase; HORNER match

Test 32.50 – 52.50 m

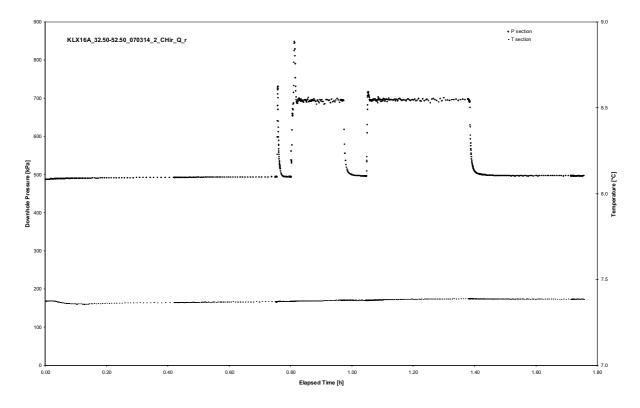


Pressure and flow rate vs. time; cartesian plot (repeated)

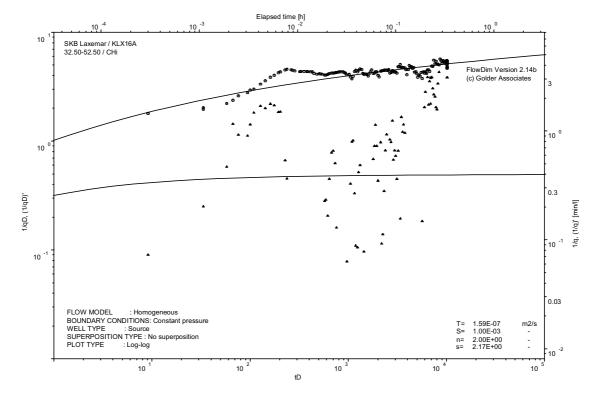




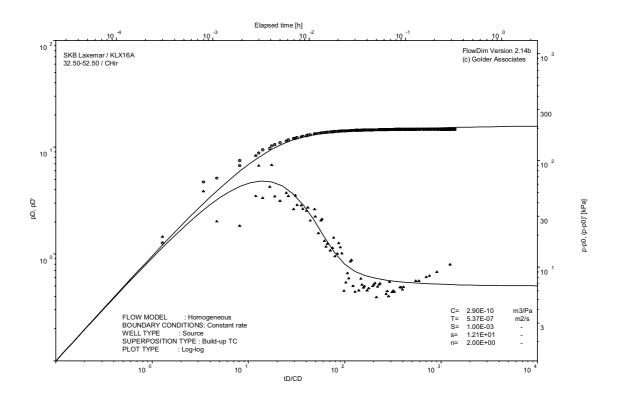
Pressure and flow rate vs. time; cartesian plot



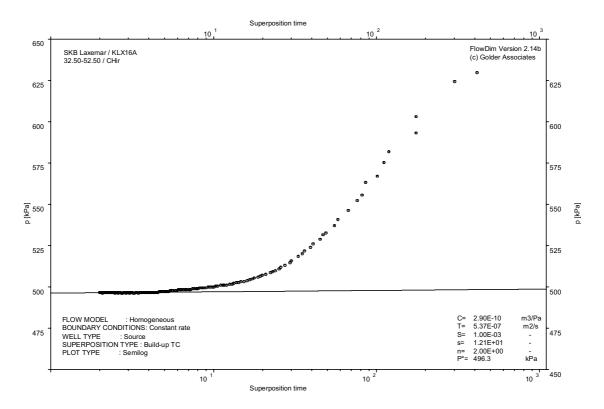




CHI phase; log-log match

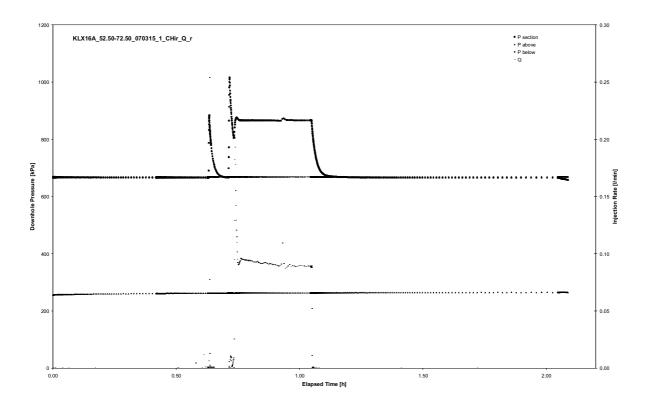


CHIR phase; log-log match

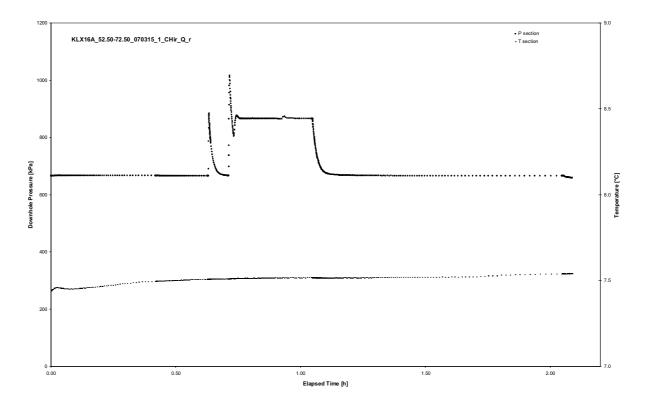


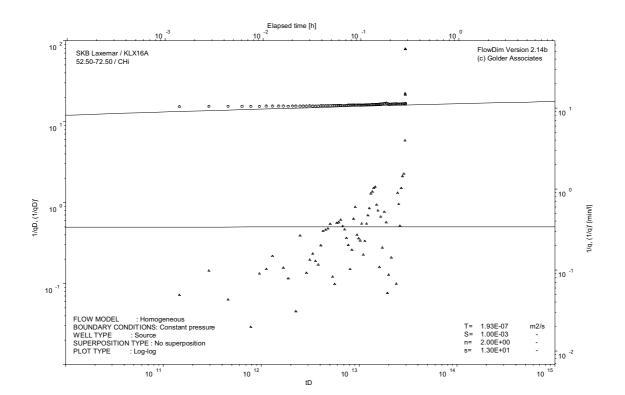
CHIR phase; HORNER match

Test 52.50 – 72.50 m

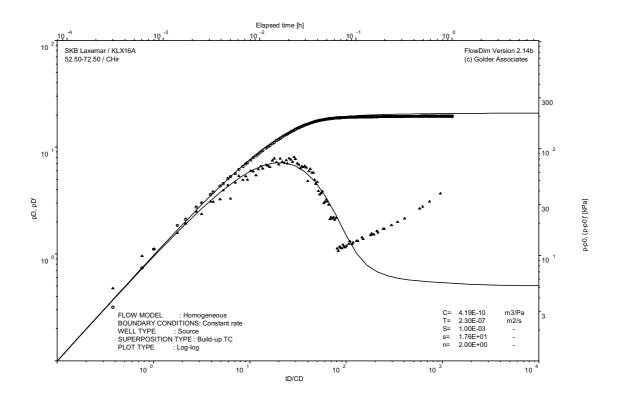


Pressure and flow rate vs. time; cartesian plot

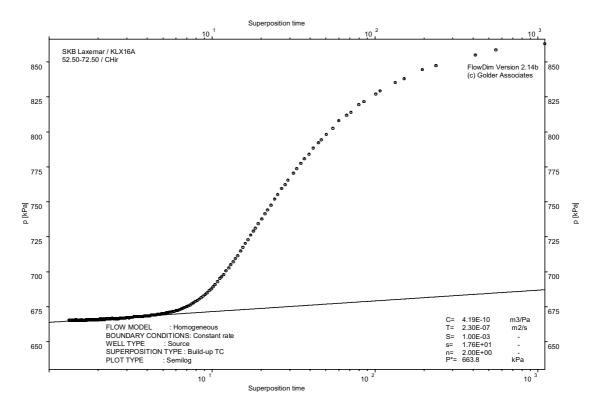




CHI phase; log-log match

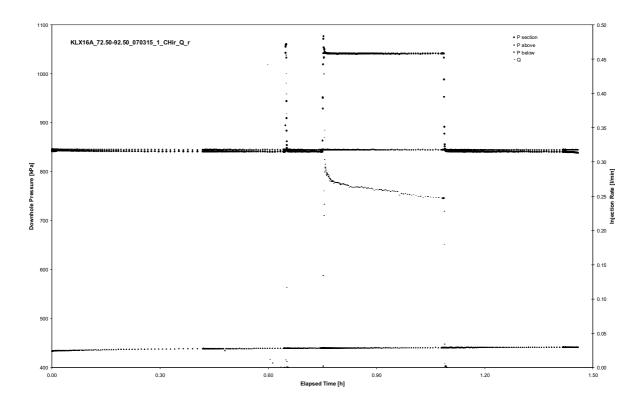


CHIR phase; log-log match

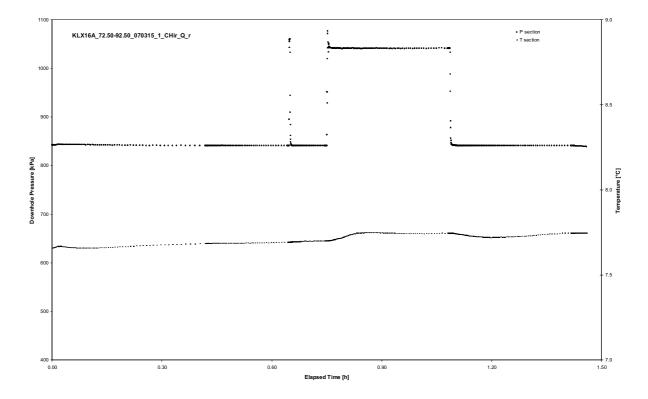


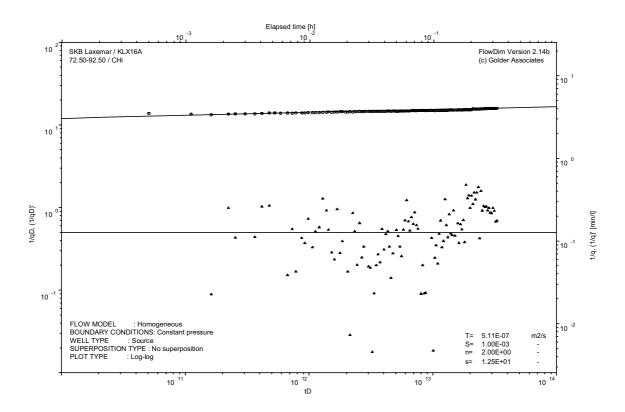
CHIR phase; HORNER match

Test 72.50 – 92.50 m

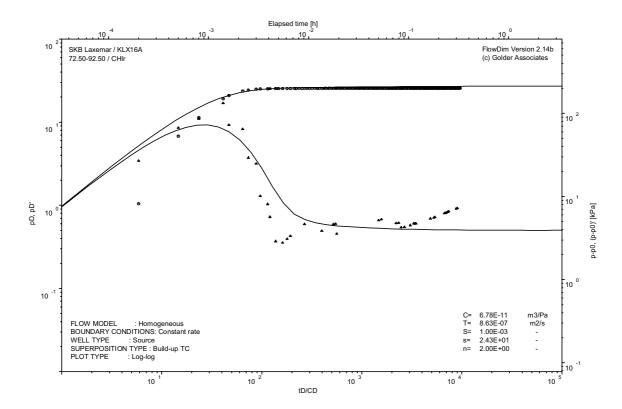


Pressure and flow rate vs. time; cartesian plot

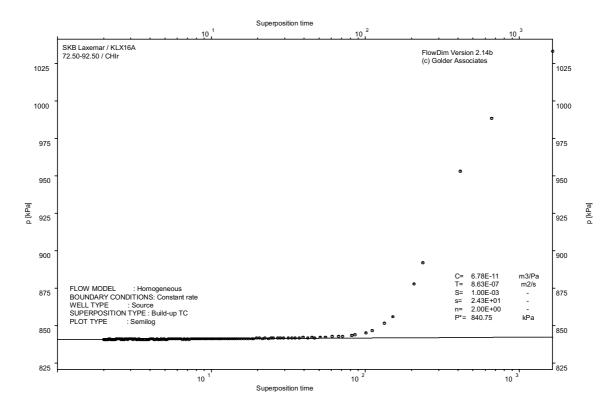




CHI phase; log-log match

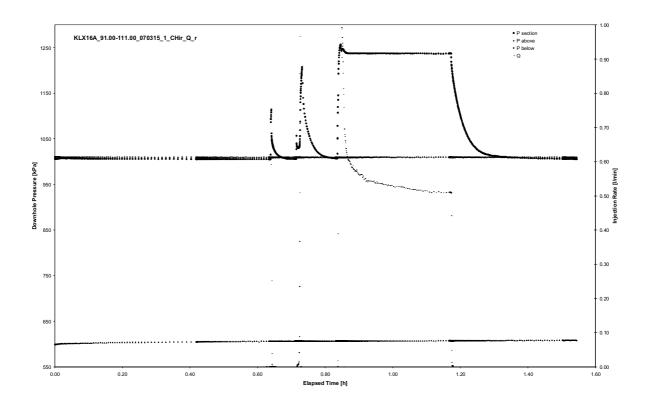


CHIR phase; log-log match

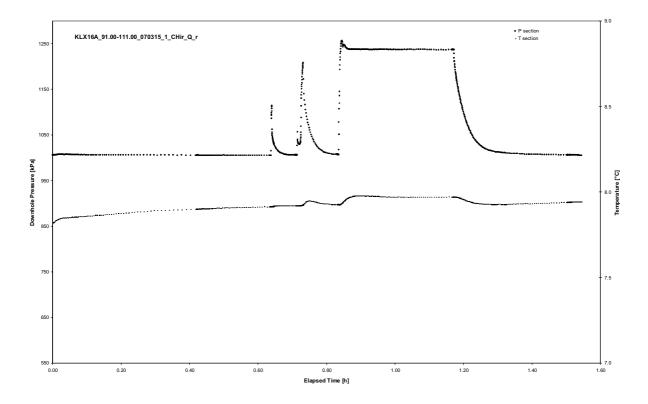


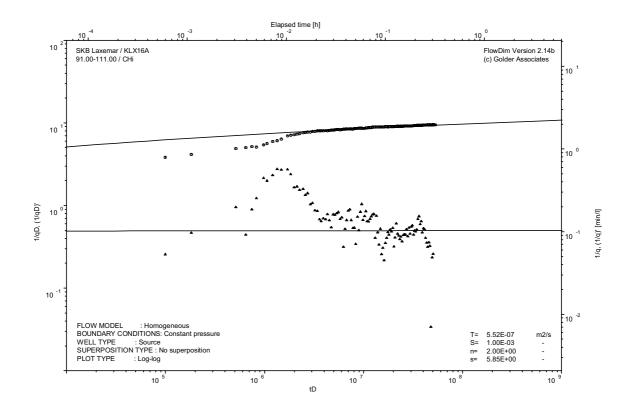
CHIR phase; HORNER match

Test 91.00 – 111.00 m



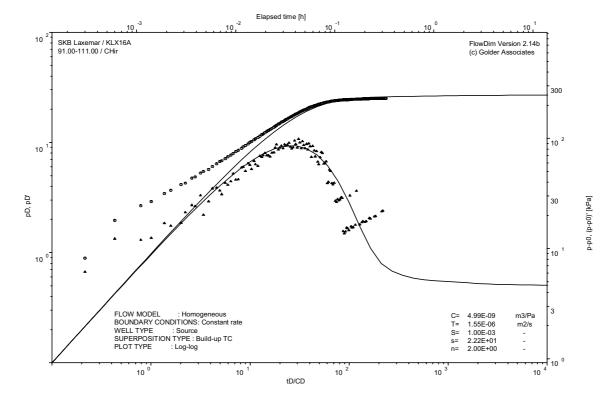
Pressure and flow rate vs. time; cartesian plot



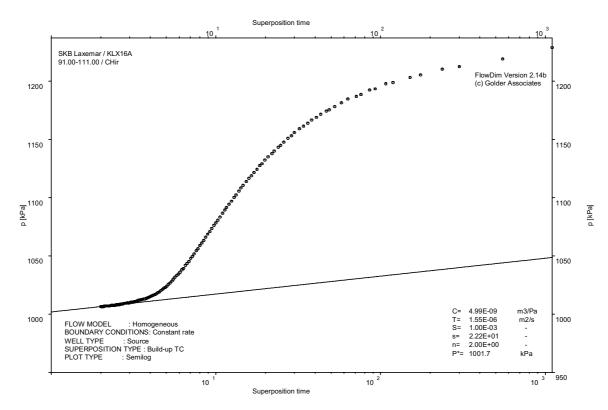


CHI phase; log-log match



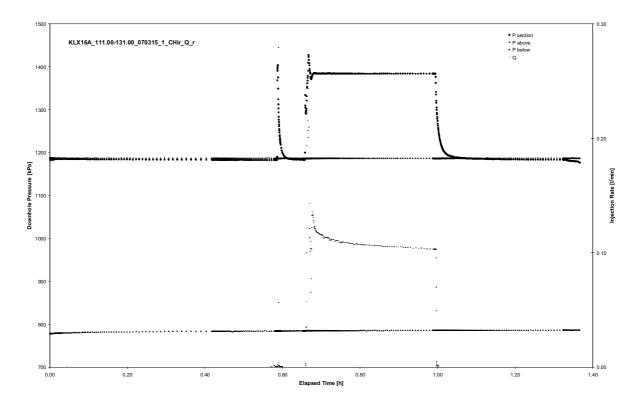


CHIR phase; log-log match

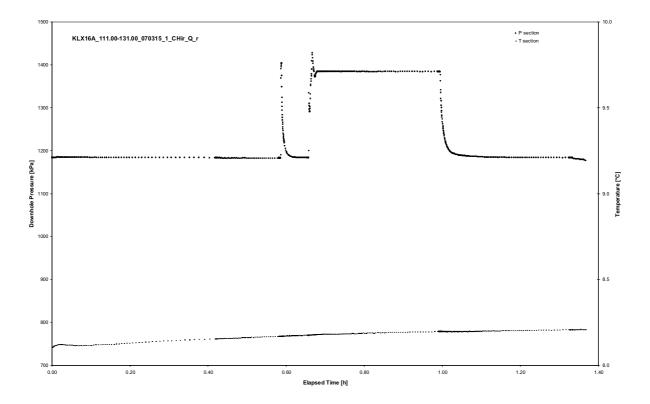


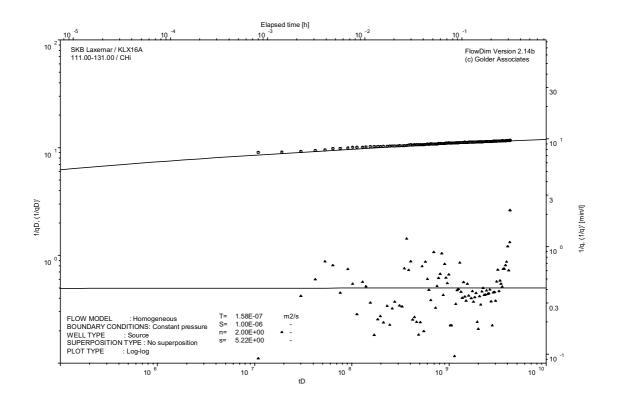
CHIR phase; HORNER match

Test 111.00 – 131.00 m

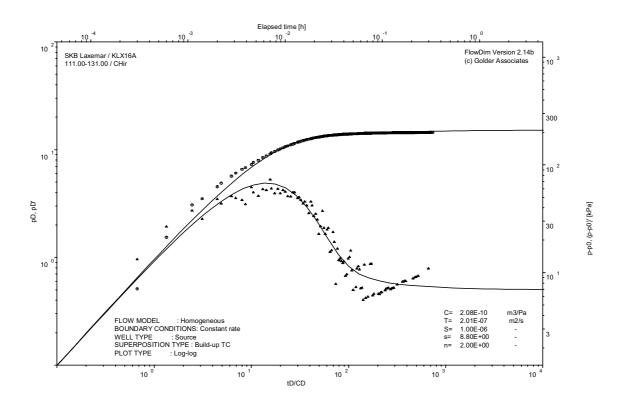


Pressure and flow rate vs. time; cartesian plot

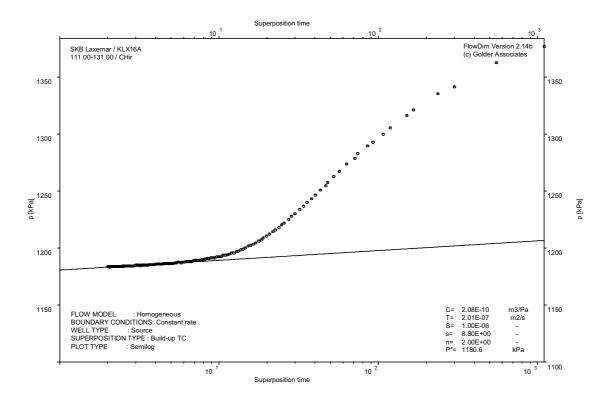




CHI phase; log-log match

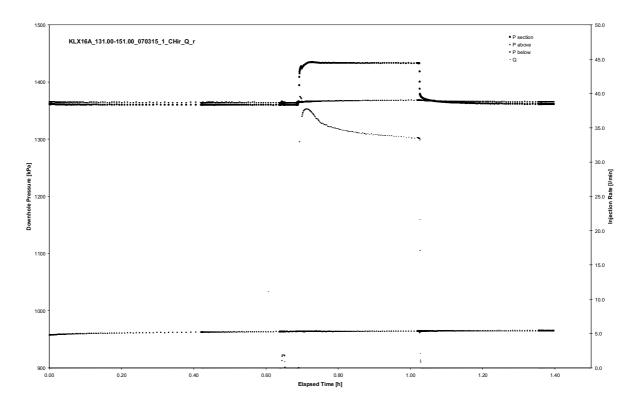


CHIR phase; log-log match

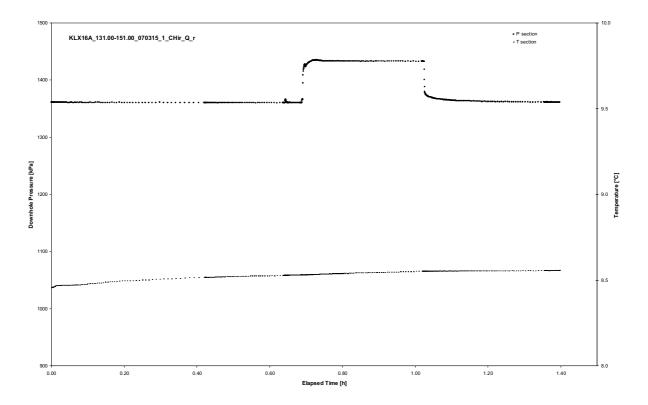


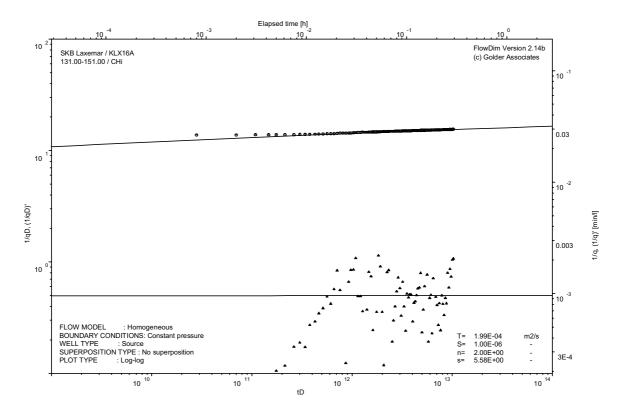
CHIR phase; HORNER match

Test 131.00 – 151.00 m

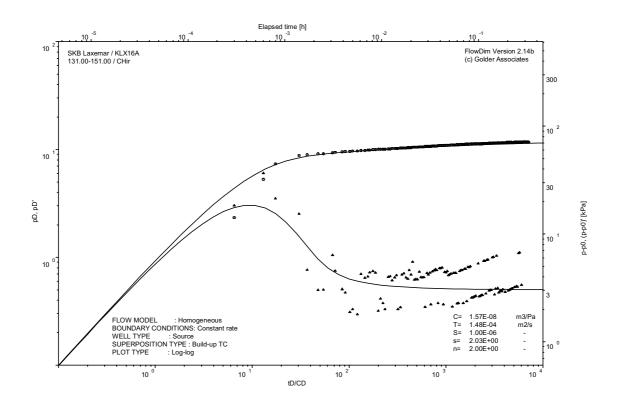


Pressure and flow rate vs. time; cartesian plot

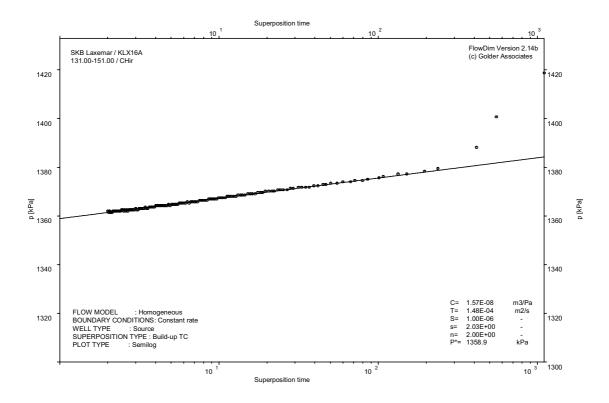




CHI phase; log-log match

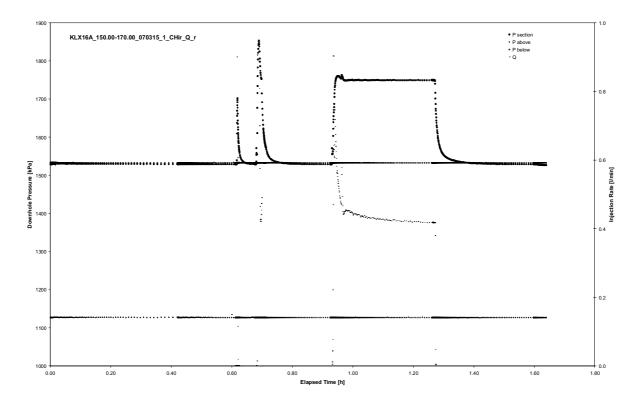


CHIR phase; log-log match

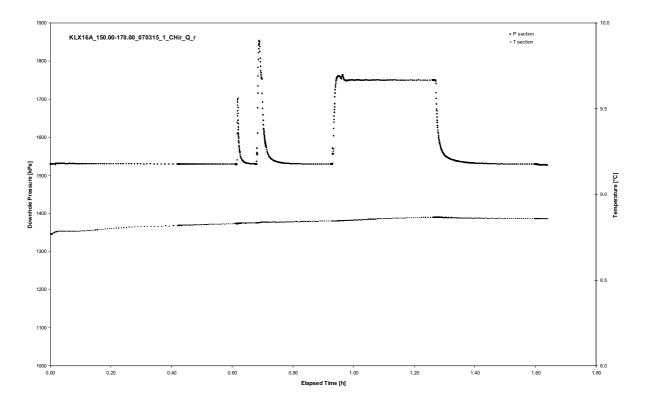


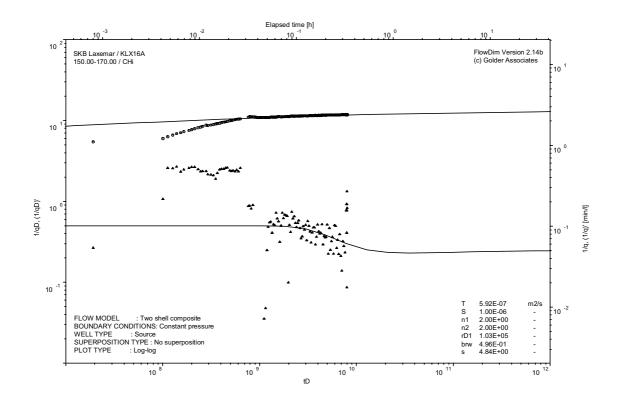
CHIR phase; HORNER match

Test 150.00 – 170.00 m

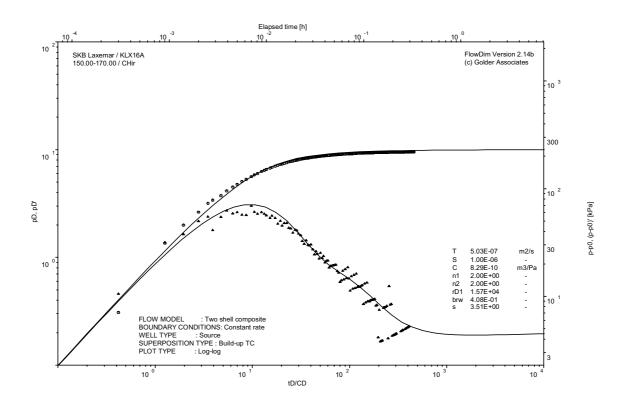


Pressure and flow rate vs. time; cartesian plot

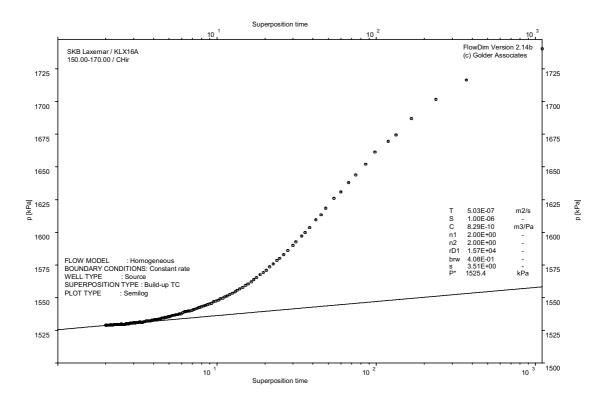




CHI phase; log-log match

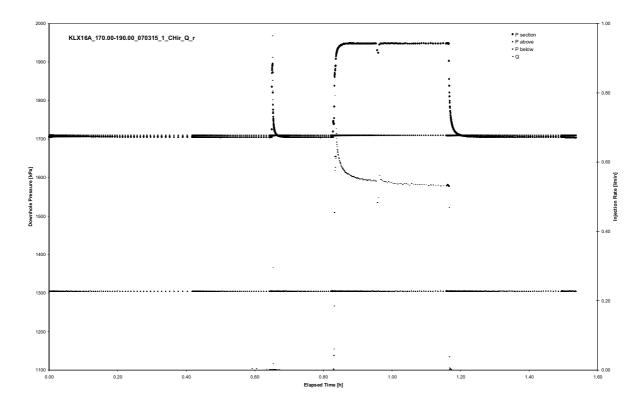


CHIR phase; log-log match

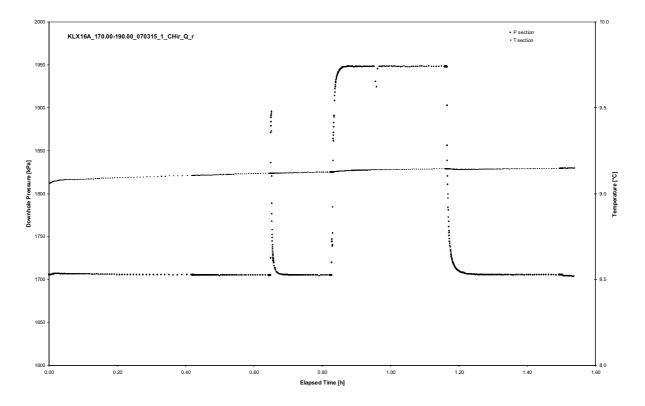


CHIR phase; HORNER match

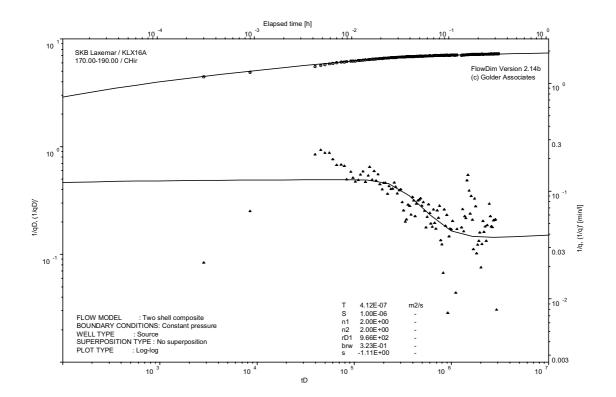
Test 170.00 – 190.00 m



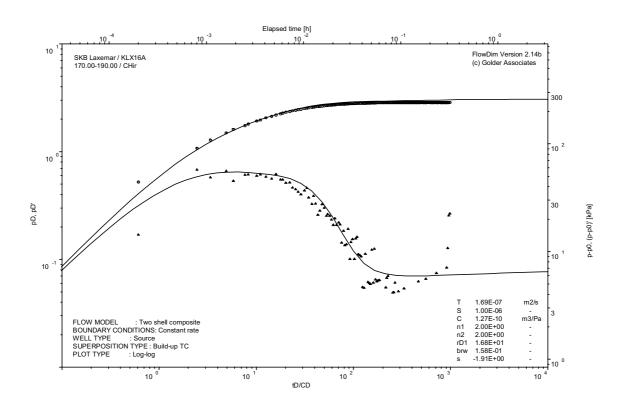
Pressure and flow rate vs. time; cartesian plot



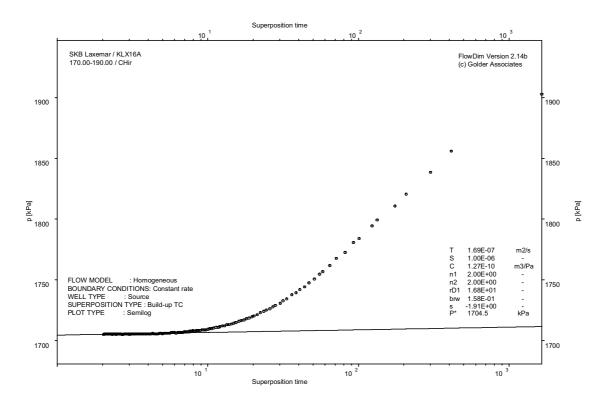
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match

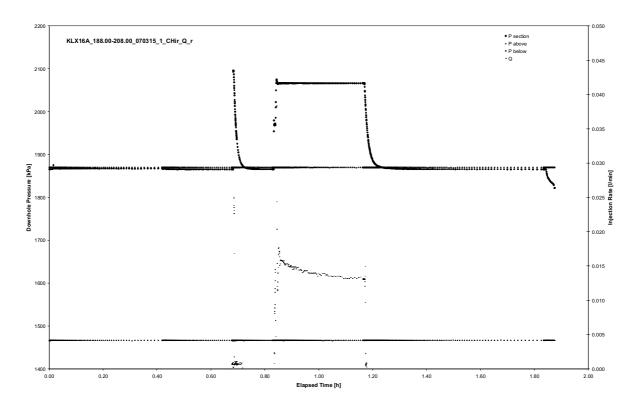


CHIR phase; log-log match

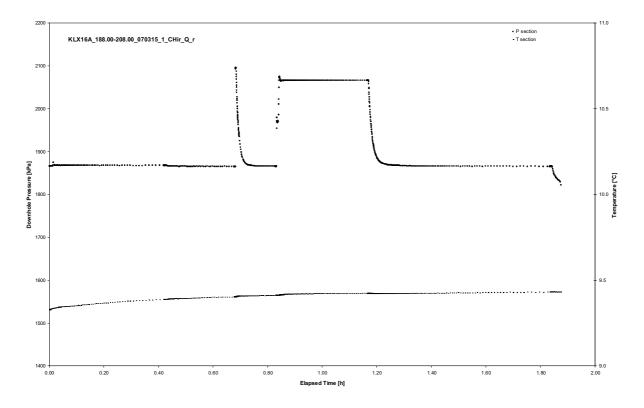


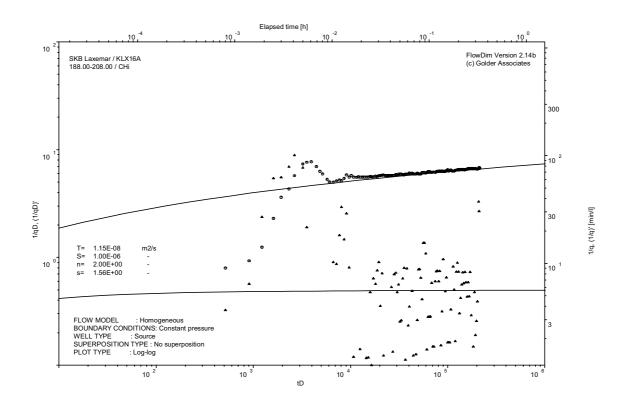
CHIR phase; HORNER match

Test 188.00 – 208.00 m



Pressure and flow rate vs. time; cartesian plot





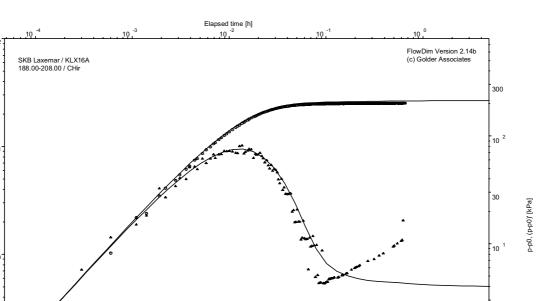
CHI phase; log-log match

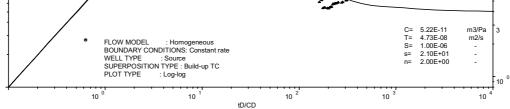
10

10

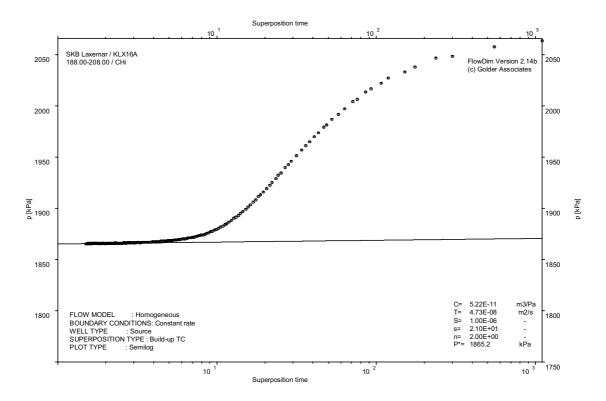
pD, pD'

10



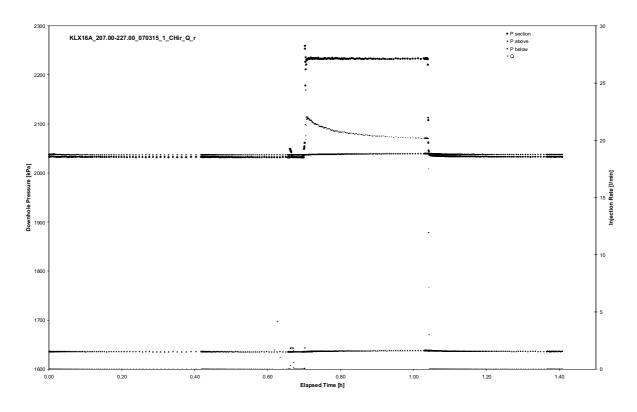


CHIR phase; log-log match

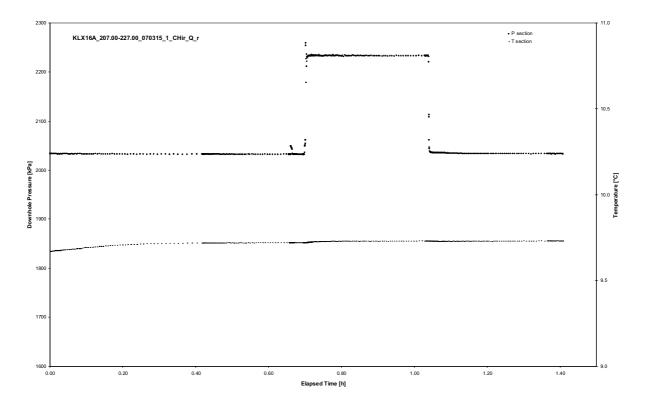


CHIR phase; HORNER match

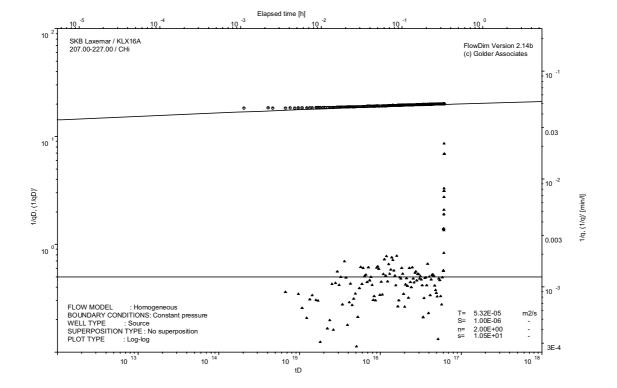
Test 207.00 – 227.00 m



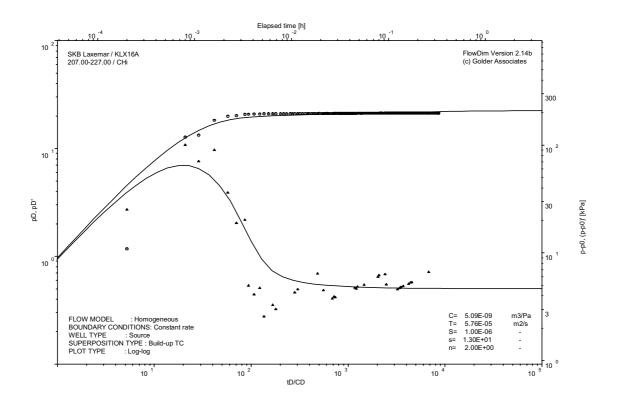
Pressure and flow rate vs. time; cartesian plot



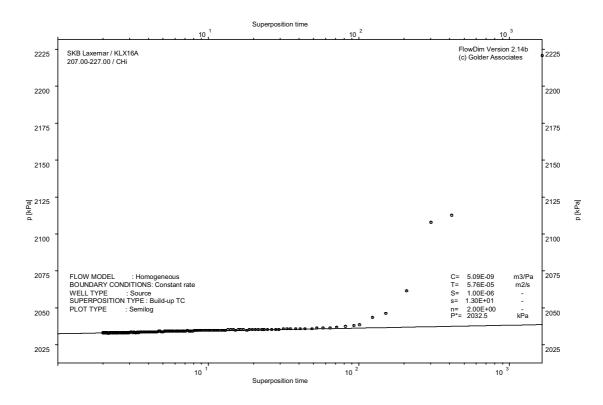




CHI phase; log-log match

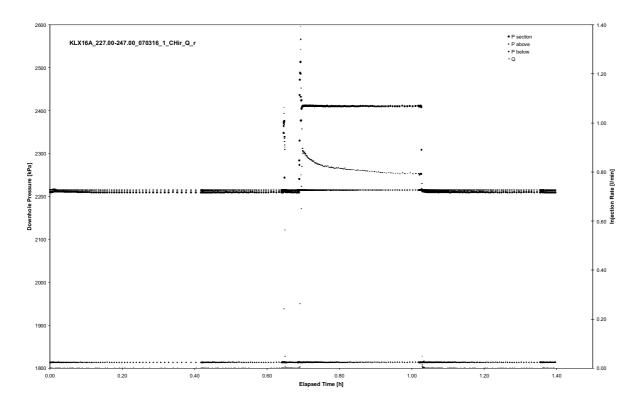


CHIR phase; log-log match

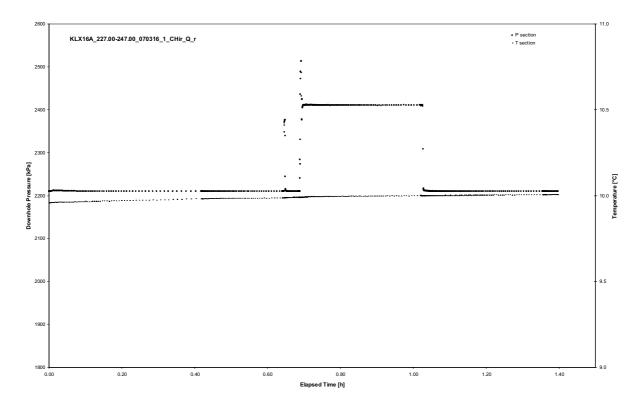


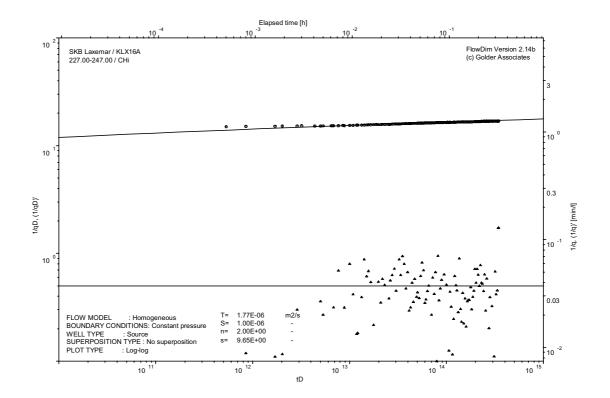
CHIR phase; HORNER match

Test 227.00 – 247.00 m

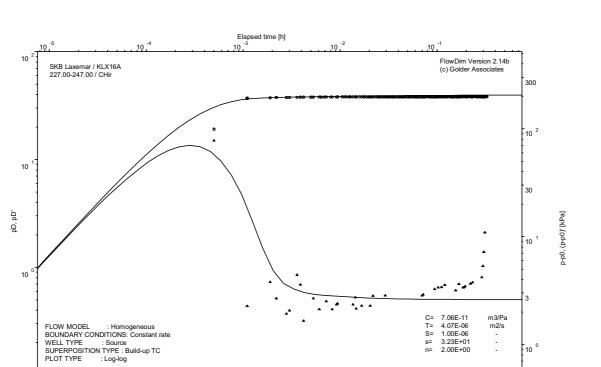


Pressure and flow rate vs. time; cartesian plot





CHI phase; log-log match

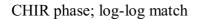


10

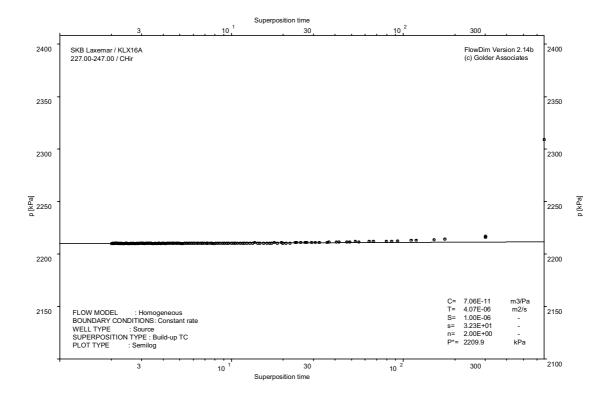
tD/CD

10 4

10



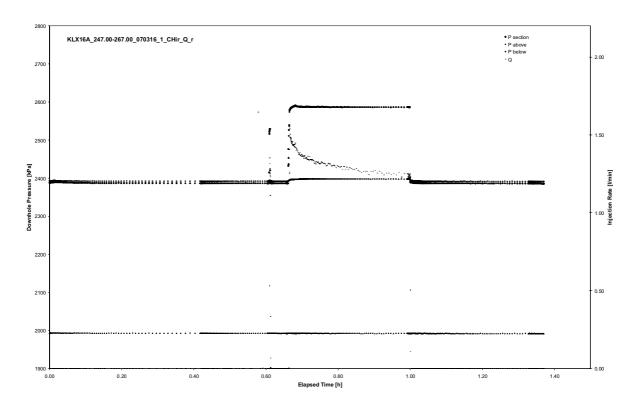
10



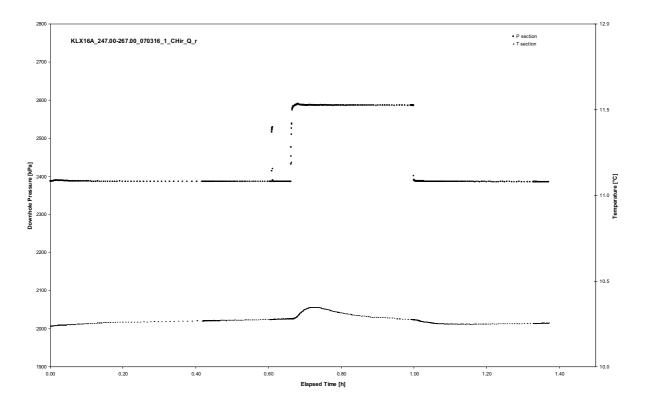
10 2

CHIR phase; HORNER match

Test 247.00 – 267.00 m

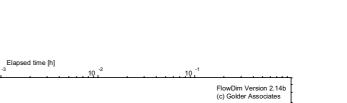


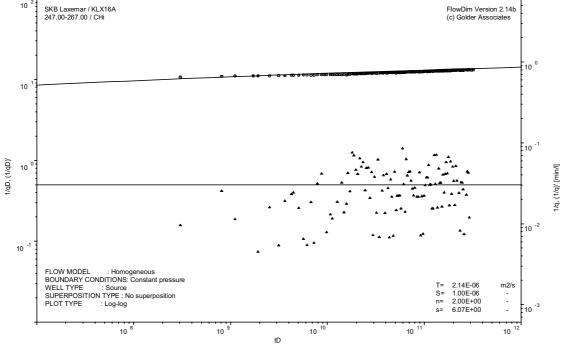
Pressure and flow rate vs. time; cartesian plot



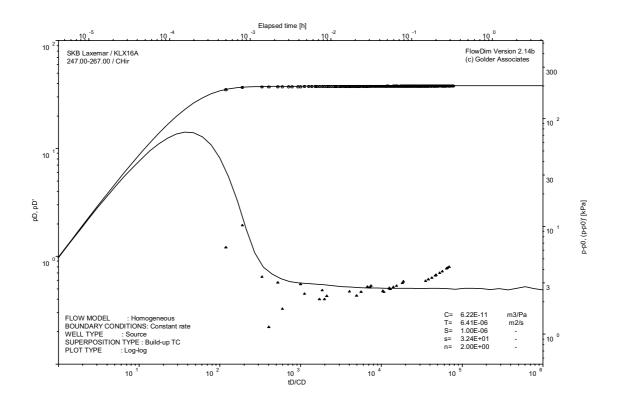
10

-4 10

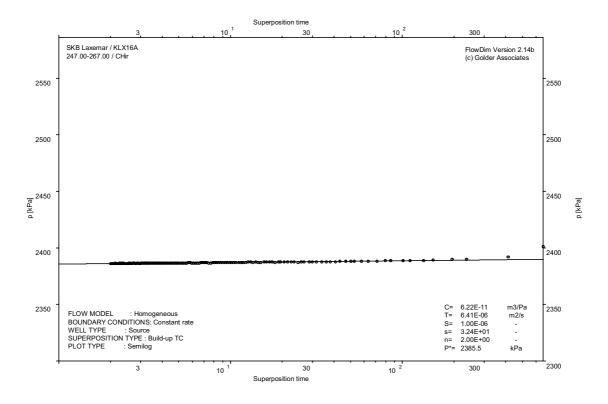




CHI phase; log-log match

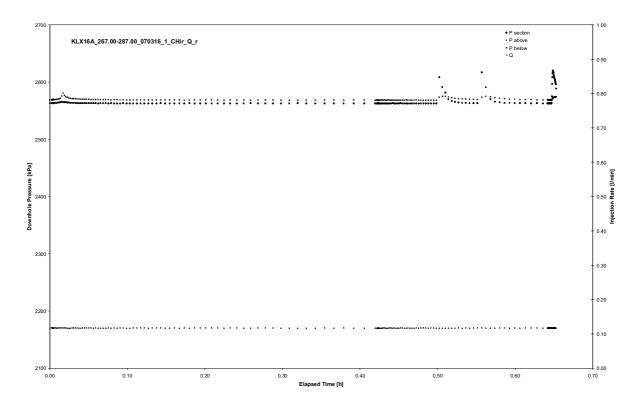


CHIR phase; log-log match

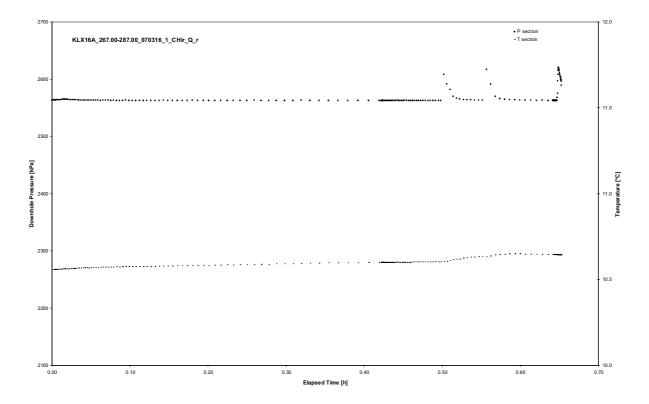


CHIR phase; HORNER match

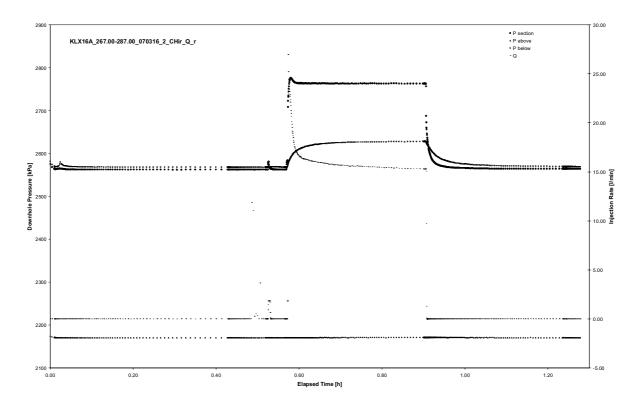
Test 267.00 – 287.00 m



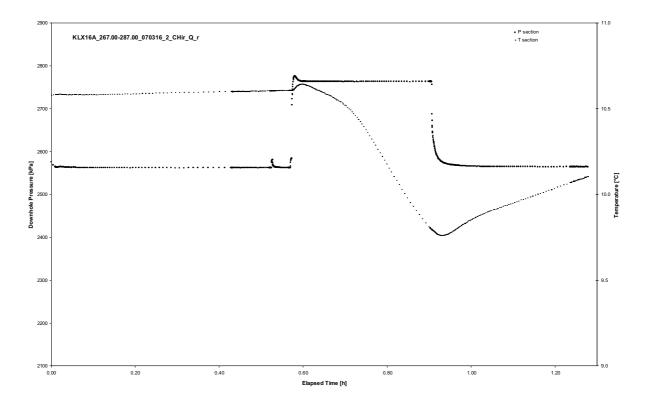
Pressure and flow rate vs. time; cartesian plot (repeated)

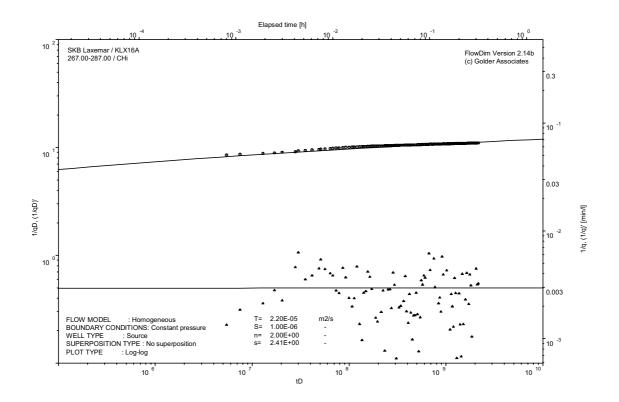


Interval pressure and temperature vs. time; cartesian plot (repeated)

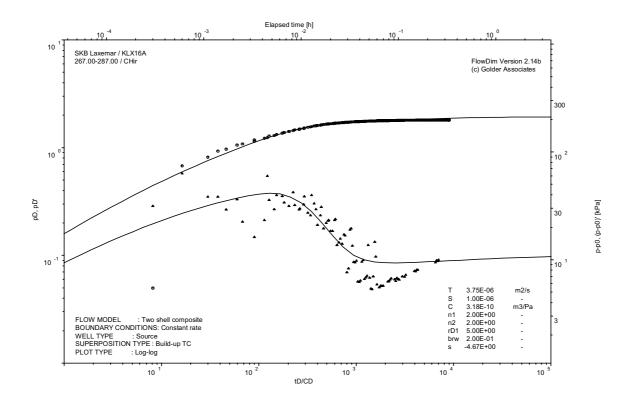


Pressure and flow rate vs. time; cartesian plot

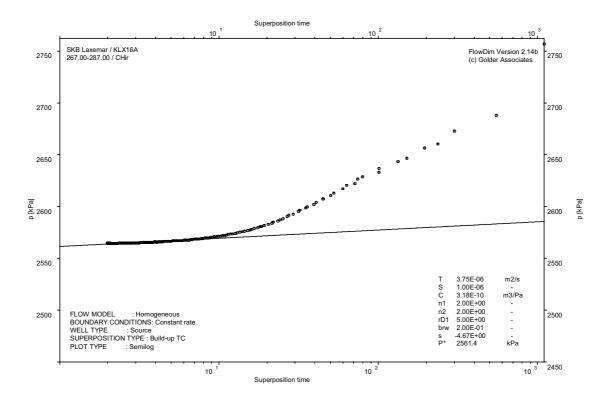




CHI phase; log-log match

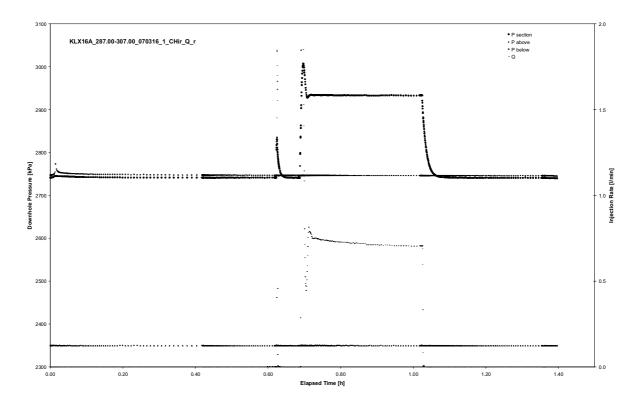


CHIR phase; log-log match

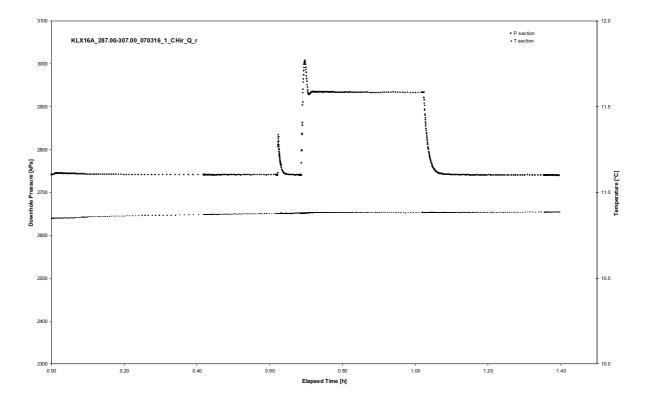


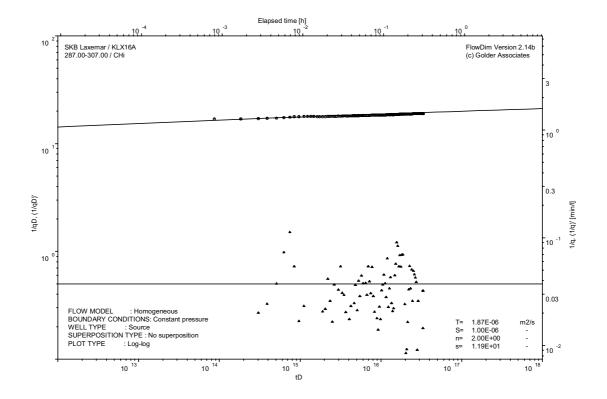
CHIR phase; HORNER match

Test 287.00 – 307.00 m

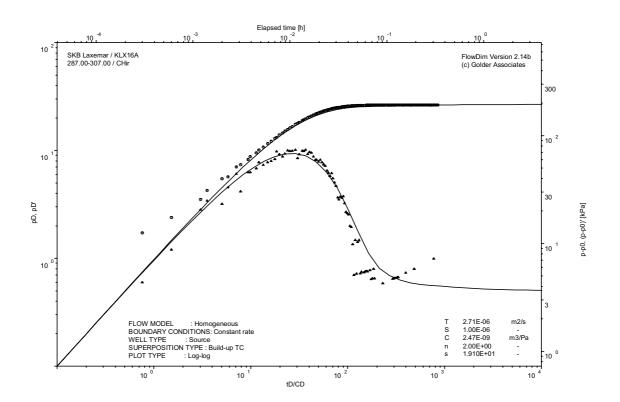


Pressure and flow rate vs. time; cartesian plot

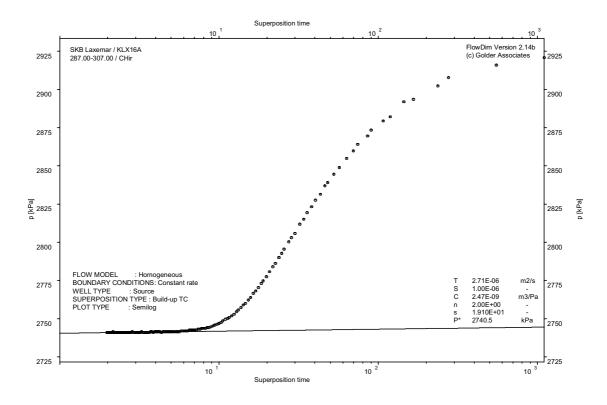




CHI phase; log-log match

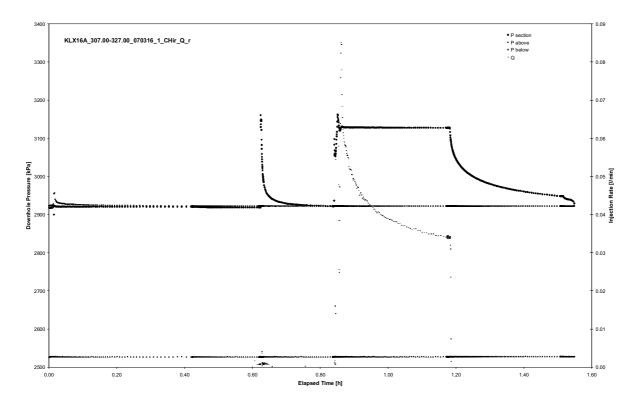


CHIR phase; log-log match

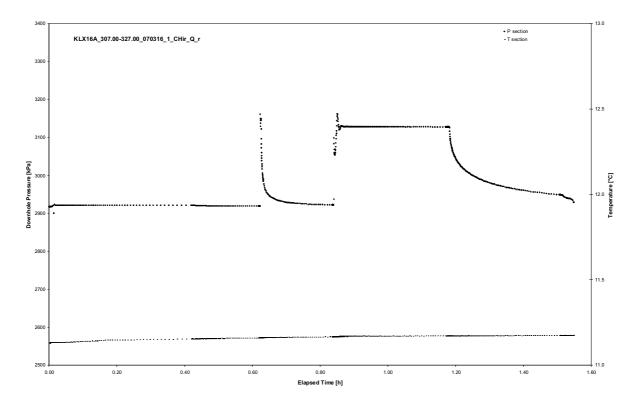


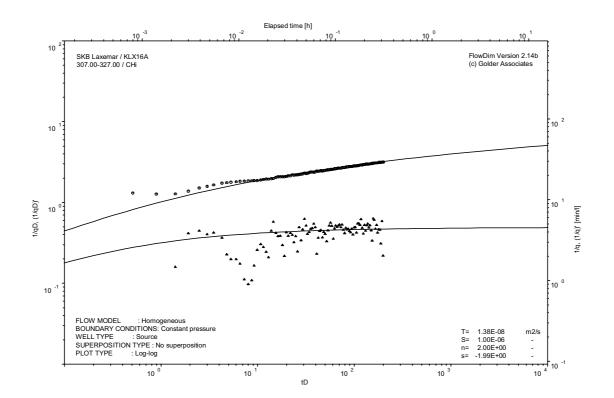
CHIR phase; HORNER match

Test 307.00 – 327.00 m

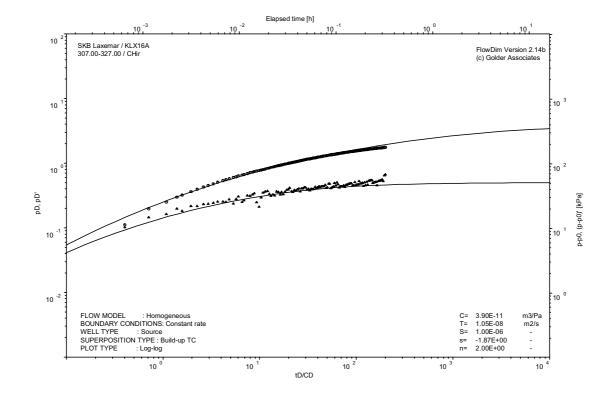


Pressure and flow rate vs. time; cartesian plot

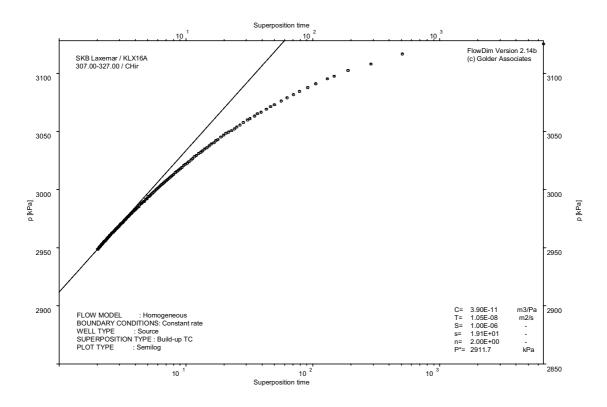




CHI phase; log-log match

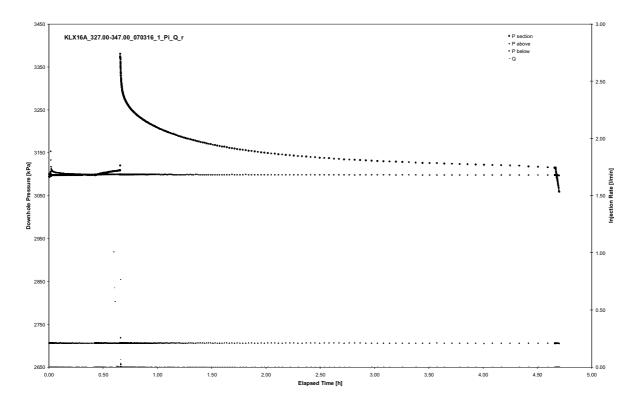


CHIR phase; log-log match

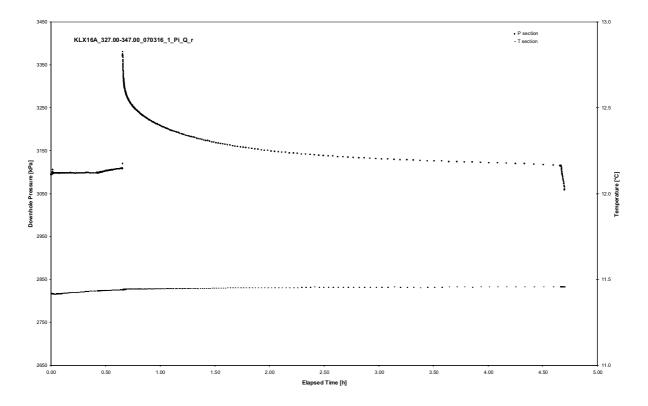


CHIR phase; HORNER match

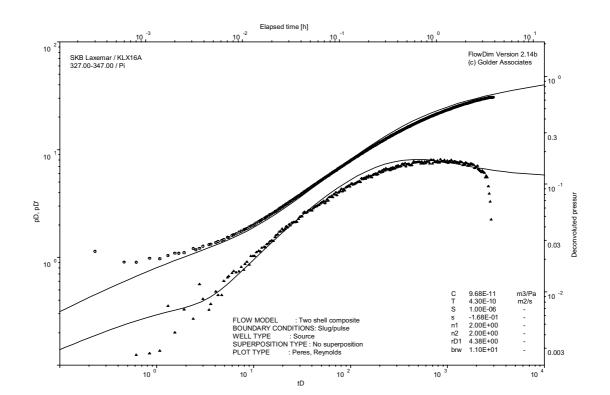
Test 327.00 – 347.00 m



Pressure and flow rate vs. time; cartesian plot

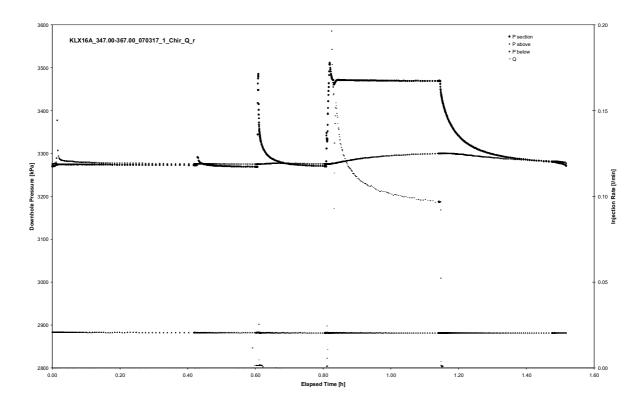


Interval pressure and temperature vs. time; cartesian plot

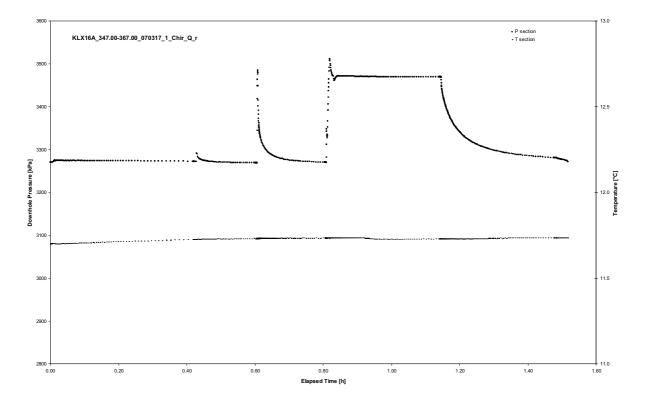


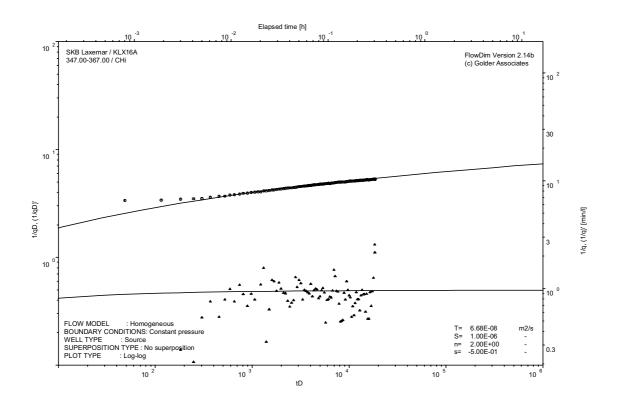
Pulse injection; deconvolution match

Test 347.00 – 367.00 m



Pressure and flow rate vs. time; cartesian plot



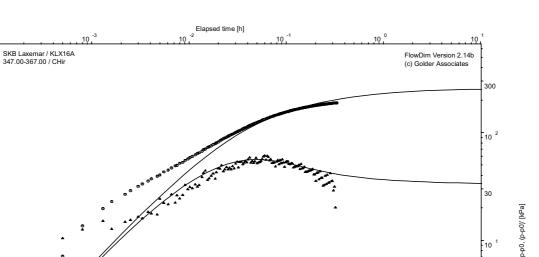


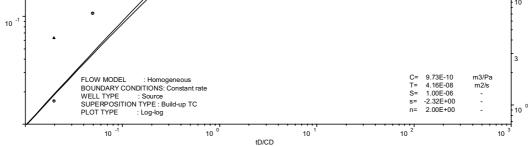
CHI phase; log-log match

10

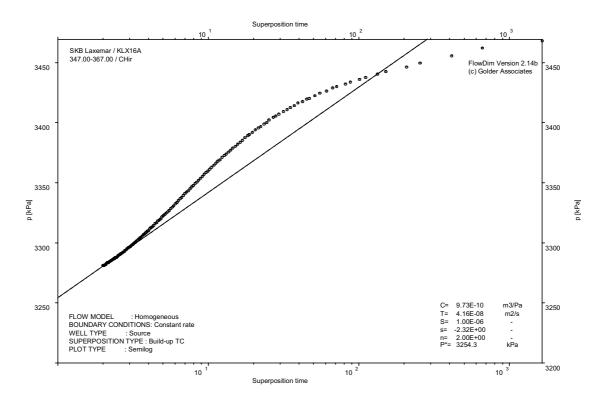
10

pD, pD'



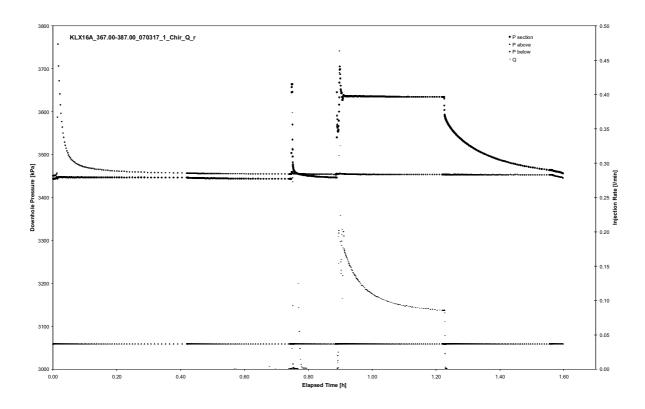


CHIR phase; log-log match

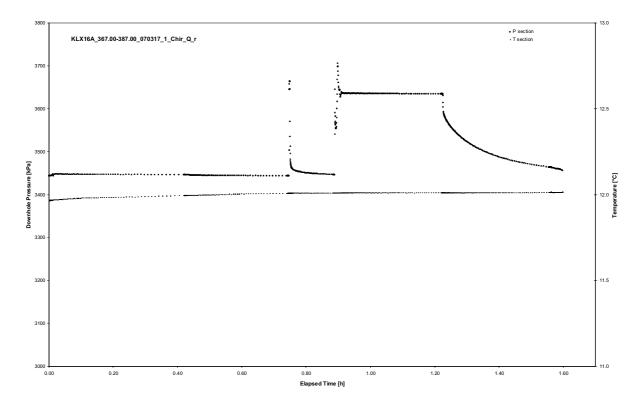


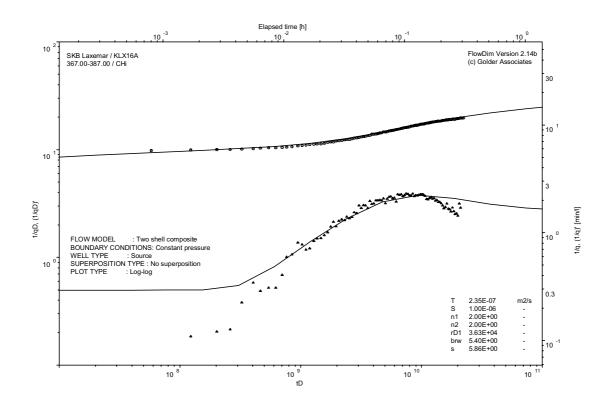
CHIR phase; HORNER match

Test 367.00 – 387.00 m

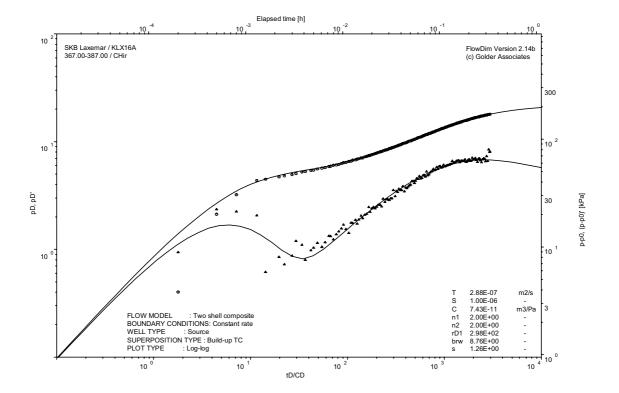


Pressure and flow rate vs. time; cartesian plot

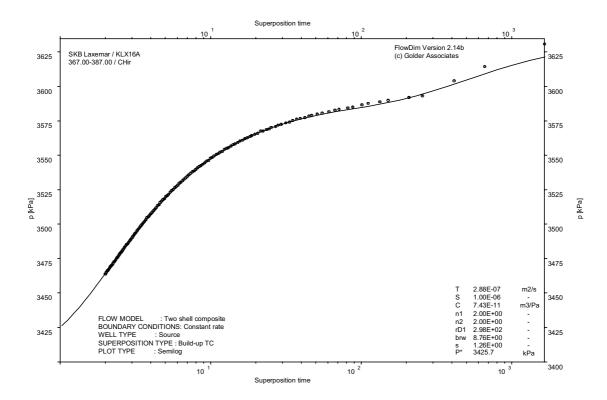




CHI phase; log-log match

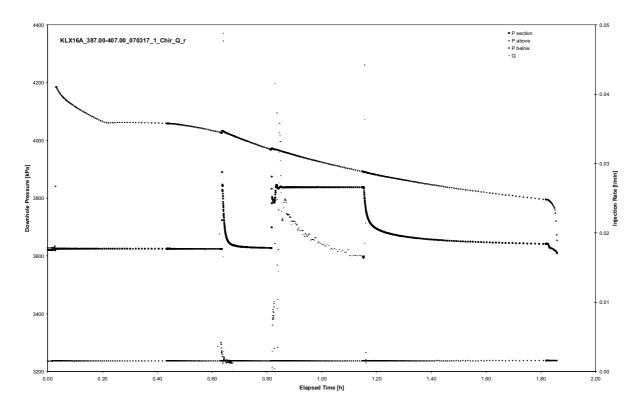


CHIR phase; log-log match

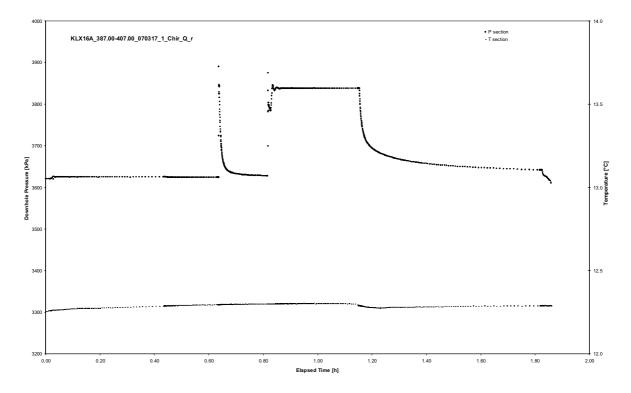


CHIR phase; HORNER match

Test 387.00 – 407.00 m



Pressure and flow rate vs. time; cartesian plot

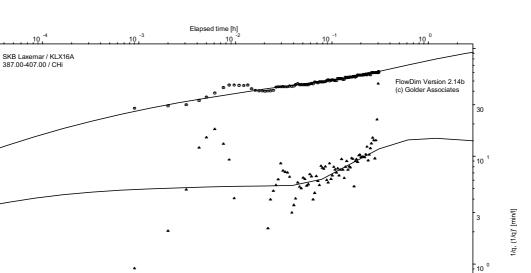


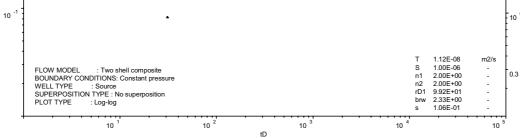
Interval pressure and temperature vs. time; cartesian plot

10

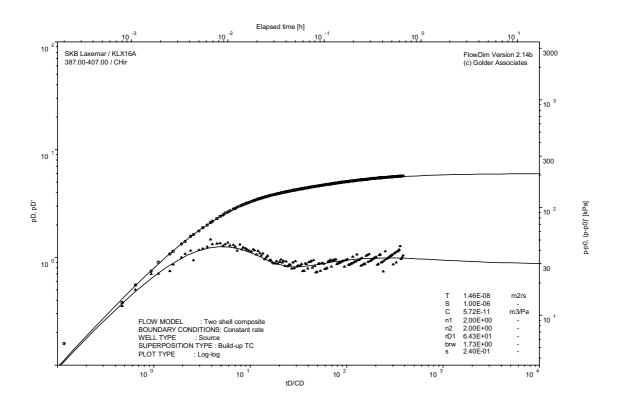
10

1/qD, (1/qD)'

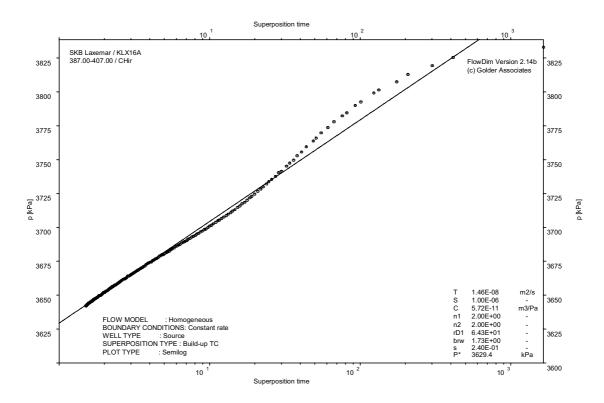




CHI phase; log-log match

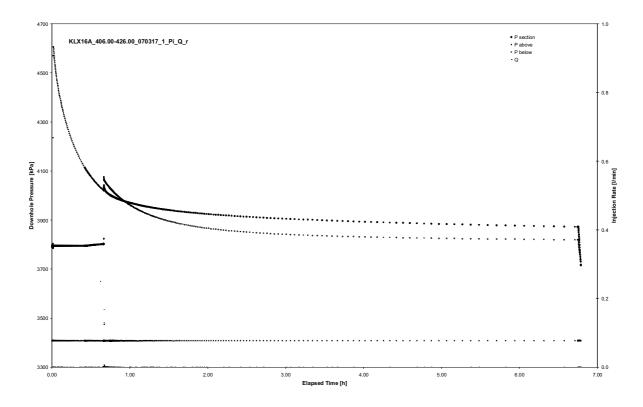


CHIR phase; log-log match

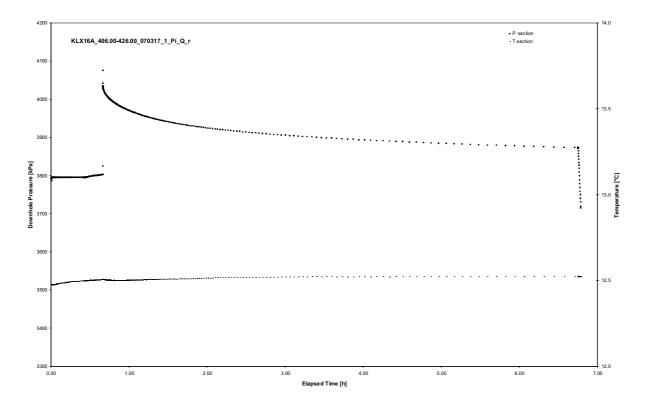


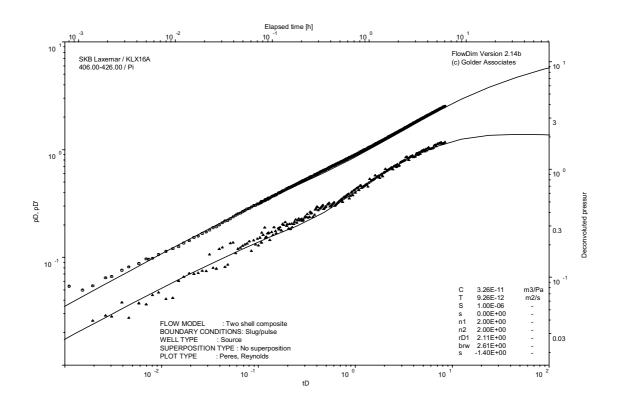
CHIR phase; HORNER match

Test 406.00 – 426.00 m



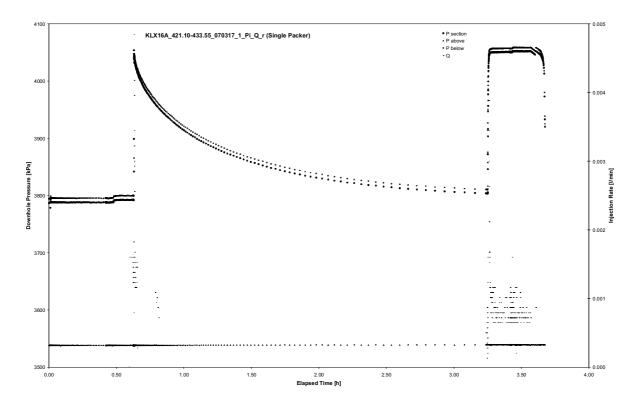
Pressure and flow rate vs. time; cartesian plot



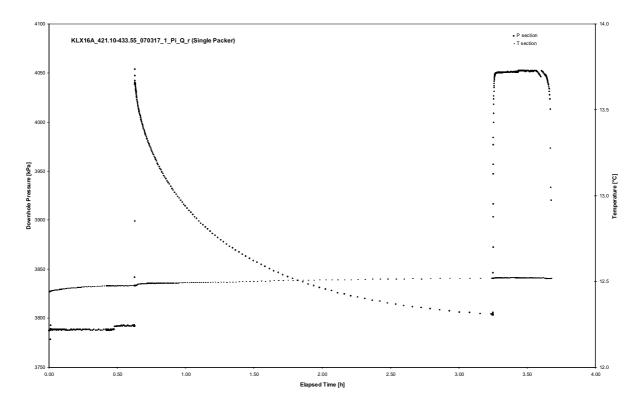


Pulse injection; deconvolution match

Test 421.10 – 433.55 m

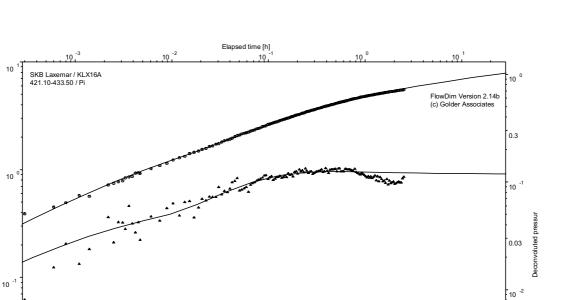


Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

pD, pD'



10<sup>2</sup>

tD

Pulse injection; deconvolution match

10 0

10

FLOW MODEL : Two shell composite BOUNDARY CONDITIONS: Slug/pulse WELL TYPE : Source SUPERPOSITION TYPE : No superposition PLOT TYPE : Peres, Reynolds 2.96E-11 9.88E-11 1.00E-06 0.00E+00 2.00E+00 2.00E+00 4.54E+00 1.82E+00 1.78E-01

m3/Pa m2/s --------

10

0.003

C T S n1 n2 rD1 brw s

10<sup>3</sup>

Borehole: KLX16A

# **APPENDIX 3**

Test Summary Sheets

	Test Su	ımı	nary Sheet			
Project:	Oskarshamn site investig			C		
Area:	Laxe	ema	Test no:			2
Borehole ID:	KL>	(16A	Test start:	070313 09:4		
Test section from - to (m):			Responsible for	Stephan R		
Section diameter, 2·r <sub>w</sub> (m):	0.076		test execution: Responsible for		Crist	Philipp Wolf ian Enachescu
			test evaluation:		Onst	
Linear plot <b>Q</b> and p	-		Flow period		Recovery period	
			Indata		Indata	
1220 KLX16A_13.00-113.00_070313_1_CHF_Q_r	■P section ■ P below ■ Q	<sup>®</sup>	p <sub>0</sub> (kPa) =	1023		
	•0	- 4	p <sub>i</sub> (kPa ) =	1031		
			p <sub>p</sub> (kPa) =	1193	p <sub>F</sub> (kPa ) =	1062
1150-		×	$Q_{p} (m^{3}/s) =$	3.69E-04		
		- 20 E	tp(s) =	1800	t <sub>F</sub> (s) =	360
		K K Stor Rub/JA	S el S <sup>*</sup> (-)=		S el S <sup>*</sup> (-)=	1.00E-03
150-	***************************************	- 20	$EC_w (mS/m) =$			
1000		• =	Temp <sub>w</sub> (gr C)=	8.3		
		10	Derivative fact.=		Derivative fact.=	0.08
660		5		0.02		0.00
500 1.00 2.00 3. 0.00 1.00 Elapsed	00 4.00 5.00 Terre [P]	600				
			Results		Results	1
and an internal devices of			Q/s (m²/s)=	2.2E-05		
Log-Log plot incl. derivates- fl	ow period		T <sub>M</sub> (m <sup>2</sup> /s)=	2.9E-05		
			Flow regime:	transient	Flow regime:	transient
Elapsed time [h]	· · · · · · · · · · · · · · · · · · ·		$dt_1$ (min) =	NA	$dt_1$ (min) =	0.14
10			$dt_2$ (min) =	NA	$dt_2$ (min) =	0.50
	1	0 -1	T (m²/s) =		T (m²/s) =	7.2E-0
			S (-) =	1.0E-03	.,	1.0E-03
10 1	0.0000000000000000000000000000000000000	.03	$K_s (m/s) =$		K <sub>s</sub> (m/s) =	7.2E-07
	in the second se	0 -2	S <sub>s</sub> (1/m) =	1.0E-05	S <sub>s</sub> (1/m) =	1.0E-0
	·	Tot form	C (m³/Pa) =	NA	C (m <sup>3</sup> /Pa) =	3.4E-09
10 *	•	.003	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	3.7E-04
	· · · ·	o <sup>-3</sup>	ξ(-) =	6.0	ξ(-) =	1.6
·			2		2	
10 <sup>7</sup> 10 <sup>8</sup>	10 <sup>9</sup> 10 <sup>10</sup> 10 <sup>11</sup>	3E-4	$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA
u .			S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
			D <sub>GRF</sub> (-) =	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives-	recovery period		Selected represe	• • • • • • • • • • • • • • • • • • • •		
Elapsed time (h)	,		$dt_1$ (min) =		C (m <sup>3</sup> /Pa) =	3.4E-09
10 2	10		$dt_2 (min) =$		C <sub>D</sub> (-) =	3.7E-04
	Ē		$T_T (m^2/s) =$	7.2E-05		1.6
	3	00	S (-) =	1.0E-03		
10 1		D <sup>2</sup>	K <sub>s</sub> (m/s) =	7.2E-07		
* *			S <sub>s</sub> (1/m) =	1.0E-05		
	3		Comments:			
	A single production	1 00-00			f 7.2E-05 m2/s was	
10 °	المعجد مشبت	o <sup>1</sup>			one), which shows a	
	-				ta and derivative qu insmissivity is estim	
	3				dimension during th	
10 <sup>1</sup> 10 <sup>2</sup>	10 <sup>-3</sup> 10 <sup>-4</sup> 10 <sup>-5</sup> 10	D °			static pressure measure	
10 to to to			transducer depth, w	as derived from	the CHir phase usin	g straight line
					value of 1,038.2 kI	

	Test Sur	nmary Sheet			
Project:	Oskarshamn site investigati	on <u>Test type:[1]</u>			CHir
Area:	Laxem	nar Test no:			1
Borehole ID:	KLX1	6A Test start:			070313 14:12
Test section from - to (m):	112.00-212.00	m Responsible for			Stephan Rohs
Section diameter, 2·r <sub>w</sub> (m):	0.0	test execution: 76 Responsible for		Crist	Philipp Wolf tian Enachescu
		test evaluation:			
Linear plot Q and p		Flow period		Recovery period	l
		Indata	1001	Indata	
2000 KLX16A_112.00-212.00_070313_1_CHir_Q_r	• P action • P action • P below • P below • Q	p <sub>0</sub> (kPa) = p <sub>i</sub> (kPa ) =	1901		
	• P balow • Q • 40	$p_i(kPa) = p_p(kPa) =$	1900	p <sub>F</sub> (kPa ) =	1902
			5.63E-04		1902
	- 33	$\frac{Q_p (m^3/s)}{tp (s)} =$		t <sub>F</sub> (s) =	1800
2500 ·	. 25	S el S <sup>*</sup> (-)=		r⊧ (3) = S el S <sup>*</sup> (-)=	1.00E-06
construction of Provide Anti-	- 20	<u>د الم الم الم الم الم الم الم الم الم الم</u>	1.001 00	5 8 5 (-)-	1.001 00
	- 15	Temp <sub>w</sub> (gr C)=	9.6		
	- 10	<ul> <li>Derivative fact.=</li> </ul>		Derivative fact.=	0.04
500 ·	- 51		0.0-		0.0
<u>.</u>	100 120 1.40 1.60 1.00				
0.00 0.20 0.40 0.60 0.60 Elapand T	100 520 540 560 580 mme[h]	Results		Results	
		Q/s (m²/s)=	1.0E-04		
Log-Log plot incl. derivates- flo	ow period	$T_{M} (m^{2}/s) =$	1.3E-04		
		Flow regime:	transient	Flow regime:	transient
10. <sup>-3</sup> Elapsed time [h]	10. <sup>-1</sup> 10. <sup>0</sup> 10. <sup>1</sup>	dt <sub>1</sub> (min) =		$dt_1$ (min) =	1.06
10 2		$dt_2$ (min) =		dt <sub>2</sub> (min) =	11.10
	10 -1	$T(m^{2}/s) =$		T (m²/s) =	1.6E-04
	0.03	S (-) =	1.0E-06		1.0E-06
10 1		$K_s (m/s) =$		K <sub>s</sub> (m/s) =	1.6E-06
: :	10 -2	$S_{s}(1/m) =$		S <sub>s</sub> (1/m) =	1.0E-08
	0.003	<sup>ww</sup> C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	1.8E-08
10 *	· · · · ·	<sup>∉</sup> C <sub>D</sub> (-) =		C <sub>D</sub> (-) =	2.0E+00
	10 <sup>3</sup>	ξ(-) =	3.5	ξ(-) =	-0.3
	3E-4	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>9</sup> 10 <sup>10</sup> 10	10 <sup>-11</sup> 10 <sup>-12</sup> 10 <sup>-13</sup>	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA
Log-Log plot incl. derivatives-	recovery period	Selected repres	entative paran	neters.	
		dt <sub>1</sub> (min) =	1.06	C (m³/Pa) =	1.8E-08
Elapsed time (h)	· · · · · · · · · · · · · · · · · · ·	$dt_2$ (min) =		C <sub>D</sub> (-) =	2.0E+00
	300	$T_{T} (m^{2}/s) =$	1.6E-04	ξ(-) =	-0.3
		S (-) =	1.0E-06		
	10 2	$R_{s}(11/3) =$	1.6E-06		
10 <u>99 80 80 80 80 80 80 80 80 80 80 80 80 80 </u>	30	S <sub>s</sub> (1/m) =	1.0E-08		
	· · · · · · · · · · · · · · · · · · ·	analysis of the CH stabilization than t transmissivity is es flow dimension dis	ir phase, which s he CHi phase. Th stimated to be 9.0 splayed during th	f 1.6E-04 m2/s was hows a better horizone confidence range DE-05 m2/s to 4.0E-0 e test was 2. The state derived from the CH	ontal for the interval 04 m2/s. The atic pressure
10 <sup>-1</sup> 10 <sup>-2</sup> INCD	10 <sup>-3</sup> 10 <sup>-4</sup> 10 <sup>-5</sup>			derived from the CH ner plot to a value of	

		nary Sheet			
Project:	Oskarshamn site investigation	Test type:[1]			CHi
Area:	Laxemar	Test no:			1
Borehole ID:	KLX16A	Test start:			070313 17:54
Fest section from - to (m):	212.00-312.00 m		Stephan R Philipp V		
Section diameter, 2·r <sub>w</sub> (m):	0.076	test execution: Responsible for		Cristian Enaches	
		test evaluation:			
₋inear plot Q and p	-	Flow period		Recovery period	
		Indata		Indata	
3 000	×	p <sub>0</sub> (kPa) =	2788		
KL X16A_212.00-312.00_070313_1_CHIr_Q_r	P action P above P bloov Q	p <sub>i</sub> (kPa ) =	2789		
·····	Ľ	p <sub>p</sub> (kPa) =	2984	p <sub>F</sub> (kPa ) =	278
200	- 2	Q <sub>p</sub> (m <sup>3</sup> /s)=	2.85E-04		
100		tp (s) =	1800	t <sub>F</sub> (s) =	180
	2 20 Linux () area ()	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
		EC <sub>w</sub> (mS/m)=			
500 *		Temp <sub>w</sub> (gr C)=	11.0		
900 -		Derivative fact.=	0.05	Derivative fact.=	0.0
1787	* 5				
000 020 0.40 0.00 0.00 11 000 020 0.40 0.00 Elapsed	80 1.20 1.40 1.60 1.80 2.60 Times[0]	Results		Results	
		Q/s (m²/s)=	1.4E-05		
og-Log plot incl. derivates- fl	ow period	$T_{M} (m^{2}/s) =$	1.9E-05		
		Flow regime:	transient	Flow regime:	transient
Elaosed time (h)		$dt_1$ (min) =	15.36	$dt_1$ (min) =	5.1
10 <sup>1</sup>	10, <sup>-1</sup>	$dt_2$ (min) =		$dt_2$ (min) =	17.8
· · · · · · · · · · · · · · · · · · ·	0.03	$T(m^2/s) =$		$T(m^2/s) =$	5.0E-0
	0.03	S (-) =	1.0E-06		1.0E-0
10 .	10 -2	K <sub>s</sub> (m/s) =		K <sub>s</sub> (m/s) =	5.0E-0
		$S_{s}(1/m) =$		$S_{s}(1/m) =$	1.0E-0
	0.003		NA		6.7E-0
		C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	7.4E-0
10 1	Ĩ.	C <sub>D</sub> (-) =		C <sub>D</sub> (-) =	
	▲ 3E-4	ξ(-) =	-1.1	ξ(-) =	-3.
10 4 10 9		T <sub>GRF</sub> (m²/s) =	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
Ci Ci	10 10 10	S <sub>GRF</sub> (-) =	NA	$S_{GRF}(-) =$	NA
		D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA
og-Log plot incl. derivatives-	recovery period	Selected represe	intative paran	neters.	
			Г <b>г</b> 40	C (m <sup>3</sup> /Pa) =	6.7E-0
		dt <sub>1</sub> (min) =	5.12	$C(\Pi/Pa) =$	
Elapsed Ime [4]					7.4E-0
10 <sup>1</sup>		$dt_2$ (min) =	17.88	C <sub>D</sub> (-) =	
10 1 Elapset Ime (1		$dt_2 (min) = T_T (m^2/s) =$	17.88 5.0E-05	$C_{D}(-) = \xi(-) =$	
10 <sup>1</sup>		$dt_2 (min) = T_T (m^2/s) = S (-) =$	17.88 5.0E-05 1.0E-06	$C_{D}(-) = \xi(-) =$	
10 10		$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07	$C_{D}(-) = \xi(-) =$	
10		$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06	$C_{D}(-) = \xi(-) =$	
10 10 10 10 10 10 10 10 10 10 10 10 10 1	10 <sup>7</sup> 30	$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08	$C_{D}(-) = \xi(-) =$	7.4E-0 -3.
10 10 10 10 10 10 10 10 10 10 10 10 10 1		$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08 ransmissivity o	$C_D(-) = \xi(-) $	-3.
10 <sup>-1</sup> 10 <sup>-1</sup> 10 <sup>-1</sup> 10 <sup>-1</sup> 10 <sup>-1</sup>	10 <sup>7</sup> 30	$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08 ransmissivity o	$C_{D}(-) = \xi(-) = \xi(-$	-3. derived from th good horizonta
10 - 50 <sup>-3</sup> Elepted time [n]	10 <sup>7</sup> 30	$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08 ransmissivity o phase (outer zo onfidence range	$C_D(-) =$ $\xi(-) =$ f 5.0E-05 m2/s was one), which shows a for the interval trans	-3. derived from th good horizonta smissivity is
10 <sup></sup>	10 <sup>7</sup> 30	$dt_{2} (min) =$ $T_{T} (m^{2}/s) =$ $S (-) =$ $K_{s} (m/s) =$ $S_{s} (1/m) =$ <b>Comments:</b> The recommended t analysis of the CHir stabilization. The co estimated to be 2.0E displayed during the	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08 ransmissivity o phase (outer ze onfidence range E-05 m2/s to 8.0 e test is 2. The s	$C_D(-) =$ $\xi(-) =$ $\xi(-) =$ f 5.0E-05 m2/s was of f 5.0E-05 m2/s was a for the interval trans E-05 m2/s. The flow tatic pressure measu	-3. derived from th good horizonta smissivity is v dimension red at
10	10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>3</sup> 10 <sup>3</sup>	$\begin{array}{llllllllllllllllllllllllllllllllllll$	17.88 5.0E-05 1.0E-06 5.0E-07 1.0E-08 ransmissivity o phase (outer ze onfidence range E-05 m2/s to 8.0 e test is 2. The s as derived from	$C_D(-) =$ $\xi(-) =$ $\xi(-) =$ f 5.0E-05 m2/s was one), which shows a for the interval trans E-05 m2/s. The flow	-3. derived from th good horizonta smissivity is v dimension red at g straight line

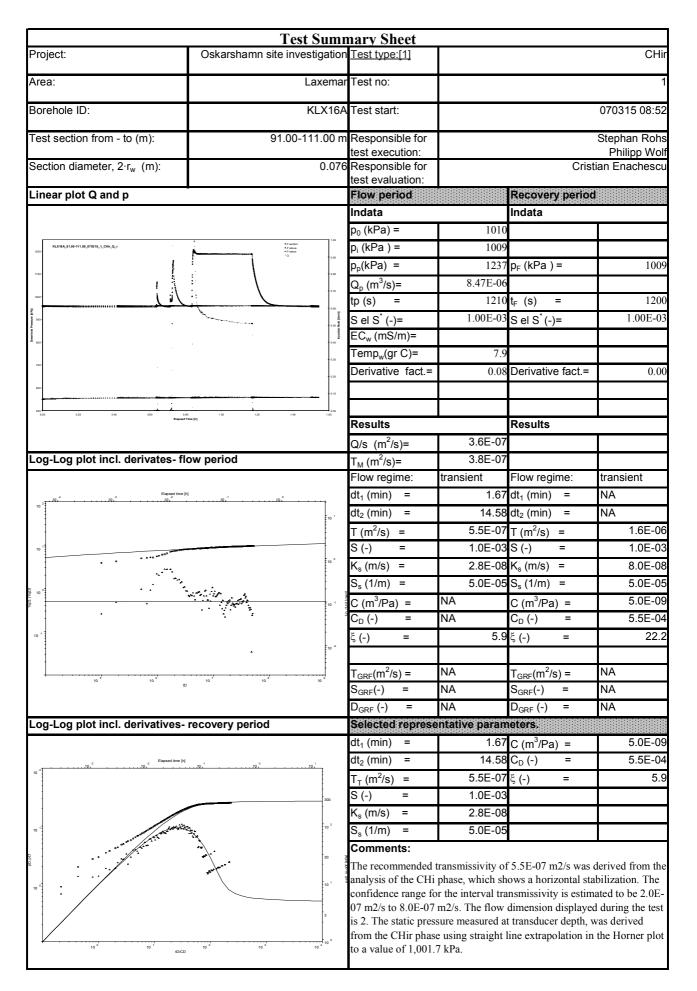
	Test Sum	nary Sheet			
Project:	Oskarshamn site investigation				CHir
Area:	Laxemar	Test no:			1
Borehole ID:	KLX16A	Test start:			070313 21:41
Test section from - to (m):	312.00-412.00 m	Responsible for	Steph		Stephan Rohs
		test execution:			Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for test evaluation:		Crist	ian Enachescu
Linear plot Q and p		Flow period		Recovery period	
		Indata		Indata	
400		p <sub>0</sub> (kPa) =	3671		1
KLX16A_312.00-412.00_070313_1_CHr=Q_r	Pacton     / Paboe     Potow     O	p <sub>i</sub> (kPa ) =	3668		
380	<u> </u>	$p_p(kPa) =$		p <sub>F</sub> (kPa ) =	3693
370		$Q_p (m^3/s) =$	2.95E-06		
3800		$\frac{d_p(m/s)}{tp(s)} =$		t <sub>F</sub> (s) =	1800
540 Cardon Cardo		S el S <sup>*</sup> (-)=		⊈ (3) = S el S <sup>*</sup> (-)=	1.00E-06
	hoden	EC <sub>w</sub> (mS/m)=	1.001 00	5 el 5 (-)-	1.002.00
380-		Temp <sub>w</sub> (gr C)=	12.3		<u> </u>
2800	-	Derivative fact.=		Derivative fact.=	0.05
		Derivative Tact	0.03	Denvalive laci	0.05
2000 100 100 Eligned Ti	1.50 2.00				
		Results		Results	
		Q/s (m <sup>2</sup> /s)=	1.5E-07		
Log-Log plot incl. derivates- flo	ow period	T <sub>M</sub> (m²/s)=	1.9E-07		
		Flow regime:	transient	Flow regime:	transient
. 10 . <sup>4</sup> Elapsed time [h]		dt <sub>1</sub> (min) =	#NV	dt <sub>1</sub> (min) =	#NV
10 2		dt <sub>2</sub> (min) =	#NV	dt <sub>2</sub> (min) =	#NV
	30	T (m²/s) =	6.9E-08	$T(m^{2}/s) =$	6.4E-08
		S (-) =	1.0E-06	S (-) =	1.0E-06
10 1	10 1	$K_s (m/s) =$	6.9E-10	$K_s (m/s) =$	6.4E-10
		$S_{s}(1/m) =$		$S_{s}(1/m) =$	1.0E-08
• • • • • • • • • • • • • • • • • • •	3	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	4.7E-10
· · ·	10 °	$C_{D}(-) =$	NA	$C_{D}(-) =$	5.2E-02
10		ξ(-) =		ξ(-) =	-2.5
		5()		~ ( )	
•	- 10 <sup>-1</sup>	$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>-1</sup> 10 <sup>-2</sup> 10	10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>5</sup>	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA
Log-Log plot incl. derivatives-	recovery period	Selected represe	ntative paran	neters.	
		$dt_1$ (min) =	NA	C (m <sup>3</sup> /Pa) =	4.7E-10
Elapsed time (h		$dt_2$ (min) =	NA	$C_{D}(-) =$	5.2E-02
	10 3	$T_{T} (m^{2}/s) =$	6.4E-08		-2.5
		S (-) =	1.0E-06		
10		$K_s (m/s) =$	6.4E-10		
	10 <sup>2</sup>	$S_{s}(1/m) =$	1.0E-08		
and the second sec		Comments:			
10 °			ransmissivity o	f 6.4E-08 m2/s was o	derived from the
	10 gi 4			one), which shows a	
10 -1		derivative quality th	an the CHi pha	se. The confidence r	ange for the
	10 <sup>°</sup>	interval transmissiv			
				ng the test was 2. Th derived from the CH	
10 <sup>°</sup> 10 <sup>1</sup> tD/CD	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>			ner plot to a value of	
				r to a value of	- , u.

Oskarshamn site investigation	Test type:[1]			CHi
Laxemar	Test no:			1
KLX16A	Test start:			070314 13:12
12.50-32.50 m				Stephan Rohs
0.076			Crist	Philipp Wol ian Enachescu
	test evaluation:			
			•••••••••••••••••••••••••••••••••••••••	
• P action				
• 2 400				
350	- F			35
300				120
				1200
200 Ba		1.00E-03	S el S (-)=	1.00E-0
150		7.0		
			Device the fact	0.0
- - - 00	Derivative fact.=	0.01	Derivative fact.=	0.0
191	Results		Results	
	Q/s (m <sup>2</sup> /s)=	2.3E-05		
w period	T <sub>M</sub> (m²/s)=	2.4E-05		
	Flow regime:	transient	Flow regime:	transient
10 <sup>-1</sup> 10 <sup>0</sup>		NA	dt <sub>1</sub> (min) =	NA
	$dt_2$ (min) =	NA	dt <sub>2</sub> (min) =	NA
10 -1	T (m²/s) =		· ·	1.9E-0
	S (-) =			1.0E-0
0.03				9.5E-0
10 <sup>-2</sup>				5.0E-0
total linear sector and the sector a				1.0E-0
0.003 Ē	C <sub>D</sub> (-) =			1.1E-02
10 <sup>-3</sup>	ξ(-) =	8.6	ξ(-) =	-1.:
•	2		2	
3E-4				NA
				NA
accurate partial				NA
ecovery period				
	,		, <i>,</i>	1.0E-0
<sup>-2</sup>				1.1E-0
			ς(-) =	8.0
10 2				
				<u> </u>
and the second s		5.0E-05		
10 1 60			C 2E 05 2/aa	daniara d Casara da
3				
	stabilization. The co	onfidence range	for the interval trans	smissivity is
10				
10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>				
	autoucor depui, w	as actived from	e errin priuse usin	
	12.50-32.50 m 0.076	Flow period Flow regime: Constrained to period Flow regime: Flow regime: Constrained to period Flow regime: Flow re	12.50-32.50 m       Responsible for         test execution:       0.076         Responsible for       test evaluation:         Flow period       Indata $p_0$ (kPa) =       314 $p_0$ (kPa) =       315 $p_0$ (kPa) =       316 $p_0$ (kPa) =       317 $p_0$ (kPa) =       318 $p_0$ (kPa) =       319 $p_0$ (kPa) =       310 $p_0$ (kPa) =       310 $p_0$ (kPa) =       310 $p_0$ (kPa) =       100E-03         Set S' (-)=       1.00E-03         K_s (m/s) =       3.1E-06         Sa (1/m) =       5.0E-05         Sore(-) =       NA $C_0$ (-) =       NA	12.50-32.50 mResponsible for test execution:0.076Responsible for test evaluation:Crist rest evaluation:Flow periodRecovery period10dataIndataIndata $p_{(k}(Pa) =$ 314Indata $p_{(k}(Pa) =$ 502 $p_{c}(kPa) =$ $p_{(k}(Pa) =$ $Q_{a}$ (m <sup>2</sup> /s)=4.37E-04Indata $p_{(k}(Pa) =$ 100E-03 S et S' (-)=EC. $Q_{a}$ (m <sup>2</sup> /s)=2.3E-05Indata $Q_{a}$ (m <sup>2</sup> /s)=2.3E-05Indata $Q'_{a}$ (m <sup>2</sup> /s)=2.4E-05Indata $Q'_{a}$ (m <sup>2</sup> /s)=0.2E-05Indata $Q'_{a}$ (

	Test Sumn	narv Sheet			
Project:	Oskarshamn site investigation				CHir
Area:	Laxemar	Test no:			1
Borehole ID:	KLX16A	Test start:			070314 22:12
Test section from - to (m):	32.50-52.50 m	Responsible for			Stephan Rohs
		test execution:			Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for		Crist	ian Enachescu
Linear plot Q and p		test evaluation: Flow period		Recovery period	
		Indata		Indata	
	. 20	p <sub>0</sub> (kPa) =	487	indata	
KLX16A_32.56-52.50_070314_2_CHir_Q_r	9 micro     9 micro     9 micro     9 micro     9 micro     9 micro     9	p <sub>0</sub> (kPa) = p <sub>i</sub> (kPa ) =	487		
603					40
700.	15 IS	p <sub>p</sub> (kPa) =		p <sub>F</sub> (kPa ) =	490
600		Q <sub>p</sub> (m <sup>3</sup> /s)=	4.10E-06		
····		tp (s) =		t <sub>F</sub> (s) =	1200
400	to day of	S el S <sup>*</sup> (-)=	1.00E-03	S el S <sup>*</sup> (-)=	1.00E-03
500		EC <sub>w</sub> (mS/m)=			
200-	- as	Temp <sub>w</sub> (gr C)=	7.4		
100	Weller John Strand Strand	Derivative fact.=	0.07	Derivative fact.=	0.0
0 000 0.20 0.40 0.60 0.00 Etapand	100 120 140 160 180				
		Results		Results	
		Q/s (m²/s)=	2.0E-07		
_og-Log plot incl. derivates- fl	ow period	T <sub>M</sub> (m²/s)=	2.1E-07		
		Flow regime:	transient	Flow regime:	transient
10 <sup>-4</sup> Elapsed time [	1 10 <sup>-1</sup> 10 <sup>0</sup>	dt <sub>1</sub> (min) =	0.47	dt <sub>1</sub> (min) =	1.60
10 1		$dt_2$ (min) =		$dt_2$ (min) =	8.09
		$T(m^2/s) =$		$T(m^2/s) =$	5.4E-07
B 00° * 4.44		S (-) =	1.0E-03		1.0E-0
10 °	10 °	$K_s (m/s) =$		K <sub>s</sub> (m/s) =	2.7E-08
		$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0
•	0.3		0.0L-03		2.9E-10
	10 <sup>-1</sup> 4	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	3.2E-0
10 -1	•			$C_{D}(-) =$	
	0.03	ξ(-) =	2.2	ξ(-) =	12.1
	10 -2	T <sub>GRF</sub> (m²/s) =	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
10 <sup>1</sup> 10 <sup>2</sup> 10	10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>5</sup>	S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
		D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA
Log-Log plot incl. derivatives-	recovery period	Selected represe	intative paran		
		dt <sub>1</sub> (min) =		C (m <sup>3</sup> /Pa) =	2.9E-10
10 <sup>-4</sup> Elapsed time [h]	-2 10 <sup>-1</sup> <sup>0</sup>	$dt_2$ (min) =		$C_{D}(-) =$	3.2E-0
10 2	10 <sup>3</sup>	$T_{T} (m^2/s) =$	5.4E-07		12.
		S(-) =	1.0E-03		
	300	K <sub>s</sub> (m/s) =	2.7E-08		
10 1		$R_{s}(11/s) = S_{s}(1/m) =$	5.0E-05		<u> </u>
	10 *	Comments:	5.0L-05		
· · · · · · · · · · · · · · · · · · ·			· · ·	65 4E 07 2'	1
· · ·				f 5.4E-07 m2/s was of hows the better deriv	
10 °	10 <sup>1</sup>			hows the better deriv al transmissivity is e	
	· · · · · · · · · · · · · · · · · · ·	3.0E-07 m2/s to 7.0	E-07 m2/s. The	flow dimension disr	blayed during
	* **** <b>* **</b> *	3.0E-07 m2/s to 7.0 the test was 2. The s			
10° 0'	0 <sup>2</sup> 10 <sup>2</sup> 10 <sup>4</sup>	the test was 2. The s	static pressure n Hir phase using	neasured at transduce straight line extrapol	er depth, was

Test Sumr	nary Sheet				
Oskarshamn site investigation	Test type:[1]			CHir	
Laxemar	Test no:			1	
KLX16A	Test start:	start:		070315 00:34	
52 50-72 50 m	Responsible for	Ster		Stephan Rohs	
02.00 72.00 11	test execution:			Philipp Wol	
0.076			Cris	tian Enachescu	
	• • • • • • • • • • • • • • • • • • • •		• • • • • • • • • • • • • • • • • • • •	3	
				1	
-P sector 0.30					
·u					
- 0.25				668	
+ 0.30					
				3600	
98 21:0 - 10 20 20 20 20 20 20 20 20 20 20 20 20 20		1.00E-03	S el S <sup>*</sup> (-)=	1.00E-03	
÷					
- 0.10					
- 0 05	Derivative fact.=	0.10	Derivative fact.=	0.00	
1.50 2.00					
Time [b]	Results		Results	<u></u>	
	Q/s (m <sup>2</sup> /s)=	7.3E-08			
ow period	T <sub>M</sub> (m <sup>2</sup> /s)=	7.6E-08			
	Flow regime:	transient	Flow regime:	transient	
[n] (d)	dt <sub>1</sub> (min) =	2.65	dt <sub>1</sub> (min) =	NA	
	dt <sub>2</sub> (min) =	13.50	dt <sub>2</sub> (min) =	NA	
•	T (m²/s) =	1.9E-07	T (m²/s) =	2.3E-07	
10 <sup>1</sup>	S (-) =			1.0E-03	
-	$K_s(m/s) =$	9.5E-09	K <sub>s</sub> (m/s) =	1.2E-08	
<b>د</b> ۱۰۰ - ۲۰۰	$S_{s}(1/m) =$	5.0E-05	$S_{s}(1/m) =$	5.0E-05	
	$C (m^{3}/Pa) =$	NA	$C (m^3/Pa) =$	4.2E-10	
		NA		4.6E-05	
10 -1	ξ(-) =			17.6	
	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	$T_{GRF}(m^2/s) =$	NA	
10 <sup>13</sup> 10 <sup>14</sup> 10 <sup>15</sup> D	S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA	
	D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA	
recovery period	Selected represe	entative paran	neters.		
	dt <sub>1</sub> (min) =	NA	C (m <sup>3</sup> /Pa) =	4.2E-10	
<u></u>	dt <sub>2</sub> (min) =	NA	C <sub>D</sub> (-) =	4.6E-05	
	$T_{T}(m^{2}/s) =$	2.3E-07	ξ(-) =	17.6	
300	S (-) =	1.0E-03			
	$K_s (m/s) =$	1.2E-08			
<b>*</b>	$S_{s}(1/m) =$	5.0E-05			
× ×	Comments:				
	The recommended	transmissivity o	f 2.3E-07 m2/s was	derived from the	
<b>service</b> 10 '	analysis of the CHin	r phase, which s	hows the better deri	vative quality.	
		c .1	1 4	actimated to be	
	The confidence ran				
3	6.0E-08 m2/s to 5.0	E-07 m2/s. A fl	ow dimension of 2	was assumed for	
3		DE-07 m2/s. A fl pressure measure	ow dimension of 2 ed at transducer dep	was assumed for th, was derived	
	Oskarshamn site investigation Laxemar KLX16A 52.50-72.50 m 0.076	$0.076 Responsible for test evaluation: Flow period Indata p_0 (kPa) = p_{p}(kPa) = p_{p}(k$	Oskarshamn site investigation         Test type:[1]           Laxemar         Test no:           KLX16A         Test start:           52:50-72:50 m         Responsible for test execution:           0.076         Responsible for test evaluation:           Elew period         Indata $p_0$ (kPa) =         668 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         866 $Q_p$ (m <sup>3</sup> /s)=         1.47E-06 $p_k$ (kPa) =         9.66 $Q_r$ (m <sup>3</sup> /s)=         7.3E-08 $Q's$ (m <sup>2</sup> /s)= <th< td=""><td>Oskarshamn site investigation         Test type:[1]           Laxemar         Test no:           S2.50-72.50 m         Responsible for test execution:         Cris           0.076         Responsible for test evaluation:         Recovery period           Flow period         Recovery period         Recovery period           <math>p_0</math> (kPa) =         668         p           <math>p_0</math> (kPa) =         866         p           <math>Q_0</math> (m<sup>3</sup>/s)=         1.47E-06         p           <math>p_0</math> (kPa) =         9.000         T           <math>Q_0</math> (m<sup>3</sup>/s)=         7.3E-08         p           <math>Q_0</math> (m<sup>3</sup>/s)=         7.3E-08         p           Ow period         T<sub>M</sub> (m<sup>2</sup>/s)=         7.6E-08           <math>Q_1</math> (m<sup>3</sup>/s) =         1.9E-07         T (m<sup>2</sup>/s) =           <math>Q_1</math> (m<sup>3</sup>/s) =         1.9E-07         T (m<sup>2</sup>/s) =           <math>Q_2</math> (m<sup>3</sup>/s) =         1.9E-07         T (m<sup>2</sup>/s) =           <math>Q_2</math> (m<sup>3</sup>/s) =         1.9E-07         <t< td=""></t<></td></th<>	Oskarshamn site investigation         Test type:[1]           Laxemar         Test no:           S2.50-72.50 m         Responsible for test execution:         Cris           0.076         Responsible for test evaluation:         Recovery period           Flow period         Recovery period         Recovery period $p_0$ (kPa) =         668         p $p_0$ (kPa) =         866         p $Q_0$ (m <sup>3</sup> /s)=         1.47E-06         p $p_0$ (kPa) =         9.000         T $Q_0$ (m <sup>3</sup> /s)=         7.3E-08         p $Q_0$ (m <sup>3</sup> /s)=         7.3E-08         p           Ow period         T <sub>M</sub> (m <sup>2</sup> /s)=         7.6E-08 $Q_1$ (m <sup>3</sup> /s) =         1.9E-07         T (m <sup>2</sup> /s) = $Q_1$ (m <sup>3</sup> /s) =         1.9E-07         T (m <sup>2</sup> /s) = $Q_2$ (m <sup>3</sup> /s) =         1.9E-07         T (m <sup>2</sup> /s) = $Q_2$ (m <sup>3</sup> /s) =         1.9E-07 <t< td=""></t<>	

	Test	Sumn	nary Sheet			
Project:	Oskarshamn site invest					CHir
Area:	La	axemar	Test no:			1
Borehole ID:	K	LX16A	Test start:	070315 0		
Test section from - to (m):	72.50-9	2.50 m	Responsible for	Stephan Ro		
			test execution:			Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):		0.076	Responsible for test evaluation:		Crist	ian Enachescu
Linear plot Q and p	4		Flow period		Recovery period	
			Indata	************************	Indata	-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1
1100	•P sedion	0.50	p <sub>0</sub> (kPa) =	846		
KLX16A_72.50-52.50_070315_1_CHir_Q_r	• P adan • P abon • P baba • P baba • Q	0.45	p <sub>i</sub> (kPa ) =	841		
1000	•		p <sub>p</sub> (kPa) =	1041	p <sub>F</sub> (kPa ) =	845
800	· ; :	0.35	$Q_{p} (m^{3}/s) =$	4.12E-06		
ξ			$\frac{d_p(m, b)}{d_p(s)} =$		t <sub>F</sub> (s) =	1200
	And a second	on Rate Dimit	S el S <sup>*</sup> (-)=		♀ (e) S el S <sup>*</sup> (-)=	1.00E-03
7700.	· ·	• 0.20 Infeatr	EC <sub>w</sub> (mS/m)=	1.0012 02	383 (-)-	1.002 02
800		0.15	Temp <sub>w</sub> (gr C)=	7.7		
		0.10	Derivative fact.=		Derivative fact.=	0.02
500		- 0.05		0.04	Derivative lact	0.02
400 0.20 0.60 Etypes	0.00 1.20 In Time [b]	0.00				
			Results		Results	-
			Q/s (m²/s)=	2.0E-07		
_og-Log plot incl. derivates- f	low period		T <sub>M</sub> (m²/s)=	2.1E-07		
			Flow regime:	transient	Flow regime:	transient
Elapsed time	իլ 1		dt <sub>1</sub> (min) =	0.15	$dt_1$ (min) =	1.21
10 2			dt <sub>2</sub> (min) =		dt <sub>2</sub> (min) =	6.60
		10	T (m²/s) =	5.1E-07	T (m²/s) =	8.6E-07
10 1	/000899 (kaliman 2000) and an angle and a long		S (-) =	1.0E-03	S (-) =	1.0E-03
		10 0	K <sub>s</sub> (m/s) =	2.6E-08	K <sub>s</sub> (m/s) =	4.3E-08
	· · · · ·		S <sub>s</sub> (1/m) =	5.0E-05	S <sub>s</sub> (1/m) =	5.0E-05
10 0		[hrim] (t	C (m³/Pa) =	NA	C (m³/Pa) =	6.8E-07
		10 10 101	$C_D(-) =$	NA	$C_{D}(-) =$	7.5E-02
10 -1	· ·		ξ(-) =		ξ(-) =	24.3
		10 -2				
	• •		T <sub>GRF</sub> (m²/s) =	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>11</sup> 10 <sup>12</sup> 1	10 <sup>10</sup> 1	10 14	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
			$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives-	· recovery period		Selected represe	ntative paran		
	-		dt <sub>1</sub> (min) =	0.15		6.8E-07
Elapsed time	<sup>2</sup> [h] 1 <sup>2</sup>		$dt_2$ (min) =	10.26	$C_{D}(-) =$	7.5E-02
10 2			$T_{T} (m^{2}/s) =$	5.1E-07		12.5
		-	S (-) =	1.0E-03		
10		10 2	$K_s (m/s) =$	2.6E-08		
		ł	$S_{s}(1/m) =$	5.0E-05		
		10 ' _	Comments:			
10 <sup>-4</sup>	10 <sup>3</sup> 10 <sup>4</sup>	10°0') 10°0	analysis of the CHi stabilization than th transmissivity is est flow dimension disp measured at transdu	phase, which she e CHir phase. T imated to be 2.0 played during th cer depth, was	he confidence range E-07 m2/s to 8.0E-0 e test is 2. The static derived from the CH	ous horizontal for the interval 7 m2/s. The pressure fir phase using
בע⊪ טו ∾י בע⊮	NCD 10 10		straight line extrapo	lation in the Ho	rner plot to a value	ot 840.8 kPa.



	Test Sum	mary Sheet			
Project:	Oskarshamn site investigatio				CHi
A == = = =	Lavama	r Toot no.			4
Area:	Laxema	r Test no:			I
Borehole ID:	KLX16	A Test start:			070315 10:59
Test section from - to (m):	111 00-131 00 r	n Responsible for			Stephan Rohs
		test execution:			Philipp Wol
Section diameter, 2·r <sub>w</sub> (m):	0.07	6 Responsible for		Crist	ian Enachescu
		test evaluation:			
Linear plot Q and p		Flow period		Recovery period	
		Indata		Indata	
1500 KLX16A_111.80-131.00_070315_1_CHir_Q_r	• P action	p <sub>0</sub> (kPa) =	1187		
1400 · · · · · · · · · · · · · · · · · ·	+ P section 19 about 19 bation 10	p <sub>i</sub> (kPa ) =	1186		
		p <sub>p</sub> (kPa) =		p <sub>F</sub> (kPa ) =	118
1300	0.20	Q <sub>p</sub> (m <sup>3</sup> /s)=	1.72E-06		
1220		tp (s) =		t <sub>F</sub> (s) =	1200
1900	and the second se	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
1000	5 martine 1000 1000	EC <sub>w</sub> (mS/m)=			
	0.0	Temp <sub>w</sub> (gr C)=	8.2		
		Derivative fact.=	0.04	Derivative fact.=	0.0
800					
700 0.20 0.40 0.60 Elapsed T	040 1.00 1.20 1.40 me[h]	Results		Results	
		Q/s (m <sup>2</sup> /s)=	8.5E-08		
.og-Log plot incl. derivates- flo	ow period	$T_{M} (m^{2}/s) =$	8.9E-08		
	•	Flow regime:	transient	Flow regime:	transient
Elapsed time (h)		$dt_1$ (min) =	2.48	$dt_1$ (min) =	NA
10 <sup>2</sup>		$dt_2$ (min) =		$dt_2$ (min) =	NA
		$T(m^2/s) =$		$T(m^2/s) =$	2.0E-0
		S (-) =	1.0E-06	( )	1.0E-0
10 1	10 <sup>1</sup>	$K_{s}$ (m/s) =		$K_s (m/s) =$	1.0E-0
		$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0
1	•	$C (m^3/Pa) =$	NA	C (m <sup>3</sup> /Pa) =	2.1E-1
	• • • • • •	$C (m / Fa) = C_D (-) =$	NA	$C_{D}(-) =$	2.3E-0
10 °		ξ(-) =		ξ(-) =	8.8
•	0.3	ς (-) –	5.2	·ç(-) –	0.0
	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>°</sup> 10 <sup>7</sup> tD	10 <sup>8</sup> 10 <sup>9</sup> 10 <sup>10</sup>	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
.og-Log plot incl. derivatives-	recovery period	Selected represe			
		$dt_1$ (min) =	• • • • • • • • • • • • • • • • • • • •	C (m <sup>3</sup> /Pa) =	2.1E-1
10 <sup>-4</sup> Eapsed time [h]	4n <sup>-1</sup> 4n <sup>0</sup>	$dt_1 (min) =$ $dt_2 (min) =$		$C (m/Pa) = C_D (-) =$	2.1E-1
10 2	· · · · · · · · · · · · · · · · · · ·				2.3E-0.
		$T_{T} (m^{2}/s) =$ S (-) =	1.6E-07 1.0E-06		5./
	300				
10 <sup>1</sup>	10 <sup>2</sup>	$K_s (m/s) =$	8.0E-09		
· · · · · · · · · · · · · · · · · · ·	10	S <sub>s</sub> (1/m) =	5.0E-08		
	30	Comments:		A (T) A =	
. //	- \.			f 1.6E-07 m2/s was o	
		analyzia of the CIT		iows a neuer norizof	nai siadiiizatiof
10 T	10 <sup>1</sup>	analysis of the CHi although the derivat			nge for the
	and a second sec	although the derivation	tive is a bit nois	y. The confidence ra to be 8.0E-08 m2/s t	
	· · · · · · · · · · · · · · · · · · ·	although the derivation interval transmissive. The flow dimension	tive is a bit nois ity is estimated a displayed durin	y. The confidence ra to be 8.0E-08 m2/s t ng the test is 2. The s	to 4.0E-07 m2/s static pressure
		although the derivat interval transmissiv The flow dimensior measured at transdu	tive is a bit nois ity is estimated displayed durin icer depth, was	y. The confidence ra to be 8.0E-08 m2/s t	to 4.0E-07 m2/s static pressure fir phase using

Test Summ	nary Sheet			
				CHi
Laxemar	Test no:			1
KLX16A	Test start:			070315 13:31
131.00-151.00 m	Responsible for			Stephan Rohs
	test execution:			Philipp Wol
			Crist	tian Enachescu
			Recovery period	
	• • • • • • • • • • • • • • • • • • • •		••••••	
T 500		1365		
▲ P above				
			n_ (kPa) =	136
350				150.
360				120
1210 to 1210 t	1- (-)		,	1.00E-0
		1.00E-00	SeiS (-)=	1.00E-0
		0.4		
			Deviseding frat	0.0
50 SD	Derivative Tact.=	0.01	Derivative fact.=	0.0
0.00 1.00 1.20 1.40 0.0				
	Results		Results	
	Q/s (m²/s)=	8.0E-05		
ow period	T <sub>M</sub> (m²/s)=	8.4E-05		
	Flow regime:	transient	Flow regime:	transient
l	dt <sub>1</sub> (min) =	0.95	dt <sub>1</sub> (min) =	1.04
	dt <sub>2</sub> (min) =	15.42	dt <sub>2</sub> (min) =	15.78
10 -1	T (m²/s) =	2.0E-04	T (m²/s) =	1.5E-04
0.03	S (-) =	1.0E-06	S (-) =	1.0E-0
	K <sub>s</sub> (m/s) =	1.0E-05	K <sub>s</sub> (m/s) =	7.5E-0
10-2	S <sub>s</sub> (1/m) =	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-08
d hard	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	1.6E-08
0.003		NA		1.8E+00
10 3	ξ(-) =	5.6		2.0
3E-4	$T_{m}^{2}(a) =$	NΔ	$T_{(m^{2}/a)} =$	NA
10 12 10 13 10 14				NA
				NA
recovery period				<u> </u>
		• • • • • • • • • • • • • • • • • • • •		1.6E-08
				1.8E+0
10, <sup>-2</sup> 10, <sup>-1</sup>				1.o⊑+0 5.i
300				Э.
	-	5.0E-08	1	
		transmissivity o	f 2.0E-04 m <sup>2/s</sup> was	derived from the
· · · · · · · · ·				
	The confidence range	ge for the interv	al transmissivity is e	estimated to be
			Cl. 1	alound during
	9.0E-05 m2/s to 9.0			
	9.0E-05 m2/s to 9.0 the test is 2. The sta derived from the CI	tic pressure mea	asured at transducer	depth, was
	Oskarshamn site investigation Laxemar KLX16A 131.00-151.00 m 0.076	Oskarshamn site investigationTest type:[1]LaxemarTest no:KLX16ATest start:131.00-151.00Responsible for test evaluation:0.076Responsible for test evaluation:Flow periodIndata $p_0 (kPa) =$ $p_1 (kPa) =$ $p_p (kPa) =$ $Q_0 (m^3/s) =$ tp (s) =0.076Sel s' (-)=ECw (mS/m)=Sel s' (-)=ECw (mS/m)=Tempw(gr C)=Derivative fact.=Image: Comparison of the structure fact.=Image: Compari	Oskarshamn site investigation         Test no:           KLX16A         Test no:           131.00-151.00 m         Responsible for test execution:           0.076         Responsible for test evaluation:           Flow period         Indata $p_0$ (kPa) =         1364 $p_0$ (kPa) =         13064 <td< td=""><td>Oskarshamn site investigation         Test type:[1]           Laxemar         Test no:           131.00-151.00         Responsible for test execution:           0.076         Responsible for test evaluation:           1000         Recovery period           1000         Recovery period           1000         Recovery period           1000         Recovery period           1000         Po(kPa) =           1000         10434           1000         Po(kPa) =           1100         10434           1000         Po(kPa) =           1000         Sel S' (-)=           1000         Sel S' (-)=           1000         Sel S' (-)=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Taskent           1010         10.424           102(min) =         15.424           1030         Taskent           1041         Taskent           1050         S (-) =           1060         S (-) =           107(%) =         2.0E-04      <tr< td=""></tr<></td></td<>	Oskarshamn site investigation         Test type:[1]           Laxemar         Test no:           131.00-151.00         Responsible for test execution:           0.076         Responsible for test evaluation:           1000         Recovery period           1000         Recovery period           1000         Recovery period           1000         Recovery period           1000         Po(kPa) =           1000         10434           1000         Po(kPa) =           1100         10434           1000         Po(kPa) =           1000         Sel S' (-)=           1000         Sel S' (-)=           1000         Sel S' (-)=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Derivative fact.=           1000         Taskent           1010         10.424           102(min) =         15.424           1030         Taskent           1041         Taskent           1050         S (-) =           1060         S (-) =           107(%) =         2.0E-04 <tr< td=""></tr<>

		<u>nmary Sheet</u>	-		
Project:	Oskarshamn site investigati	on <u>Test type:[1]</u>			CHi
Area:	Laxem	ar Test no:			1
Borehole ID:	KLX16	6A Test start:			070315 15:35
Test section from - to (m):	150.00-170.00	m Responsible for			Stephan Rohs
Continu diameter 2 r (m):	0.0	test execution: 76 Responsible for		Cria	Philipp Wol tian Enachescu
Section diameter, $2 \cdot r_w$ (m):	0.0	test evaluation:		Clis	
Linear plot Q and p		Flow period		Recovery period	b
		Indata		Indata	
1990	-0t	p <sub>0</sub> (kPa) =	1529		
KLX16A_190.00-170.00_070315_1_CHir_Q_r	• P acton • P atos • P atos • Q atos • Q	p <sub>i</sub> (kPa ) =	1533		
1700	· · · · · · · · · · · · · · · · · · ·	p <sub>p</sub> (kPa) =	1750	p <sub>F</sub> (kPa ) =	153
		$Q_{p} (m^{3}/s) =$	6.97E-06		
<u>↓</u>		tp (s) =	1200	t <sub>F</sub> (s) =	120
a store		S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
5 MOD	- D4	EC <sub>w</sub> (mS/m)=			
1300-		Temp <sub>w</sub> (gr C)=	8.8		
	- 62	Derivative fact.=	0.09	Derivative fact.=	0.0
1000 1000 000 020 040 080 080	100 120 140 160 180				
Elipsed T	ime [N	Results		Results	
		Q/s $(m^{2}/s)=$	3.1E-07		
.og-Log plot incl. derivates- flo	ow period	T <sub>M</sub> (m <sup>2</sup> /s)=	3.3E-07		
		Flow regime:	transient	Flow regime:	transient
10 <sup>-3</sup> Elapsed time (h)	40 <sup>0</sup> 40 <sup>1</sup>	$dt_1$ (min) =	NA	$dt_1$ (min) =	NA
10 2		dt <sub>2</sub> (min) =	NA	dt <sub>2</sub> (min) =	NA
		$T(m^{2}/s) =$	5.9E-07	T (m²/s) =	5.1E-0
10 1		S (-) =	1.0E-06	S (-) =	1.0E-0
• • • • • • • • • • • • • • • • • • •	10 <sup>°</sup>	$K_{s}(m/s) =$	3.0E-08	K <sub>s</sub> (m/s) =	2.6E-0
		$S_{s}(1/m) =$	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-0
	10 1	<sup>will</sup> C (m <sup>3</sup> /Pa) =	NA	C (m³/Pa) =	8.3E-1
		<sup>∉</sup> C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	9.1E-0
10 1	-	ξ(-) =	4.8	ξ(-) =	3.
		- (2)	NA	<b>-</b> (2)	NA
10 <sup> th</sup> 10 <sup> 9</sup> tD	10 <sup>10</sup> 10 <sup>11</sup> 10 <sup>12</sup>	$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA
		$S_{GRF}(-) =$ $D_{GRF}(-) =$	NA	$S_{GRF}(-) =$ $D_{CRF}(-) =$	NA
Log-Log plot incl. derivatives-	recovery period	Selected repres		- GRF ( )	
Log-Log plot men derivatives-	recovery period	$dt_1$ (min) =	NA	<u></u>	8.3E-1
Elapsed time [h]		$\frac{dt_1(mn)}{dt_2(min)} =$	NA	C (m <sup>3</sup> /Pa) = C <sub>D</sub> (-) =	9.1E-0
10 <sup>2</sup>		$T_{T} (m^2/s) =$	5.9E-07		4.6
	10 3	$S_{T} (m/s) =$	1.0E-06		-+.•
		$K_{s}(m/s) =$	3.0E-08		
10 1	300	$S_{s}(1/m) =$	5.0E-08		
5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.5.	10 2	Comments:	0.0E-00		
	20 10 2 10 2 10 10 10 10 10 10 10 10 10 10 10 10 10	The recommended analysis of the CHi interval transmissiv stabilization. The c estimated to be 1.0 during the test was	i phase (inner zo vity because neit onfidence range E-07 m2/s to 2.0 assumed to be 2	f 5.9E-07 m2/s was ne), which gives the her derivative show for the interval tran E-06 m2/s. The flow . The static pressure the CHir phase usin	be best hint of the s horizontal smissivity is w dimension the measured at

	Test Sur	mary Sheet			
Project:	Oskarshamn site investigation	on <u>Test type:[1]</u>			CHir
Area:	Laxem	ar Test no:			1
Borehole ID:	KLX16	A Test start:			070315 17:51
Test section from - to (m):	170.00-190.00	m Responsible for test execution:			Stephan Rohs Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):	0.07	76 Responsible for test evaluation:		Crist	tian Enachescu
Linear plot Q and p	<u> </u>	Flow period		Recovery period	
		Indata	<u></u>	Indata	
	100	p <sub>0</sub> (kPa) =	1710		
KLX16A_170.00-190.00_070315_1_CHir_Q_r	Precion     Pation     Photo     O	p <sub>i</sub> (kPa ) =	1705		
1800 -		$p_{p}(kPa) =$	1949	p <sub>F</sub> (kPa ) =	1709
1800 -		$\frac{Q_{p}}{Q_{p}} (m^{3}/s) =$	8.88E-06		
1700		$\frac{d_p(m/s)}{d_p(s)} =$		t <sub>F</sub> (s) =	1200
Ted 1000		S el S <sup>*</sup> (-)=		⊊ (e) S el S <sup>*</sup> (-)=	1.00E-06
£ ∑ 5100. 8	· · · · ·	$EC_{w} (mS/m) =$	1.001 00	3 8 3 (-)-	1.002 00
5600 -	t uno	Temp <sub>w</sub> (gr C)=	9.1		
		Derivative fact.=		Derivative fact.=	0.06
100 -	:				
ов 629 66 60 СВ	188 128 1.68 1.88 a filme №	Results		Results	
		Q/s (m²/s)=	3.6E-07		
Log-Log plot incl. derivates- f	low period	$T_{M} (m^{2}/s) =$	3.7E-07		
		Flow regime:	transient	Flow regime:	transient
Elapsed time	· [b] 10 <sup>-2</sup> 10 <sup>-1</sup> 10 <sup>0</sup>	dt <sub>1</sub> (min) =	9.36	dt <sub>1</sub> (min) =	0.06
10 1	8 78 449 449 449 449 449 449 449 449 449 44	dt <sub>2</sub> (min) =	15.00	dt <sub>2</sub> (min) =	0.37
	10 °	T (m²/s) =	4.1E-07	T (m²/s) =	1.7E-07
		S (-) =	1.0E-06	S (-) =	1.0E-06
10 °	0.3	K <sub>s</sub> (m/s) =	2.1E-08	K <sub>s</sub> (m/s) =	8.5E-09
		S <sub>s</sub> (1/m) =	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-08
144		<sup>www</sup> C (m <sup>3</sup> /Pa) =	NA	C (m³/Pa) =	1.3E-10
10 -1	0.03	$\frac{1}{2} C_{\rm D}(-) =$	NA	C <sub>D</sub> (-) =	1.4E-02
	* • • • • • • • • • • • • • • • • • • •	ξ(-) =	-1.1	ξ(-) =	-1.9
	0.003	$T_{GRF}(m^2/s) =$	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
10 <sup>3</sup> 10 <sup>4</sup>	10 ° 10 ° 10 °	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives-	recovery period	Selected represe			
		$dt_1$ (min) =		C (m <sup>3</sup> /Pa) =	1.3E-10
10 <sup>-4</sup> 5 Elapsed time j	[h] 	$dt_2$ (min) =		$C_{D}(-) =$	1.4E-02
10 10 10 10 10 10 10 10 10 10 10 10 10 1		$T_{T} (m^{2}/s) =$	1.7E-07		-1.9
	300	S(-) =	1.0E-06	.,	
		$K_{s}$ (m/s) =	8.5E-09		
10 *	10 2	$S_{s}(1/m) =$	5.0E-08		
	30	Comments:	0.02.00		
10 °	· · · · · · · · · · · · · · · · · · ·	The recommended analysis of the CHi interval transmissiv	r phase (inner zo ity because both	f 1.7E-07 m2/s was one), which gives the derivatives show o	e best hint of the nly an
10 <sup>°</sup> 10 <sup>°</sup> 10	20 20 20 20 20 20 20 20 20 20 20 20 20 2	for the interval tran 07 m2/s. The flow of	smissivity is est dimension durin	at late time. The co imated to be 5.0E-08 g the test was assume the depth was derived	8 m2/s to 5.0E- and to be 2. The
			traight line extra	er depth, was derive polation in the Horr	

	Test S	umn	nary Sheet			
Project:	Oskarshamn site investig					CHir
Area:	Lax	emar	Test no:			1
Borehole ID:	KL:	X16A	Test start:			070315 20:00
Test section from - to (m):	188.00-208.	.00 m	Responsible for			Stephan Rohs
			test execution:			Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	(	0.076	Responsible for test evaluation:		Cris	tian Enachescu
Linear plot Q and p			Flow period		Recovery period	1
F			Indata		Indata	
			p <sub>0</sub> (kPa) =	1866		
2200 KLX16A_188.00.208.00_070315_1_CHir_Q_r	• P ancion • P alcon • P balan	0.050	p <sub>i</sub> (kPa ) =	1866		
2100	• P talaw • Q	0.045	p <sub>p</sub> (kPa) =	2066	p <sub>F</sub> (kPa ) =	1865
2000		0.040	$Q_{p} (m^{3}/s) =$	2.17E-07		
		0.035	$\frac{d_p(m/s)^2}{tp(s)} =$		t <sub>F</sub> (s) =	2400
		0.030 June	S el S <sup>*</sup> (-)=		⊈ (3) = S el S <sup>*</sup> (-)=	1.00E-06
1000 · · · · · · · · · · · · · · · · · ·	·		S el S (-)= EC <sub>w</sub> (mS/m)=	1.001-00	383(-)=	1.001-00
5 1750		0.020	$Temp_w(gr C)=$	9.4		+
1000	<sup>975</sup> Martin	0.015	Derivative fact.=		Derivative fact.=	0.02
150		0.010		0.01		0.02
1600 0.22 0.40 0.60 0.80 1. Element		0.000				
			Results		Results	
			Q/s (m²/s)=	1.1E-08		
_og-Log plot incl. derivates- fl	ow period		T <sub>M</sub> (m²/s)=	1.1E-08		
			Flow regime:	transient	Flow regime:	transient
Elapsed time [h]			$dt_1 (min) =$		$dt_1$ (min) =	NA
10			$dt_2 (min) =$		$dt_2$ (min) =	NA
		200	T (m²/s) =		T (m²/s) =	4.7E-08
			S (-) =	1.0E-06		1.0E-06
10 <sup>1</sup>	·	10 2	K <sub>s</sub> (m/s) =		K <sub>s</sub> (m/s) =	2.4E-09
	- loop and the second s		S <sub>s</sub> (1/m) =	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-08
·· .	3	5 1/of fming	C (m³/Pa) =	NA	C (m³/Pa) =	5.2E-11
10 <sup>4</sup>		10 <sup>1</sup>	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	5.7E-03
			ξ(-) =	1.6	ξ(-) =	21.0
		3	T <sub>GRF</sub> (m²/s) =	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>2</sup> 10 <sup>3</sup> tD	10 <sup>-4</sup> 10 <sup>-5</sup> 10 <sup>-6</sup>		$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
			$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives-	recovery period		Selected represe			
	•••		$dt_1$ (min) =	NA	C (m <sup>3</sup> /Pa) =	5.2E-11
21 10, -4 Elapsed time [h]			$dt_2$ (min) =	NA	$C_{D}(-) =$	5.7E-03
10 <sup>2</sup>			$T_{T} (m^2/s) =$	1.2E-08		1.6
		300	S(-) =	1.0E-06		1.0
		10 <sup>2</sup>	K <sub>s</sub> (m/s) =	6.0E-10		
10 <sup>1</sup>	***	10	$S_{s}(1/m) =$	5.0E-08		
i. A.	in the second se	30 g	Comments:	0.02 00		
		(p p0) (kP		rancmiccivity	$f = 1.2 E_{-0.8} m^{2/a} m^{2/a}$	derived from the
10 "	and the second second	10 1 2	The recommended t analysis of the CHi			
/	· *****		The confidence range			
	ľ	3	9.0E-09 m2/s to 6.0	E-08 m2/s. The	flow dimension dis	played during
		10 0	the test is 2. The sta			
10 <sup>0</sup> 10 <sup>1</sup> tD/CD	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>		derived from the CH Horner plot to a val			lation in the
			riorner plot to a Val	ue of 1,000.2 Ki	a.	

	Test Sur	mmary Sheet			
Project:	Oskarshamn site investigat	tion <u>Test type:[1]</u>			CHir
Area:	l axer	nar Test no:			1
Nou.	Euxer	nui rest no.			
Borehole ID:	KLX1	I6A Test start:			070315 22:44
Test section from - to (m):	207 00-227 00	) m Responsible for			Stephan Rohs
	201.00 221.00	test execution:			Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):	0.0	076 Responsible for		Crist	tian Enachescu
Linear plot Q and p		test evaluation: Flow period		Recovery period	
linear plot & and p		Indata		Indata	
		$p_0 (kPa) =$	2034		
2000 KLX16A_207.00-227.00_070315_1_CHir_Q_r	• P accion • P accen • P below	p <sub>0</sub> (kPa) =	2034		
2300	· · ·	$p_{i}(kPa) =$		p <sub>F</sub> (kPa ) =	202
	1				2033
2100		$Q_{p} (m^{3}/s) =$	3.36E-04		120
2000		tp (s) =		t <sub>F</sub> (s) =	1200
1900		$S el S^* (-)=$	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-00
		<sup>*</sup> EC <sub>w</sub> (mS/m)=			
1800		Temp <sub>w</sub> (gr C)=	9.7		
1700 -	·	Derivative fact.=	0.06	Derivative fact.=	0.0
	Mar se se a constantin a de se				
1600 0.20 0.40 0.60 Elepte	0.80 1.00 1.20 1.40 d Time (h)	Results		Results	
			1.7E-05		1
.og-Log plot incl. derivates- f	low pariod	$Q/s (m^2/s) =$	1.7E-05		
.og-Log plot lifel. derivates- li		T <sub>M</sub> (m <sup>2</sup> /s)= Flow regime:	transient	Flow regime:	transient
		$dt_1$ (min) =		$dt_1 (min) =$	2.6
Elapsed time [h]	. 10, <sup>-2</sup> 10, <sup>-1</sup> 10, <sup>0</sup>	,			8.88
	- 10 <sup>-1</sup>	$dt_2$ (min) =		$dt_2$ (min) =	
	10	1 (1175) =		$T(m^2/s) =$	5.8E-0
	0.03	S (-) =	1.0E-06	17	1.0E-0
10 1	:	$K_s (m/s) =$		$K_s (m/s) =$	2.9E-0
	<b>1</b> 0 <sup>-2</sup>	$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0
	•	<sup>ww</sup> C (m <sup>3</sup> /Pa) =	NA	$C (m^{3}/Pa) =$	5.1E-1
10 °	0.003	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	5.6E-0
• .	10 -3	ξ(-) =	10.5	ξ(-) =	13.0
10 <sup>-13</sup> 10 <sup>-14</sup> 10 <sup>-15</sup>	3E-4 10 <sup>16</sup> 10 <sup>17</sup> 10 <sup>18</sup>	TGRF(III /0)	NA	$T_{GRF}(m^2/s) =$	NA
л.		S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
		$D_{GRF}(-) =$	NA	D <sub>GRF</sub> (-) =	NA
.og-Log plot incl. derivatives-	recovery period	Selected represe	• . • . • . • . • . • . • . • . • . • .		
		$dt_1 (min) =$	0.97	0 (iii /i u)	5.1E-1
Elapsed time [h	ا 	$dt_2$ (min) =		C <sub>D</sub> (-) =	5.6E-0
		$T_{T} (m^{2}/s) =$	5.3E-05	ξ(-) =	13.0
	300	()	1.0E-06		
		$K_s (m/s) =$	2.7E-06		
0 0 0 000000000000000000000000000000000		5( )			
10	10 <sup>-1</sup>	$S_{s}(1/m) =$	5.0E-08		
10		2	5.0E-08		
10 %	w <sup>1</sup>	S <sub>s</sub> (1/m) = Comments: The recommended	ransmissivity o	f 5.3E-05 m2/s was	
	90 30 90	$S_s (1/m) =$ <b>Comments:</b> The recommended the analysis of the CHi	ransmissivity o	f 5.3E-05 m2/s was hows the best horizon	ntal
		S <sub>s</sub> (1/m) = <b>Comments:</b> The recommended analysis of the CHi stabilization. The co	ransmissivity of phase, which should be range	f 5.3E-05 m2/s was hows the best horizon for the interval trans	ntal smissivity is
	20 20 20 3	<b>S</b> <sub>s</sub> (1/m) = <b>Comments:</b> The recommended analysis of the CHi stabilization. The co estimated to be 2.01	ransmissivity of phase, which sh onfidence range E-05 m2/s to 9.0	f 5.3E-05 m2/s was ows the best horizon for the interval trans E-05 m2/s. The flow	ntal smissivity is v dimension
		S <sub>s</sub> (1/m) = <b>Comments:</b> The recommended analysis of the CHi stabilization. The co estimated to be 2.0I displayed during the	ransmissivity of phase, which sh onfidence range 2-05 m2/s to 9.0 e test is 2. The s	f 5.3E-05 m2/s was hows the best horizon for the interval trans	ntal smissivity is v dimension ıred at

	Test Su	ımn	nary Sheet	-		
Project:	Oskarshamn site investiga	ation	Test type:[1]			CHi
Area:	Laxe	emar	Test no:			1
Borehole ID:	KLX	(16A	Test start:			070316 00:49
Test section from - to (m):	227 00-247 (	)0 m	Responsible for			Stephan Rohs
	221.00 241.0		test execution:			Philipp Wol
Section diameter, 2·r <sub>w</sub> (m):	0	.076	Responsible for		Crist	ian Enachescu
			test evaluation:			
Linear plot Q and p			Flow period		Recovery period	
			Indata		Indata	
2000	•P action		p <sub>0</sub> (kPa) =	2215		
KLX16A_227.00-347.00_070316_1_CHir_Q_r	● praction ● bacon ● bacon ● bacon ● Co		p <sub>i</sub> (kPa ) =	2214		
		1.20	p <sub>p</sub> (kPa) =	2411	p <sub>F</sub> (kPa ) =	221-
2400			Q <sub>p</sub> (m <sup>3</sup> /s)=	1.32E-05		
200		- 0.80 E	tp (s) =		t <sub>F</sub> (s) =	120
2200		ion Rate (Tám	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
2100		ideot	EC <sub>w</sub> (mS/m)=			
		0.40	Temp <sub>w</sub> (gr C)=	10.0		
			Derivative fact.=	0.03	Derivative fact.=	0.0
1900- -		• 0.20				
1900 020 0.40 0.60 Elipsed	0.80 1.00 1.20 1.40 Time [h]	<b>L</b>	Results		Results	
			Q/s (m²/s)=	6.6E-07		1
.og-Log plot incl. derivates- fl	ow period		$T_{\rm M} (m^2/s) =$	6.9E-07		
			Flow regime:	transient	Flow regime:	transient
Elapsed time			$dt_1$ (min) =		$dt_1$ (min) =	0.8
10 <sup>2</sup>	······································	•	$dt_2 (min) =$		$dt_2$ (min) =	4.34
		3	2		2	4.1E-0
			, ,	1.0E-06		4.1E-0
	- + @ @ 3 & cos differenting and a second	10 °	5()			
10 1			$K_s(m/s) =$			2.1E-0
1		0.3	$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0
	•	-10, [m]	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	7.1E-1
10 0		10 4	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	7.8E-0
		0.03	ξ(-) =	9.7	ξ(-) =	32.3
· · · ·		10 -2	T <sub>GRF</sub> (m²/s) =	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
10 <sup>11</sup> 10 <sup>12</sup>	10 <sup>13</sup> 10 <sup>14</sup> 10 <sup>1</sup> D	5	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
			$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
.og-Log plot incl. derivatives-	recovery period		Selected represe	intative paran		
			dt <sub>1</sub> (min) =		C (m <sup>3</sup> /Pa) =	7.1E-1
_10_6 Elapsed time [h]			$dt_2$ (min) =		$C_{D}(-) =$	7.8E-0
10 2	300		$T_{T} (m^{2}/s) =$	1.8E-06		9.1
	= +0.00000000000000000000000000000		S(-) =	1.0E-06		J.
	10	2	K <sub>s</sub> (m/s) =	9.0E-08		
10 1			$S_{s}(1/m) =$	5.0E-08		
	30		Comments:	0.0∟-00		
	- 10	8			1 OF 06 2/	1
		0, (b	The recommended t analysis of the CHi			
	· · · · · · · · · · · · · · · · · · ·		The confidence range			
	•		8.0E-07 m2/s to 5.0	E-06 m2/s. The	flow dimension dis	played during
1	10		the test is 2. The sta	tic pressure mea	sured at transducer	depth, was
10 <sup>1</sup> 10 <sup>2</sup> tD/CD	10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>5</sup>		derived from the CH Horner plot to a val			lation in the

	Test Su	ımn	nary Sheet			
Project:	Oskarshamn site investiga	ation	Test type:[1]			CHi
Area:	Laxe	emar	Test no:			
Borehole ID:	KLX	(16A	Test start:			070316 07:30
Test section from - to (m):	247 00-267 (	)0 m	Responsible for			Stephan Roh
	247.00-207.0		test execution:			Philipp Wol
Section diameter, 2·r <sub>w</sub> (m):	0	.076	Responsible for		Crist	tian Enachescu
			test evaluation:			
₋inear plot Q and p			Flow period		Recovery period	
			Indata		Indata	1
2000 KLX18A_247.05-287.00_070316_1_CH/r_O_r	• P action		p <sub>0</sub> (kPa) =	2393		
2700	<ul> <li>P sector</li> <li>P below</li> <li>P below</li> <li>Q</li> </ul>		p <sub>i</sub> (kPa ) =	2386		
2000			p <sub>p</sub> (kPa) =	2586	p <sub>F</sub> (kPa ) =	238
		1.50	Q <sub>p</sub> (m <sup>3</sup> /s)=	2.08E-05		
	The second se	-	tp (s) =	1200	t <sub>F</sub> (s) =	120
2000		s Ratio (rmin)	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
230		1.00 Judgoolu	EC <sub>w</sub> (mS/m)=		\/	
2200			Temp <sub>w</sub> (gr C)=	10.3		
2100		0.50	Derivative fact.=		Derivative fact.=	0.0
200	a Salahan Marka ang Kang Kang Kang Kang Kang Kang Kang			0.00		0.0
100	0.00 1.00 1.20 1.40	0.00	Deculto		Deculto	
			Results		Results	1
	<u> </u>		Q/s (m <sup>2</sup> /s)=	1.0E-06		
.og-Log plot incl. derivates- flo	ow period		T <sub>M</sub> (m²/s)=	1.1E-06		
			Flow regime:	transient	Flow regime:	transient
Elapsed time [h]	10.2 10.1		dt <sub>1</sub> (min) =	0.46	dt <sub>1</sub> (min) =	0.4
10 2			dt <sub>2</sub> (min) =	15.18	dt <sub>2</sub> (min) =	4.3
			T (m²/s) =	2.1E-06	T (m²/s) =	6.4E-0
10 1	1 - C	10 <sup>0</sup>	S (-) =	1.0E-06		1.0E-0
			$K_s (m/s) =$		$K_s (m/s) =$	3.2E-0
			$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0
10 "			C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	6.2E-1
		5			, ,	6.8E-0
· ·		10 -2		NA	-D()	
10 <sup>-1</sup>			ξ(-) =	0.1	ξ(-) =	32.
	1	10 <sup>-3</sup>	T <sub>GRF</sub> (m²/s) =	NA	T <sub>GRF</sub> (m²/s) =	NA
10 <sup>°°</sup> 10 <sup>°°</sup> tD	10 <sup>10</sup> 10 <sup>11</sup> 10 <sup>12</sup>		$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
			$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
ag Log plot incl. dorivativos	racovery period					
.og-Log plot incl. derivatives-	recovery period		Selected represe		· . · . · . · . · . · . · . · . · . · .	
			$dt_1 (min) =$		C (m <sup>3</sup> /Pa) =	6.2E-1
0 2 10,-5 10,-4	.10, <sup>-2</sup> 10, <sup>-1</sup> 10, <sup>0</sup>		$dt_2$ (min) =		C <sub>D</sub> (-) =	6.8E-0
	300		$T_T (m^2/s) =$	2.1E-06		6.
		2	S (-) =	1.0E-06		
	10	2	K <sub>s</sub> (m/s) =	1.1E-07		
• 1			S <sub>s</sub> (1/m) =	5.0E-08		
	30	<u>8</u>	Comments:			
	10	- (p-p0) (kf	The recommended t	ransmissivity of	2.1E-06 m2/s was	derived from th
. \			analysis of the CHi			
· · · ·	3		The confidence rang	ge for the interv	al transmissivity is e	estimated to be
			9.0E-07 m2/s to 5.0			
			the test is 7. The ste	tio measure mass	gurad at transdugar	denth was
	10		the test is 2. The sta			
10 <sup>1</sup> 10 <sup>1</sup> 10 <sup>3</sup> 10 <sup>3</sup>	10 <sup>-4</sup> 10 <sup>-6</sup>		derived from the CF Horner plot to a val	Iir phase using	straight line extrapo	

	Test Sumr	nary Sheet			
Project:	Oskarshamn site investigation	Test type:[1]			CHi
Area:	Laxemar	Test no:			2
Borehole ID:	KLX16A	Test start:			070316 10:58
Test section from - to (m):	267.00-287.00 m	Responsible for			Stephan Rohs
		test execution:			Philipp Wol
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for		Crist	ian Enachesc
incomplet Q and p		test evaluation: Flow period		mercenter	
₋inear plot Q and p				Recovery period	
		Indata	2502	Indata	
2005 KLX16A, 247.00-287.00_070316,2_CHr_Q_r	P nuclon     S0 00     P noon     P blow	p <sub>0</sub> (kPa) =	2582		
2000	- P below - Q = 25.00	p <sub>i</sub> (kPa ) =	2563		
2700		p <sub>p</sub> (kPa) =		p <sub>F</sub> (kPa ) =	256
	20.00	Q <sub>p</sub> (m <sup>3</sup> /s)=	2.55E-04		
····	5.00 <u>F</u>	tp (s) =		t <sub>F</sub> (s) =	120
2000	officer Reads	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
5430-	1000 g	EC <sub>w</sub> (mS/m)=			
2000	5.00	Temp <sub>w</sub> (gr C)=	10.3		
	·	Derivative fact.=	0.00	Derivative fact.=	0.0
2200					
2006 020 040 000 000 000 000 000 000 000 000	Gao 100 120 400	Results		Results	
		Q/s (m²/s)=	1.3E-05		
og-Log plot incl. derivates- fl	low period	$T_{\rm M} (m^2/s) =$	1.3E-05		
0 01	•	Flow regime:	transient	Flow regime:	transient
Elapsed time (h)		$dt_1$ (min) =		$dt_1$ (min) =	3.1
10 <sup>2</sup>		$dt_2$ (min) =		$dt_2$ (min) =	14.4
	0.3	$T(m^2/s) =$		$T(m^2/s) =$	3.8E-0
		S (-) =	1.0E-06	. ,	1.0E-0
10	10 <sup>-1</sup>	$\frac{S(-)}{K_{s}(m/s)} =$		$K_{s}$ (m/s) =	1.9E-0
	0.03			$S_{s}(11/s) = S_{s}(1/m) =$	
		$S_{s}(1/m) =$	5.0E-06	<u>,</u>	5.0E-0 3.2E-1
	10 <sup>-2</sup> \$2	$C (m^{3}/Pa) =$		C (m <sup>3</sup> /Pa) =	
10 0		C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	3.5E-0
	0.003	ξ(-) =	2.4	ξ(-) =	-4.
	10-3	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
10 <sup>6</sup> 10 <sup>7</sup> tD	10 <sup>6</sup> 10 <sup>6</sup> 10 <sup>16</sup>	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
.og-Log plot incl. derivatives-	recovery period	Selected represe			L
		dt <sub>1</sub> (min) =		C (m <sup>3</sup> /Pa) =	3.2E-1
Elapsed time [h]	J 0	$dt_1(min) =$ $dt_2(min) =$		$C_{D}(-) =$	3.5E-0
10 10 10 10 10 10 10 10 10 10 10 10 10 1		$T_{T} (m^2/s) =$	2.2E-05		3.5⊑-0
		$I_{T} (m^{-}/s) =$ S (-) =	2.2E-05 1.0E-06		
	300		1.0E-06 4.4E-06		
10 °	10 <sup>2</sup>	· ·s (·····•)			
		S <sub>s</sub> (1/m) =	2.0E-07		
	30 (194	Comments:	• • •. ·.		1 · 10 ·
10 4		The recommended analysis of the CHi		f 2.2E-05 m2/s was	
•	10 <sup>1</sup>			al transmissivity is e	
	3	9.0E-06 m2/s to 5.0			
		the test is 2. The sta	tic pressure mea	asured at transducer	depth, was
10 <sup>1</sup> 10 <sup>2</sup>	10 <sup>-3</sup> 10 <sup>-4</sup> 10 <sup>-5</sup>	derived from the CI	Hir phase using	straight line extrapol	lation in the
10 10 tD/CE		Horner plot to a val			

	Test Sı	ımn	nary Sheet			
Project:	Oskarshamn site investig	ation	Test type:[1]			CHir
Area:	Laxe	emar	Test no:			1
Borehole ID:	KI X	(164	Test start:			070316 13:27
Dorendie ID.						070310 13.27
Test section from - to (m):	287.00-307.0		Responsible for			Stephan Rohs
Section diameter, 2·r <sub>w</sub> (m):	0		test execution: Responsible for		Crist	Philipp Wolf ian Enachescu
			test evaluation:			
Linear plot Q and p			Flow period		Recovery period	
			Indata	07.01	Indata	
2000 KLX16A_287.00-307.00_070316_1_CHir_Q_r	●P section ● P sectors	20	p <sub>0</sub> (kPa) = p <sub>i</sub> (kPa ) =	2741		
2000	●P section ←P section ←P balance ←Q			2746	n (kPa) -	274
2000		- 15	$p_p(kPa) =$	2933 1.18E-05	p <sub>F</sub> (kPa ) =	2746
			$Q_p (m^3/s) =$ tp (s) =		t <sub>r</sub> (s) =	1200
		Denied	(°)		+ (C)	1.00E-06
2 2000 - C 200		<u>a</u>	S el S <sup>*</sup> (-)= EC <sub>w</sub> (mS/m)=	1.00E-00	S el S <sup>*</sup> (-)=	1.00E-00
8 2009		-	$EC_w$ (mo/m)= Temp <sub>w</sub> (gr C)=	10.9		
2000		- 05	Derivative fact.=		Derivative fact.=	0.02
2400-				0.04		0.02
2000 0.20 0.40 0.60	0.40 1.00 1.20 1.40					
Elapsed	Time (h)		Results		Results	
			Q/s (m²/s)=	6.2E-07		
Log-Log plot incl. derivates- fl	ow period		T <sub>M</sub> (m²/s)=	6.5E-07		
			Flow regime:	transient	Flow regime:	transient
Elapsed time (h	<sup>1</sup>		dt <sub>1</sub> (min) =	1.30	dt <sub>1</sub> (min) =	#NV
10 2			dt <sub>2</sub> (min) =	15.72	dt <sub>2</sub> (min) =	#NV
		3	T (m²/s) =	1.9E-06	T (m²/s) =	2.7E-06
· · · · · · · · · · · · · · · · · · ·		10 °	S (-) =	1.0E-06		1.0E-0
10 1			K <sub>s</sub> (m/s) =	9.5E-08	$K_s (m/s) =$	1.4E-0
		0.3	S <sub>s</sub> (1/m) =	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-08
		(Inim) (pit	C (m³/Pa) =	NA	C (m³/Pa) =	2.5E-0
10 *	1 	10 <sup>-1</sup> <sup>1</sup> <sup>1</sup>	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	2.8E-0
•		0.03	ξ(-) =	11.9	ξ(-) =	19.1
· · · · · · · · · · · · · · · · · · ·	<b>* *</b>	10 -2	T <sub>GRF</sub> (m²/s) =	NA	T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA
10 <sup>13</sup> 10 <sup>14</sup> 10 <sup>15</sup> 10	10 <sup>.16</sup> 10 <sup>.17'</sup> 10 <sup>.11</sup>		S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
			D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA
Log-Log plot incl. derivatives-	recovery period		Selected represe	entative paran	ieters.	
			dt <sub>1</sub> (min) =	1.30	C (m³/Pa) =	2.5E-09
Elapsed time [h]	10 <sup>1</sup>		dt <sub>2</sub> (min) =	15.72	C <sub>D</sub> (-) =	2.8E-01
10			$T_{T} (m^{2}/s) =$	1.9E-06	ξ(-) =	11.9
	*	10	S (-) =	1.0E-06		1
	110	2	K <sub>s</sub> (m/s) =	9.5E-08		
10 10	Set and the set of the		S <sub>s</sub> (1/m) =	5.0E-08		
;/.·	at a	[8]	Comments:			
• • •		- 	The recommended	transmissivity of	1.9E-06 m2/s was	derived from the
10 *	· · · ·		analysis of the CHi	phase, which sh	ows a horizontal sta	bilization. The
	3		confidence range for $0.7 \text{ m}^{2/3}$ to $5.0 \text{ E}$ 06			
			07 m2/s to 5.0E-06 is 2. The static pres			
	-					
10 <sup>°</sup> 10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>		from the CHir phas	e using straight l	ine extrapolation in	the Horner plot

Project: Oskarshamn site investig		nary Sheet			
	gation	Test type:[1]			CHir
Area: Lax	kemar	Test no:			1
Borehole ID: KL	X16A	Test start:			070316 15:27
Test section from - to (m): 307.00-327	00 m	Responsible for			Stephan Rohs
		test execution:			Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for		Crist	ian Enachescu
		test evaluation:			
Linear plot Q and p		Flow period		Recovery period	
		Indata	1	Indata	
342	0.00	p <sub>0</sub> (kPa) =	2919		
۲۹ سندی ۲۹ سندی ۱۹ سندی ۱۹ سندی ۱۹ سندی ۱۹ سندی ۱۹ سندی	0.00	p <sub>i</sub> (kPa ) =	2923		
-		p <sub>p</sub> (kPa) =	3127	p <sub>F</sub> (kPa ) =	2947
	0.07	$Q_{p} (m^{3}/s) =$	5.67E-07		
300	0.06	tp (s) =	1200	t <sub>F</sub> (s) =	1200
	Rate [inter	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-06
	in the second	EC <sub>w</sub> (mS/m)=		()	
300-	0.00	Temp <sub>w</sub> (gr C)=	11.2		
: .	0.02	Derivative fact.=	0.05	Derivative fact.=	0.02
200	- 0.01				
200 620 640 600 500 10 10 10 10 10 10	1.60	<b>D</b> #		D 11	
		Results	0.75.00	Results	
		Q/s ( $m^{2}/s$ )=	2.7E-08		
Log-Log plot incl. derivates- flow period		Τ <sub>M</sub> (m²/s)=	2.9E-08		
		Flow regime:	transient	Flow regime:	transient
Elapsed time [h]	-	dt <sub>1</sub> (min) =		dt <sub>1</sub> (min) =	2.05
10		$dt_2$ (min) =		$dt_2 (min) =$	18.30
	-	$T(m^{2}/s) =$	1.4E-08	T (m²/s) =	1.1E-08
10 1	10 2	S (-) =	1.0E-06	S (-) =	1.0E-06
	-	$K_s (m/s) =$	7.0E-10	K <sub>s</sub> (m/s) =	5.5E-10
		$S_{s}(1/m) =$	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-08
	10 Guiul Ja	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	3.9E-11
	Mq. (1)	$\frac{C_{\rm D}(-)}{C_{\rm D}(-)} =$	NA	$C_{D}(-) =$	4.3E-03
10 -1	10 °	ξ(-) =		ξ(-) =	-1.9
		· ( )		() د	
		T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	$T_{GRF}(m^2/s) =$	NA
10 <sup>0</sup> 10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup> 1	0 <sup>4</sup> 10 <sup>-1</sup>	$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives- recovery period		Selected represe			
Log-Log plot lifel. derivatives- recovery period			• • • • • • • • • • • • • • • • • • • •		
Piezza (m. 54		$dt_1$ (min) =		C (m <sup>3</sup> /Pa) =	3.9E-11
Lapseo ume (n)	7	$dt_2 (min) =$		C <sub>D</sub> (-) =	4.3E-03
	ł	$T_T (m^2/s) =$	1.1E-08		-1.9
10 1	10 3	S (-) =	1.0E-06		
	-	$K_s (m/s) =$	5.5E-10		
10 4	10 2	S <sub>s</sub> (1/m) =	5.0E-08		
and a second and a second and a second	, s	Comments:			
	10 (00-0)			f 1.1E-08 m2/s was	
	10 8			hows a better deriva	
				insmissivity is estim	
10 ~	10 °	09 m2/s to 3.0E-08		dimension displayed t transducer depth, v	
	ł			line extrapolation in	
10 <sup>0</sup> 10 <sup>1</sup> 10 <sup>2</sup> 10 <sup>3</sup>	10 4	to a value of 2,911.		e estrupolation III	the riother plot
		2-			

	Test S	umn	nary Sheet			
Project:	Oskarshamn site investig	ation	Test type:[1]			Р
Area:	Lax	emar	Test no:			1
Borehole ID:	KL	X16A	Test start:			070316 17:41
Test section from - to (m):	327.00-34	47.00	Responsible for			Stephan Rohs
			test execution:			Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):			Responsible for		Crist	ian Enachescu
Linear plot Q and p			test evaluation: Flow period		Recovery period	
			Indata		Indata	
			p <sub>0</sub> (kPa) =	3101		
1420 KLX16A_327.00-347.00_070316_1_PI_Q_F	P pacton   P pacon   P pacon   P pacon   C	3.00	p <sub>i</sub> (kPa ) =	3108		
3320	· a	• 2.50	p <sub>p</sub> (kPa) =	3380	p <sub>F</sub> (kPa ) =	3114
2201			$\overline{Q_p(m^3/s)}=$	NA		-
3100		2.00	$\frac{dp(m/d)}{tp(s)} =$	10.2	t <sub>F</sub> (s) =	1440
	f::::::	i B Ban Rado ()/min)	S el S <sup>*</sup> (-)=		S el S <sup>*</sup> (-)=	1.00E-00
		- Fije clion R	EC <sub>w</sub> (mS/m)=		()	
2850		1.00	Temp <sub>w</sub> (gr C)=	11.4		
2850			Derivative fact.=	NA	Derivative fact.=	0.0
2750		* 0.50				
	2.29 3.00 3.50 4.00 4.50	5.00				
Elap	2.50 3.00 3.50 4.00 4.50 and Time [h]		Results		Results	
			Q/s (m <sup>2</sup> /s)=	NA		
Log-Log plot incl. derivates-	flow period		T <sub>M</sub> (m²/s)=	AN		
			Flow regime:	transient	Flow regime:	transient
			dt <sub>1</sub> (min) =	NA	dt <sub>1</sub> (min) =	NA
			dt <sub>2</sub> (min) =	NA	$dt_2$ (min) =	NA
			T (m²/s) =	NA	T (m²/s) =	3.9E-1
			S (-) =	NA	S (-) =	1.0E-0
			$K_{s} (m/s) =$	NA	$K_s (m/s) =$	2.0E-1
Not :	analysed		$S_{s}(1/m) =$	NA	S <sub>s</sub> (1/m) =	5.0E-0
	and joba		C (m³/Pa) =	NA	C (m³/Pa) =	9.7E-1
			$C_D(-) =$	NA	$C_D(-) =$	1.1E-0
			ξ(-) =	NA	ξ(-) =	-0.2
			T <sub>GRF</sub> (m <sup>2</sup> /s) =	NA	$T_{GRF}(m^2/s) =$	NA
			S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
			$D_{GRF}(-)$ =	NA	D <sub>GRF</sub> (-) =	NA
-og-Log plot incl. derivatives	- recovery period		Selected represe	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •	<b></b>
40 <sup>-3</sup> Elapsed tim	ne (h)		$dt_1$ (min) =	NA	C (m <sup>3</sup> /Pa) =	9.7E-1
10 2		7	$dt_2 (min) =$		$C_{D}(-) =$	1.1E-02
1		10 °	$T_T (m^2/s) =$	3.9E-11		-0.2
-	and the second s	1	S (-) = K <sub>s</sub> (m/s) =	1.0E-06		
		1		2.0E-12		
10 1		0.3				
10		0.3	S <sub>s</sub> (1/m) =	5.0E-08		
10		1	S <sub>s</sub> (1/m) = Comments:	5.0E-08		demiserad Cr. d.
		10 <sup>-1</sup> resad pt normo	S <sub>s</sub> (1/m) = Comments: The recommended	5.0E-08 transmissivity of	f 3.9E-11 m2/s was	
10 10 		10 <sup>-1</sup>	S <sub>s</sub> (1/m) = Comments:	5.0E-08 transmissivity of hase (inner zone	f 3.9E-11 m2/s was ). The confidence ra	nge for the
		10 <sup>-1</sup> resad	$S_s (1/m) =$ <b>Comments:</b> The recommended analysis of the Pi pl interval transmissiv analysis was condu	5.0E-08 transmissivity of hase (inner zone ity is estimated cted using a flow	f 3.9E-11 m2/s was ). The confidence ra to be 2.0E-11 to 2.0 v dimension of 2. Th	nge for the E-10 m2/s. The ne static
		10 <sup>-1</sup> resad	$S_s (1/m) =$ <b>Comments:</b> The recommended analysis of the Pi pl interval transmissiv	5.0E-08 transmissivity of hase (inner zone ity is estimated cted using a flow	f 3.9E-11 m2/s was ). The confidence ra to be 2.0E-11 to 2.0 v dimension of 2. Th	nge for the E-10 m2/s. The ne static

	Test Sumr	nary Sheet			
Project:	Oskarshamn site investigation	Test type:[1]			CHi
Area:	Laxemar	Test no:			1
Borehole ID:	KI X164	Test start:			070317 08:35
Test section from - to (m):	347.00-367.00 m	Responsible for test execution:			Stephan Rohs Philipp Wol
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for		Crist	tian Enachescu
		test evaluation:			
Linear plot Q and p		Flow period		Recovery period	1
		Indata		Indata	
3005	0.20	p <sub>0</sub> (kPa) =	3276		
KLX16A_347.00-367.00_070317_1_Chir_Q_r	P socian     Phone     Phone     Pointer     * Q	p <sub>i</sub> (kPa ) =	3269		
		p <sub>p</sub> (kPa) =	3469	p <sub>F</sub> (kPa ) =	328
	0.15	Q <sub>p</sub> (m <sup>3</sup> /s)=	1.60E-06		
2000		tp (s) =	1200	t <sub>F</sub> (s) =	120
3390-		S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0
	gpool4	EC <sub>w</sub> (mS/m)=			
		Temp <sub>w</sub> (gr C)=	11.7		
3000	- - az	Derivative fact.=	0.03	Derivative fact.=	0.0
2000					
2000 0.00 0.40 0.60 0.80 0.00 0.20 0.40 0.60 0.80 Elapsed Time	1.00 1.20 1.40 1.60 [0]	Results		Results	
			7.8E-08		1
		Q/s $(m^{2}/s)=$	7.8E-08 8.2E-08		
og-Log plot incl. derivates- flo	w period	T <sub>M</sub> (m <sup>2</sup> /s)=			
		Flow regime:	transient	Flow regime:	transient
24	10 <sup>-1</sup>	$dt_1$ (min) =		dt <sub>1</sub> (min) =	12.0
0	F 10 <sup>2</sup>	$dt_2$ (min) =		$dt_2$ (min) =	17.5
		T (m²/s) =		T (m²/s) =	4.2E-0
	30	S (-) =	1.0E-06		1.0E-0
10 <sup>1</sup>		$K_{s}$ (m/s) =		K <sub>s</sub> (m/s) =	2.1E-0
• • • • • • • • • • • • • • • • • • •	10 '	S <sub>s</sub> (1/m) =	5.0E-08	S <sub>s</sub> (1/m) =	5.0E-0
	(but and a second se	C (m <sup>3</sup> /Pa) =	NA	C (m³/Pa) =	9.7E-10
10 *	· · · · · · · · · · · · · · · · · · ·	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	1.1E-0
	10 °	ξ(-) =	-0.5	ξ(-) =	-2.3
	· • •			2	
10 <sup>2</sup> 10 <sup>3</sup>	10 <sup>4</sup> 10 <sup>5</sup> 10 <sup>6</sup>	$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA
2		S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA
		$D_{GRF}(-) =$	NA	D <sub>GRF</sub> (-) =	NA
.og-Log plot incl. derivatives- r	ecovery period	Selected represe	• • • • • • • • • • • • • • • • • • • •		
		$dt_1$ (min) =		C (m³/Pa) =	9.7E-1
Elapsed time (h)		dt <sub>2</sub> (min) =	17.04	$C_D(-) =$	1.1E-0
		$T_{T} (m^{2}/s) =$	6.7E-08	ξ(-) =	-0.
	300	S (-) =	1.0E-06		
	10 <sup>2</sup>	K <sub>s</sub> (m/s) =	3.4E-09		
10 °	and the second s	S <sub>s</sub> (1/m) =	5.0E-08		
1	30	Comments:		-	
		<b>T</b> 1 1 1.	transmissivity o	f 6.7E-08 m2/s was	derived from th
		The recommended			
10-4	10 ' 9	analysis of the CHi	phase, which sh	ows a horizontal sta	
10 <sup>4</sup>	10 <sup>°</sup> 90	analysis of the CHi confidence range for	phase, which shor the interval tra	ows a horizontal sta ansmissivity is estim	ated to be 3.0E-
10 -1	10 ' 50 10 ' 50 10 ' 50 10 10 10 10 10 10 10 10 10 10 10 10 10	analysis of the CHi confidence range fo 08 m2/s to 8.0E-08	phase, which shor the interval tra m2/s. The flow	ows a horizontal sta ansmissivity is estim dimension displayed	ated to be 3.0E- d during the test
10 -	10 <sup>°</sup>	analysis of the CHi confidence range fo 08 m2/s to 8.0E-08 is 2. The static press	phase, which shor the interval tra m2/s. The flow sure measured a	ows a horizontal sta ansmissivity is estim	ated to be 3.0E- d during the test was derived

	Test St	ımn	nary Sheet				
Project:	Oskarshamn site investiga					CHi	
Area:	Laxe	emar	Test no:				
Borehole ID:	KLX	Test start:			070317 10:38		
Test section from - to (m):	367.00-387.0	00 m	Responsible for			Stephan Rohs	
Section diameter, 2·r <sub>w</sub> (m):	0	076	test execution: Responsible for		Cris	Philipp Wol tian Enachescu	
	, i i i i i i i i i i i i i i i i i i i		test evaluation:				
Linear plot Q and p			Flow period		Recovery period	1	
			Indata		Indata		
3800		100	p <sub>0</sub> (kPa) =	3444			
KLX16A_367.09-387.00_070317_1_Chir_Q_r •	Pacton Patore Patore Q	0.45	p <sub>i</sub> (kPa ) =	3446			
		0.40	p <sub>p</sub> (kPa) =	3634	p <sub>F</sub> (kPa ) =	346	
3000		- 0.25	Q <sub>p</sub> (m <sup>3</sup> /s)=	1.42E-06			
		• 0.20	tp (s) =	1200	t <sub>F</sub> (s) =	120	
3400		Rado ()/min)	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-0	
	18	0.20 0.20	EC <sub>w</sub> (mS/m)=				
3300 -	$\overline{\mathbf{A}}$	• 0.15	Temp <sub>w</sub> (gr C)=	12.0			
3300 ·		0.10	Derivative fact.=	0.10	Derivative fact.=	0.0	
1900	· · · · · · · · · · · · · · · · · · ·	• a.cs					
2000 0.00 0.40 0.60 0.60 Elepted T	100 1.20 1.40 1.60 ima [h]	a	Results		Results		
			Q/s (m²/s)=	7.4E-08			
_og-Log plot incl. derivates- flo	ow period		$T_{\rm M} (m^2/s) =$	7.7E-08			
0 01	· ·		Flow regime:	transient	Flow regime:	transient	
a Elapsed time (h)			dt <sub>1</sub> (min) =	#NV	$dt_1$ (min) =	0.1	
10 2	······································		$dt_2$ (min) =	#NV	$dt_2$ (min) =	0.3	
	1	30	$T(m^2/s) =$		T (m <sup>2</sup> /s) =	2.9E-0	
		10 <sup>1</sup>	S (-) =	1.0E-06		1.0E-0	
10 1	1970/05/00/09/09/09/09/09/09/09/09/09/09/09/09/	10	K <sub>s</sub> (m/s) =		K <sub>s</sub> (m/s) =	1.5E-0	
	-	3	$S_{s}(1/m) =$		$S_{s}(1/m) =$	5.0E-0	
	imaining and it	[//ii/]	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	7.4E-1	
		0 0 10 <sup>0</sup> 101		NA		8.2E-0	
10 "	-	0.3	$C_{D}(-) = \xi(-) =$		$C_{D}(-) = \xi(-) =$	1.	
		0.3	ξ(-) =	0.0	ς (-)	1.	
		10 -1	T <sub>GRF</sub> (m²/s) =	NA	$T_{GRF}(m^2/s) =$	NA	
10 <sup>8</sup> 10 <sup>9</sup>	10 10 10 10		$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA	
			$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA	
_og-Log plot incl. derivatives-	recovery period		Selected repres				
			$dt_1$ (min) =		C (m³/Pa) =	7.4E-1	
Elapsed time (h)	2 4 0		$dt_2$ (min) =		$C_{D}(-) =$	8.2E-0	
10 2			$T_T (m^2/s) =$	2.9E-07		1.	
			S(-) =	1.0E-06		1.	
	3	300	$K_{s}(m/s) =$	1.5E-08			
10 1		10 2	$S_{s}(1/m) =$	5.0E-08			
	and the second s			5.0E-06			
	and the state of t	01 [kPa]	Comments:	,,		1 . 10 4	
	معج <sup>ر</sup> شرند م	- - -			f 2.9E-07 m2/s was one), which gives th		
	× [1	υ			derivatives don't r		
•	3	3			lence range for the		
	د		transmissivity is es	timated to be 9.0	E-08 m2/s to 7.0E-0	07 m2/s. The	
			flam, dimension der	at a state state of the state o	accument to be 2 Th	ne static pressur	
10 ° 10 '	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup> 1	10 0	flow dimension du				
10 <sup>°°</sup> 10 <sup>°</sup> 10CD	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	10 0	measured at transd	ucer depth, was	derived from the CF rner plot to a value	Iir phase using	

	Test Sum	nary Sheet				
Project:	Oskarshamn site investigation	Test type:[1]			CHir	
Area:	Laxema	Test no:				
Borehole ID:	KLX16A	Test start:			070317 12:48	
Test section from - to (m):	387.00-407.00 m	Responsible for			Stephan Rohs	
	0.070	test execution:			Philipp Wolf	
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for test evaluation:		Cris	tian Enachescu	
Linear plot Q and p		Flow period		Recovery period	ł	
		Indata		Indata	·····	
400	3.05	p <sub>0</sub> (kPa) =	3621			
KLX16A_387.00-407.00_070317_1_Chir_Q_r	P as don     P bolow     P bolow     O	p <sub>i</sub> (kPa ) =	3627			
· · · ·	0.04	p <sub>p</sub> (kPa) =	3838	p <sub>F</sub> (kPa ) =	3642	
		$Q_{p} (m^{3}/s) =$	2.67E-07			
		tp (s) =	1200	t <sub>F</sub> (s) =	2400	
5 3 2 2 2000		S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-06	
Download Contraction of the second se	0.02	EC <sub>w</sub> (mS/m)=				
3000		Temp <sub>w</sub> (gr C)=	12.3			
3400 -	+ 0.01	Derivative fact.=	0.10	Derivative fact.=	0.05	
2000 azz 040 azo 110	3 1.20 f.40 1.00 1.10 2.00					
Elegand 1	ime (h)	Results		Results		
		Q/s (m <sup>2</sup> /s)=	1.2E-08			
Log-Log plot incl. derivates- flo	ow period	T <sub>M</sub> (m <sup>2</sup> /s)=	1.3E-08			
		Flow regime:	transient	Flow regime:	transient	
Elapsed time [n] -3 Elapsed time [n] -3	· · · · · · · 10 , 1 · · · · · · · · 10 , 0	$dt_1$ (min) =	#NV	$dt_1$ (min) =	0.17	
10		$dt_2$ (min) =	#NV	$dt_2$ (min) =	0.32	
0000 0000 0000	30	T (m²/s) =		T (m²/s) =	1.5E-08	
· · ·		S (-) =	1.0E-06		1.0E-06	
10 °	10 1	$K_s (m/s) =$		$K_s (m/s) =$	7.5E-10	
÷ .		S <sub>s</sub> (1/m) =		S <sub>s</sub> (1/m) =	5.0E-08	
• •		C (m³/Pa) =	NA	C (m³/Pa) =	5.7E-11	
10 -1	10 °	C <sub>D</sub> (-) =	NA	C <sub>D</sub> (-) =	6.3E-03	
	0.3	ξ(-) =	0.1	ξ(-) =	0.2	
10 <sup>-1</sup> 10 <sup>-2</sup>	10 <sup>3</sup> 10 <sup>4</sup> 10 <sup>5</sup>	$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA	
di Cara		S <sub>GRF</sub> (-) =	NA	S <sub>GRF</sub> (-) =	NA	
		D <sub>GRF</sub> (-) =	NA	D <sub>GRF</sub> (-) =	NA	
Log-Log plot incl. derivatives-	recovery period	Selected represe	entative paran	neters.		
		$dt_1 (min) =$		C (m³/Pa) =	5.7E-11	
Elapsed time [h]	10 <sup>11</sup> ,,10 <sup>10</sup> ,,10 <sup>1</sup>	$dt_2$ (min) =		$C_D(-) =$	6.3E-03	
		$T_T (m^2/s) =$	1.5E-08		0.2	
1	10 3	S (-) =	1.0E-06			
10 1		$K_s (m/s) =$	7.5E-10			
	300	S <sub>s</sub> (1/m) =	5.0E-08			
10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup>	10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup> 10 <sup>2</sup>	<b>Comments:</b> The recommended fanalysis of the CHin derivative quality. T is estimated to be 8. displayed during the transducer depth, w extrapolation in the	r phase (inner zo The confidence n .0E-09 m2/s to 4 e test was 2. The as derived from	one), which shows the ange for the interval 1.0E-08 m2/s. The flue static pressure mean the CHir phase using the	he best data and l transmissivity low dimension asured at ng straight line	

	Test Sumr	nary Sheet			
Project:	Oskarshamn site investigation	Test type:[1]			Pi
Area:	Laxemar	Test no:			1
Alea.	Laxemai	Test no.			I
Borehole ID:	KLX16A	Test start:			070317 15:37
Test section from - to (m):	406.00-426.00 m	Responsible for			Stephan Rohs
		test execution:			Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for		Cris	tian Enachescu
Linear plot Q and p		test evaluation: Flow period		Recovery period	4
		Indata		Indata	1
		p <sub>0</sub> (kPa) =	3794		1
4700 KLX16A_406.00-428.00_070317_1_PL_Q_r	• P motion • P atom • P balow • P balow • Q	p <sub>0</sub> (kPa) = p <sub>i</sub> (kPa ) =	3/94		
450	• P balow • Q				297
	- a.a.	p <sub>p</sub> (kPa) =		p <sub>F</sub> (kPa ) =	3872
		$Q_{p} (m^{3}/s) =$	NA		21(0)
F +100	a.a.	tp (s) =		t <sub>F</sub> (s) =	21600
	jection Rees	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-06
		EC <sub>w</sub> (mS/m)=			<u> </u>
3780 ·	I I	Temp <sub>w</sub> (gr C)=	12.5		
	02	Derivative fact.=	NA	Derivative fact.=	0.03
3300	440 5.00 6.00 7.00 Time [N]	Results		Results	
		$Q/s (m^2/s)=$	NA		
.og-Log plot incl. derivates- fl	ow period	$T_{\rm M} (m^2/s) =$	NA		
		Flow regime:	transient	Flow regime:	transient
		$dt_1$ (min) =	NA	$dt_1$ (min) =	NA
		$dt_1(min) =$ $dt_2(min) =$	NA	$dt_1 (min) =$ $dt_2 (min) =$	NA
			NA		9.3E-12
		$T(m^{2}/s) =$		$T(m^2/s) =$	9.3E-12 1.0E-06
		S (-) =	NA	S (-) =	
		$K_s (m/s) =$	NA	$K_s (m/s) =$	4.7E-13
Not a	nalysed	$S_{s}(1/m) =$	NA	S <sub>s</sub> (1/m) =	5.0E-08
	-	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	3.3E-11
		$C_D(-) =$	NA	C <sub>D</sub> (-) =	3.6E-03
		ξ(-) =	NA	ξ(-) =	-1.4
		- <i>(</i> 2 <i>i</i> )	NIA	<b>-</b> , 2, ,	NA
		$T_{GRF}(m^2/s) =$	NA	$T_{GRF}(m^2/s) =$	NA
		$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
	· · ·	$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives-	recovery period	Selected represe	• • • • • • • • • • • • • • • • • • • •		
		$dt_1$ (min) =	NA	C (m <sup>3</sup> /Pa) =	3.3E-1
10 <sup>1</sup>	<sup>h]</sup> <sup>10</sup> , <sup>°</sup>	$dt_2 (min) =$	NA	C <sub>D</sub> (-) =	3.6E-03
	10 1	$T_{T} (m^{2}/s) =$	9.3E-12		-1.4
		S (-) =	1.0E-06		
		K <sub>s</sub> (m/s) =	4.7E-13		
10	10°	S <sub>s</sub> (1/m) =	5.0E-08		
		Comments:			
a state and the state of the st	0.3	The recommended			
10 <sup>-1</sup>	Ě	analysis of the Pi pl			
· · · · · · · · · · · · · · · · · · ·	10 <sup>-1</sup>	interval transmissiv analysis was conduc			
· ·····	0.03	pressure could not b			
			-	-	-
10 <sup>-2</sup> 10 <sup>-1</sup>	10 <sup>0</sup> 10 <sup>1</sup> 10 <sup>2</sup>				

	Test Sumr	nary Sheet			
Project:	Oskarshamn site investigation				Pi
Area:	Laxemar	Test no:			1
Borehole ID:	KLX16A	Test start:	070318 19:1		
Test section from - to (m):	421.10-433.55 m	Pooponsible for			Stephan Rohs
rest section from - to (m).	421.10-433.55111	test execution:			Philipp Wolf
Section diameter, 2·r <sub>w</sub> (m):	0.076	Responsible for		Crist	tian Enachescu
		test evaluation:			
Linear plot Q and p		Flow period		Recovery period	
		Indata	-	Indata	
400	Presion     Operation	p <sub>0</sub> (kPa) =	3788		
KLX16A_421.10-433.55_070317_1_Pi_Q_r (Single Packer)	<ul> <li>P stolon</li> <li>P alone</li> <li>P blow</li> </ul>	p <sub>i</sub> (kPa ) =	3792		
4000	0.004	p <sub>p</sub> (kPa) =	4053	p <sub>F</sub> (kPa ) =	3806
		Q <sub>p</sub> (m <sup>3</sup> /s)=	NA		
2	• • • • • • • • • • • • • • • • • • •	tp (s) =		t <sub>F</sub> (s) =	9441
2000 · · · · · · · · · · · · · · · · · ·	**************************************	S el S <sup>*</sup> (-)=	1.00E-06	S el S <sup>*</sup> (-)=	1.00E-06
	0.002	EC <sub>w</sub> (mS/m)=			
1700-	÷ .	Temp <sub>w</sub> (gr C)=	12.5		
300		Derivative fact.=	NA	Derivative fact.=	0.05
3500 100 150 100 150 Elepte	000 200 300 300 400 d Time [h]	Results		Results	
		Q/s (m²/s)=	NA		
Log-Log plot incl. derivates- f	low period	$T_{M}$ (m <sup>2</sup> /s)=	NA		
		Flow regime:	transient	Flow regime:	transient
		dt <sub>1</sub> (min) =	NA	dt <sub>1</sub> (min) =	12.88
		$dt_2$ (min) =	NA	$dt_2$ (min) =	48.07
		$T(m^2/s) =$	NA	$T(m^2/s) =$	5.4E-11
		S (-) =	NA	S (-) =	1.0E-06
		K <sub>s</sub> (m/s) =	NA	$K_s (m/s) =$	4.3E-12
		$S_{s}(1/m) =$	NA	$S_{s}(1/m) =$	8.0E-08
Not a	nalysed	C (m <sup>3</sup> /Pa) =	NA	C (m <sup>3</sup> /Pa) =	3.0E-11
		$C_{D}(-) =$	NA	$C_{D}(-) =$	3.3E-03
					0.2
		ξ(-) =	INA	ξ(-) =	0.2
		T <sub>GRF</sub> (m²/s) =	NA	$T_{GRF}(m^2/s) =$	NA
		$S_{GRF}(-) =$	NA	$S_{GRF}(-) =$	NA
		$D_{GRF}(-) =$	NA	$D_{GRF}(-) =$	NA
Log-Log plot incl. derivatives	- recovery period	Selected represe			
		dt <sub>1</sub> (min) =	• • • • • • • • • • • • • • • • • • • •	C (m <sup>3</sup> /Pa) =	3.0E-11
10. <sup>-3</sup> Elapsed fm	e[h] 10 <sup>-1</sup> 10 <sup>-0</sup> 40 <sup>-1</sup>	$dt_1(min) =$ $dt_2(min) =$		$C (m /Pa) = C_D (-) =$	3.3E-03
10 1	10 °		48.07 5.4E-11		5.3⊑-03 0.2
		$T_{T} (m^{2}/s) =$	1.0E-06		0.2
	0.3	- ( )			
10 °	and the second s	· ·s (·····=)	4.3E-12		
and the second second	10 -1	S <sub>s</sub> (1/m) =	8.0E-08		
	2 2 2 2 2 0 0 2	Comments:			
				f 5.4E-11 m2/s was	
10 -1	10 -2			) which shows horiz for the interval trans	
				m2/s and encompas	
	0.003			nsion displayed duri	
l	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	2. The static pressu			
10 <sup>0</sup> 10 <sup>1</sup>	10 <sup>2</sup> 10 <sup>3</sup> 10 <sup>4</sup>	transmissivity.			

Borehole: KLX16 A

#### **APPENDIX 4**

Nomenclature

Character	SICADA	Explanation	Dimension	Unit
Variables,	designation			
A <sub>w</sub>		Horizontal area of water surface in open borehole, not	$[L^2]$	m <sup>2</sup>
•••		including area of signal cables, etc.	[-]	
b		Aquifer thickness (Thickness of 2D formation)	[L]	m
B		Width of channel		m
L		Corrected borehole length		m
L <sub>0</sub>		Uncorrected borehole length	[L]	m
<u> </u>		Point of application for a measuring section based on its	[L]	m
—p		centre point or centre of gravity for distribution of	[-]	
		transmissivity in the measuring section.		
L <sub>w</sub>		Test section length.	[L]	m
dL		Step length, Positive Flow Log - overlapping flow logging.	[L]	m
		(step length, PFL)	[=]	
r		Radius	[L]	m
		Borehole, well or soil pipe radius in test section.	[L]	m
r <sub>w</sub>		Effective borehole, well or soil pipe radius in test section.		
r <sub>we</sub>		(Consideration taken to skin factor)	[L]	m
r		Distance from test section to observation section, the	[L]	m
r <sub>s</sub>		shortest distance.		m
r			<u>п</u> 1	m
r <sub>t</sub>		Distance from test section to observation section, the	[L]	m
r		<b>interpreted</b> shortest distance via conductive structures.	-	-
r <sub>D</sub>		Dimensionless radius, r <sub>D</sub> =r/r <sub>w</sub>		
Z		Level above reference point	[L]	m
Z <sub>r</sub>		Level for reference point on borehole	[L]	m
Z <sub>wu</sub>		Level for test section (section that is being flowed), upper	[L]	m
		limitation		
Z <sub>wl</sub>		Level for test section (section that is being flowed), lower	[L]	m
		limitation		
Z <sub>ws</sub>		Level for sensor that measures response in test section	[L]	m
		(section that is flowed)		
Z <sub>ou</sub>		Level for observation section, upper limitation	[L]	m
Z <sub>ol</sub>		Level for observation section, lower limitation	[L]	m
Z <sub>os</sub>		Level for sensor that measures response in observation	[L]	m
		section		
E		Eveneration:	$[L^{3}/(T L^{2})]$	mm/v
E		Evaporation:		mm/y,
		huden la rice la udente	rı <sup>3</sup> / <del>-</del> -1	mm/d, m <sup>3</sup> /s
<u></u>		hydrological budget:	[L <sup>3</sup> /T] [L <sup>3</sup> /(T L <sup>2</sup> )]	
ET		Evapotranspiration	[L /(I L )]	mm/y,
		hudede einel hudentu	rı 3/ <del></del> 1	mm/d, m <sup>3</sup> /s
<b></b>		hydrological budget:	[L <sup>3</sup> /T] [L <sup>3</sup> /(T L <sup>2</sup> )]	
Р		Precipitation	[L <sup>-</sup> /(1 L <sup>-</sup> )]	mm/y,
			rı <sup>3</sup> / <del>-</del>	mm/d,
		hydrological budget:	[L <sup>3</sup> /T] [L <sup>3</sup> /(T L <sup>2</sup> )]	m <sup>3</sup> /s
R		Groundwater recharge	[L°/(T L <sup>-</sup> )]	mm/y,
			ru <sup>3</sup> / <del>-</del> -1	mm/d,
		hydrological budget:	[L <sup>3</sup> /T] [L <sup>3</sup> /(T L <sup>2</sup> )]	m <sup>3</sup> /s
D		Groundwater discharge	[LŸ/(T L <sup>*</sup> )]	mm/y,
				mm/d,
		hydrological budget:	[L <sup>3</sup> /T] [L <sup>3</sup> /T]	m <sup>3</sup> /s
Q <sub>R</sub>		Run-off rate	[L <sup>v</sup> /T]	m <sup>3</sup> /s
Q <sub>p</sub>		Pumping rate	[L <sup>3</sup> /T]	m³/s
Q		Infiltration rate	[L <sup>3</sup> /T]	m³/s
Q		Volumetric flow. Corrected flow in flow logging $(Q_1 - Q_0)$	[L <sup>3</sup> /T]	m³/s
		(Flow rate)		
Q <sub>0</sub>	1	Flow in test section during undisturbed conditions (flow	[L <sup>3</sup> /T]	m³/s
		logging).	' '	
Q <sub>p</sub>	1	Flow in test section immediately before stop of flow.	[L <sup>3</sup> /T]	m <sup>3</sup> /s
·u	1	Stabilised pump flow in flow logging.	ра — с на — — — — — — — — — — — — — — — — — —	1

Character	SICADA designation	Explanation	Dimension	Unit
Q <sub>m</sub>		Arithmetical mean flow during perturbation phase.	[L <sup>3</sup> /T]	m <sup>3</sup> /s
Q <sub>1</sub>		Flow in test section during pumping with pump flow Q <sub>p1</sub> , (flow logging).	[L <sup>3</sup> /T]	m³/s
Q <sub>2</sub>		Flow in test section during pumping with pump flow $Q_{p1}$ , (flow logging).	[L <sup>3</sup> /T]	m³/s
ΣQ	SumQ	Cumulative volumetric flow along borehole	[L <sup>3</sup> /T]	m <sup>3</sup> /s
$\Sigma Q_0$	SumQ0	Cumulative volumetric flow along borehole, undisturbed conditions (ie, not pumped)	[L <sup>3</sup> /T]	m³/s
$\Sigma Q_1$	SumQ1	Cumulative volumetric flow along borehole, with pump flow $Q_{p1}$	[L <sup>3</sup> /T]	m³/s
$\Sigma Q_2$	SumQ2	Cumulative volumetric flow along borehole, with pump flow $Q_{p2}$	[L <sup>3</sup> /T]	m <sup>3</sup> /s
$\Sigma Q_{C1}$	SumQC1	Corrected cumulative volumetric flow along borehole, $\Sigma Q_1 - \Sigma Q_0$	[L <sup>3</sup> /T]	m³/s
$\Sigma Q_{C2}$	SumQC2	Corrected cumulative volumetric flow along borehole, $\Sigma Q_2 - \Sigma Q_0$	[L <sup>3</sup> /T]	m³/s
q		Volumetric flow per flow passage area (Specific discharge (Darcy velocity, Darcy flux, Filtration velocity)).	([L <sup>3</sup> /T*L <sup>2</sup> ]	m/s
V		Volume	[L <sup>3</sup> ]	m <sup>3</sup>
V <sub>w</sub>		Water volume in test section.	[L <sup>3</sup> ]	m <sup>3</sup>
V <sub>p</sub>		Total water volume injected/pumped during perturbation phase.	[L <sup>3</sup> ]	m <sup>3</sup>
V		Velocity	$([L^3/T^*L^2])$	m/s
Va		Mean transport velocity (Average linear velocity (Average linear groundwater velocity, Mean microscopic velocity));. $v_a=q/n_e$	([L <sup>3</sup> /T*L <sup>2</sup> ]	m/s
t		Time	[T]	hour,mi n,s
t <sub>0</sub>		Duration of rest phase before perturbation phase.	[T]	S
t <sub>p</sub>		Duration of perturbation phase. (from flow start as far as $p_p$ ).	[T]	S
t <sub>F</sub>		Duration of recovery phase (from $p_p$ to $p_F$ ).	[T]	S
$t_1, t_2$ etc		Times for various phases during a hydro test.	[T]	hour,mi n,s
dt		Running time from start of flow phase and recovery phase respectively.	[T]	S
dt <sub>e</sub>		$dt_e = (dt \cdot tp) / (dt + tp)$ Agarwal equivalent time with dt as running time for recovery phase.	[T]	S
t <sub>D</sub>		$t_D = T \cdot t / (S \cdot r_w^2)$ . Dimensionless time	-	-
р		Static pressure; including non-dynamic pressure which depends on water velocity. Dynamic pressure is normally ignored in estimating the potential in groundwater flow relations.	[M/(LT) <sup>2</sup> ]	kPa
p <sub>a</sub>		Atmospheric pressure	$[M/(LT)^2]$	kPa
p <sub>t</sub>		Absolute pressure; $p_t=p_a+p_q$	$[M/(LT)^2]$	kPa
pg		Gauge pressure; Difference between absolute pressure and atmospheric pressure.	$[M/(LT)^2]$	kPa
<b>p</b> <sub>0</sub>		Initial pressure before test begins, prior to packer expansion.	[M/(LT) <sup>2</sup> ]	kPa
p <sub>i</sub>		Pressure in measuring section before start of flow.	$[M/(LT)^2]$	kPa
Pf		Pressure during perturbation phase.	$[M/(LT)^2]$	kPa
p <sub>s</sub>		Pressure during recovery.	$[M/(LT)^2]$	kPa
p <sub>p</sub>		Pressure in measuring section before flow stop.	$[M/(LT)^2]$	kPa
р <sub>F</sub>		Pressure in measuring section at end of recovery.	$[M/(LT)^2]$	kPa
p <sub>D</sub>		$p_{\rm D}=2\pi\cdot T\cdot p/(Q\cdot \rho_{\rm w}g)$ , Dimensionless pressure	-	-
dp		Pressure difference, drawdown of pressure surface	$[M/(LT)^2]$	kPa
- 15		between two points of time.	r ( <b>-</b> . ) 1	

Character	SICADA designation	Explanation	Dimension	Unit
dp <sub>f</sub>		$dp_f = p_i - p_f$ or $= p_f - p_i$ , drawdown/pressure increase of pressure surface between two points of time during perturbation phase. $dp_f$ usually expressed positive.	[M/(LT) <sup>2</sup> ]	kPa
dp <sub>s</sub>		$dp_s = p_s - p_p$ or $p_p - p_s$ , pressure increase/drawdown of pressure surface between two points of time during recovery phase. $dp_s$ usually expressed positive.	[M/(LT) <sup>2</sup> ]	kPa
dp <sub>p</sub>		$dp_p = p_i - p_p$ or $p_p = p_p - p_i$ , <b>maximal</b> pressure increase/drawdown of pressure surface between two points of time during perturbation phase. $dp_p$ expressed positive.	[M/(LT) <sup>2</sup> ]	kPa
dp <sub>F</sub>		$dp_F = p_p - p_F$ or $p_F = p_F - p_p$ , <b>maximal</b> pressure increase/drawdown of pressure surface between two points of time during recovery phase. $dp_F$ expressed positive.	[M/(LT) <sup>2</sup> ]	kPa
Η		Total head; (potential relative a reference level) (indication of h for phase as for p). $H=h_e+h_p+h_v$	[L]	m
h		Groundwater pressure level (hydraulic head (piezometric head; possible to use for level observations in boreholes, static head)); (indication of h for phase as for p). $h=h_e+h_p$	[L]	m
h <sub>e</sub>		Height of measuring point (Elevation head); Level above reference level for measuring point.	[L]	m
h <sub>p</sub>		Pressure head; Level above reference level for height of measuring point of stationary column of water giving corresponding static pressure at measuring point	[L]	m
h <sub>v</sub>		Velocity head; height corresponding to the lifting for which the kinetic energy is capable (usually neglected in hydrogeology)	[L]	m
S		Drawdown; Drawdown from undisturbed level (same as dh <sub>p</sub> , positive)	[L]	m
Sp		Drawdown in measuring section before flow stop.	[L] [L]	m
h <sub>0</sub>		Initial above reference level before test begins, prior to packer expansion.	[L]	m
h <sub>i</sub>		Level above reference level in measuring section before start of flow.	[L]	m
h <sub>f</sub>		Level above reference level during perturbation phase.	[L]	m
h <sub>s</sub>		Level above reference level during recovery phase.	[L]	m
h <sub>p</sub>		Level above reference level in measuring section before flow stop.	[L]	m
h <sub>F</sub>		Level above reference level in measuring section at end of recovery.	[L]	m
dh		Level difference, drawdown of water level between two points of time.	[L]	m
dh <sub>f</sub>		$dh_f = h_i - h_f$ or $= h_f - h_i$ , drawdown/pressure increase of pressure surface between two points of time during perturbation phase. $dh_f$ usually expressed positive.	[L]	m
dh <sub>s</sub>		$dh_s = h_s - h_p$ or $= h_p - h_s$ , pressure increase/drawdown of pressure surface between two points of time during recovery phase. $dh_s$ usually expressed positive.	[L]	m
dh <sub>p</sub>		$dh_p = h_i - h_p$ or $= h_p - h_i$ , maximal pressure increase/drawdown of pressure surface between two points of time during perturbation phase. $dh_p$ expressed positive.	[L]	m
dh <sub>F</sub>		$dh_F = h_p - h_F$ or $= h_F - h_p$ , maximal pressure increase/drawdown of pressure surface between two points of time during perturbation phase. $dh_F$ expressed positive.	[L]	m
Te <sub>w</sub>		Temperature in the test section (taken from temperature logging). Temperature		°C
Te <sub>w0</sub>		Temperature in the test section during undisturbed conditions (taken from temperature logging).		°C

Character	SICADA designation	Explanation	Dimension	Unit
Te <sub>o</sub>		Temperature in the observation section (taken from temperature logging). Temperature		°C
ECw		Electrical conductivity of water in test section.		mS/m
$EC_{w0}$		Electrical conductivity of water in test section during undisturbed conditions.		mS/m
ECo		Electrical conductivity of water in observation section		mS/m
TDS <sub>w</sub>		Total salinity of water in the test section.	$[M/L^3]$	mg/L
TDS <sub>w0</sub>		Total salinity of water in the test section during undisturbed conditions.	[M/L <sup>3</sup> ]	mg/L
TDS₀		Total salinity of water in the observation section.	[M/L <sup>3</sup> ]	mg/L
g		Constant of gravitation (9.81 m*s <sup>-2</sup> ) (Acceleration due to gravity)	[L/T <sup>2</sup> ]	m/s <sup>2</sup>
π	pi	Constant (approx 3.1416).	[-]	
r		Residual. $r = p_c p_m$ , $r = h_c h_m$ , etc. Difference between measured data ( $p_m$ , $h_m$ , etc) and estimated data ( $p_c$ , $h_c$ , etc)		
ME		Mean error in residuals. $ME = \frac{1}{n} \sum_{i=1}^{n} r_i$		
NME		Normalized ME. NME=ME/(x <sub>MAX</sub> -x <sub>MIN</sub> ), x: measured variable considered.		
MAE		Mean absolute error. $MAE = \frac{1}{n} \sum_{i=1}^{n}  r_i $		
NMAE		Normalized MAE. NMAE=MAE/(x <sub>MAX</sub> -x <sub>MIN</sub> ), x: measured variable considered.		
RMS		Root mean squared error. $RMS = \left(\frac{1}{n}\sum_{i=1}^{n}r_{i}^{2}\right)^{0.5}$		
NRMS		Normalized RMR. NRMR=RMR/(x <sub>MAX</sub> -x <sub>MIN</sub> ), x: measured variable considered.		
SDR		Standard deviation of residual. $SDR = \left(\frac{1}{n-1}\sum_{i=1}^{n} (r_i - ME)^2\right)^{0.5}$		
SEMR		Standard error of mean residual. $SEMR = \left(\frac{1}{n(n-1)}\sum_{i=1}^{n} (r_i - ME)^2\right)^{0.5}$		
Parameter	s			
Q/s		Specific capacity $s=dp_p$ or $s=s_p=h_0-h_p$ (open borehole)	$[L^2/T]$	m²/s
D		Interpreted flow dimension according to Barker, 1988.	[-]	-
dt <sub>1</sub>		Time of starting for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	S
dt <sub>2</sub>		End of time for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	S
dtL		Response time to obtain 0.1 m (or 1 kPa) drawdown in observation section counted from start of recovery phase.	[T]	S
ТВ		Flow capacity in a one-dimensional structure of width B and transmissivity T. Transient evaluation of one- dimensional structure	[L <sup>3</sup> /T]	m <sup>3</sup> /s
Т		Transmissivity	$[L^2/T]$	m²/s
Т <sub>М</sub>		Transmissivity according to Moye (1967)	$[L^2/T]$	m²/s
Τ <sub>Q</sub>		Evaluation based on Q/s and regression curve between Q/s and T, as example see Rhén et al (1997) p. 190.	[L <sup>2</sup> /T]	m²/s
Ts		Transmissivity evaluated from slug test	$[L^2/T]$	m²/s

Character	SICADA designation	Explanation	Dimension	Unit
T <sub>D</sub>		Transmissivity evaluated from PFL-Difference Flow Meter	[L <sup>2</sup> /T]	m²/s
Γ <sub>I</sub>		Transmissivity evaluated from Impeller flow log	$[L^2/T]$	m²/s
Γ <sub>Sf</sub> , Τ <sub>Lf</sub>		Transient evaluation based on semi-log or log-log	$[L^2/T]$	m²/s
		diagram for perturbation phase in injection or pumping.		
Γ <sub>Ss</sub> , Τ <sub>Ls</sub>		Transient evaluation based on semi-log or log-log	$[L^2/T]$	m²/s
		diagram for recovery phase in injection or pumping.		
Γ <sub>T</sub>		Transient evaluation (log-log or lin-log). Judged best evaluation of $T_{Sf}$ , $T_{Lf}$ , $T_{Ss}$ , $T_{Ls}$	[L <sup>2</sup> /T]	m²/s
r		Evaluation based on non-linear regression.	[L <sup>2</sup> /T]	m²/s
NLR			$[L^{7}/T]$	m <sup>2</sup> /s
Γ <sub>Tot</sub>		Judged most representative transmissivity for particular test section and (in certain cases) evaluation time with respect to available data (made by SKB at a later stage).		m /s
(		Hydraulic conductivity	[L/T]	m/s
<b>κ</b> <b>κ</b> s		Hydraulic conductivity based on spherical flow model	[L/T]	m/s
∖ <sub>s</sub> ∕ <sub>m</sub>		Hydraulic conductivity based on spherical now model	[L/T]	m/s
ν <sub>m</sub> (		Intrinsic permeability	[L/1] [L <sup>2</sup> ]	$m^2$
k kb		Permeability-thickness product: kb=k·b	[L] [L <sup>3</sup> ]	m <sup>3</sup>
NU		Ferneability-thickness product. KD=K·D		111
SB		Storage capacity in a one-dimensional structure of width B and storage coefficient S. Transient evaluation of one- dimensional structure	[L]	m
SB*		Assumed storage capacity in a one-dimensional structure of width B and storage coefficient S. Transient evaluation of one-dimensional structure	[L]	m
S		Storage coefficient, (Storativity)	[-]	-
S S*		Assumed storage coefficient	[-]	-
S <sub>y</sub>		Theoretical specific yield of water (Specific yield; unconfined storage. Defined as total porosity (n) minus retention capacity (S <sub>r</sub> )	[-]	-
S <sub>ya</sub>		Specific yield of water (Apparent specific yield); unconfined storage, field measuring. Corresponds to volume of water achieved on draining saturated soil or rock in free draining of a volumetric unit. $S_{ya} = S_y$ (often called $S_y$ in literature)	[-]	-
Sr		Specific retention capacity, (specific retention of water, field capacity) (Specific retention); unconfined storage. Corresponds to water volume that the soil or rock has left after free draining of saturated soil or rock.	[-]	-
S <sub>f</sub>		Fracture storage coefficient	[-]	-
S <sub>m</sub>		Matrix storage coefficient	[-]	-
S <sub>NLR</sub>		Storage coefficient, evaluation based on non-linear regression	[-]	-
S <sub>Tot</sub>		Judged most representative storage coefficient for particular test section and (in certain cases) evaluation time with respect to available data (made by SKB at a later stage).	[-]	-
<u></u>			54/13	4/
S <sub>s</sub>		Specific storage coefficient; confined storage.	[ 1/L]	1/m
S <sub>s</sub> *		Assumed specific storage coefficient; confined storage.	[ 1/L]	1/m
Эf		Hydraulic resistance: The hydraulic resistance is an aquitard with a flow vertical to a two-dimensional formation. The inverse of c is also called Leakage coefficient. $c_r=b'/K'$ where b' is thickness of the aquitard and K' its hydraulic conductivity across the aquitard.	[T]	S
	1		l	+
-f		Leakage factor: $L_f = (K \cdot b \cdot c_f)^{0.5}$ where K represents characteristics of the aquifer.	[L]	m

Character	SICADA designation	Explanation	Dimension	Unit
٤*	Skin	Assumed skin factor	[-]	-
<u>ځ*</u> C		Wellbore storage coefficient	$[(LT^2) \cdot M^2]$	m³/Pa
C <sub>D</sub>		$C_D = C \cdot \rho_w g / (2\pi \cdot S \cdot r_w^2)$ , Dimensionless wellbore storage coefficient	[-]	-
ω	Stor-ratio	$\omega = S_f / (S_f + S_m)$ , storage ratio (Storativity ratio); the ratio of storage coefficient between that of the fracture and total storage.	[-]	-
λ	Interflow-coeff	$\lambda = \alpha \cdot (K_m / K_f) \cdot r_w^2$ interporosity flow coefficient.	[-]	-
T <sub>GRF</sub>		Transmissivity interpreted using the GRF method	[L <sup>2</sup> /T]	m²/s
S <sub>GRF</sub>		Storage coefficient interpreted using the GRF method	[ 1/L]	1/m
D <sub>GRF</sub>		Flow dimension interpreted using the GRF method	[-]	-
C <sub>w</sub>		Water compressibility; corresponding to β in hydrogeological literature.	[(LT <sup>2</sup> )/M]	1/Pa
Cr		Pore-volume compressibility, (rock compressibility); Corresponding to α/n in hydrogeological literature.	[(LT <sup>2</sup> )/M]	1/Pa
Ct		$c_t = c_r + c_w$ , total compressibility; compressibility per volumetric unit of rock obtained through multiplying by the total porosity, n. (Presence of gas or other fluids can be included in $c_t$ if the degree of saturation (volume of respective fluid divided by n) of the pore system of respective fluid is also included)	[(LT <sup>2</sup> )/M]	1/Pa
nct		Porosity-compressibility factor: $nc_t = n \cdot c_t$	[(LT <sup>2</sup> )/M]	1/Pa
nc <sub>t</sub> b		Porosity-compressibility-thickness product: $nc_tb = n \cdot c_t.b$	$[(L^2T^2)/M]$	m/Pa
n		Total porosity	-	-
n <sub>e</sub>		Kinematic porosity, (Effective porosity)	-	-
e		Transport aperture. $e = n_e b$	[L]	m
0				111
ρ	Density	Density	$[M/L^3]$	$kg/(m^3)$
ρ <sub>w</sub>	Density-w	Fluid density in measurement section during pumping/injection	[M/L <sup>3</sup> ]	$kg/(m^3)$
ρο	Density-o	Fluid density in observation section	$[M/L^3]$	kg/(m <sup>3</sup> )
ρ <sub>sp</sub>	Density-sp	Fluid density in standpipes from measurement section	$[M/L^3]$	$kg/(m^3)$
μ	my	Dynamic viscosity	[M/LT]	Pas
μ <sub>w</sub>	my	Dynamic viscosity (Fluid density in measurement section during pumping/injection)	[M/LT]	Pas
FC <sub>T</sub>		Fluid coefficient for intrinsic permeability, transference of k to K; K=FC <sub>T</sub> ·k; FC <sub>T</sub> = $\rho_w \cdot g/\mu_w$	[1/LT]	1/(ms)
FCs		Fluid coefficient for porosity-compressibility, transference of $c_t$ to $S_s$ ; $S_s=FC_s \cdot n \cdot c_t$ ; $FC_s=\rho_w \cdot g$	[ M/T <sup>2</sup> L <sup>2</sup> ]	Pa/m
Index on K	, T and S			·
S		S: semi-log		
L		L: log-log		
f		Pump phase or injection phase, designation following S or L (withdrawal)		
S		Recovery phase, designation following S or L (recovery)		
NLR		NLR: Non-linear regression. Performed on the entire test		
N/		sequence, perturbation and recovery		
M		Moye		
GRF		Generalised Radial Flow according to Barker (1988)		
m f		Matrix		
f T		Fracture		
Т		Judged best evaluation based on transient evaluation.		

Character	SICADA designation	Explanation	Dimension	Unit
Tot	g	Judged most representative parameter for particular test		
		section and (in certain cases) evaluation time with		
		respect to available data (made by SKB at a later stage).		
b		Bloch property in a numerical groundwater flow model		
e		Effective property (constant) within a domain in a		
		numerical groundwater flow model.		
Index on p	and Q	<u> </u>	•	
0		Initial condition, undisturbed condition in open holes		
i		Natural, "undisturbed" condition of formation parameter		
f		Pump phase or injection phase (withdrawal, flowing		
		phase)		
S		Recovery, shut-in phase		
p		Pressure or flow in measuring section at end of		
۴		perturbation period		
F		Pressure in measuring section at end of recovery period.		
m		Arithmetical mean value		
С		Estimated value. The index is placed last if index for		
•		"where" and "what" are used. Simulated value		
m		Measured value. The index is placed last if index for		
		"where" and "what" are used. Measured value		
Some mise	ellaneous inde	exes on p and h		
W		Test section (final difference pressure during flow phase		
		in test section can be expressed $dp_{wp}$ ; First index shows		
		"where" and second index shows "what")		
0		Observation section (final difference pressure during flow		
-		phase in observation section can be expressed $dp_{op}$ ;		
		First index shows "where" and second index shows		
		"what")		
f		Fresh-water head. Water is normally pumped up from		
		section to measuring hoses where pressure and level are		
		observed. Density of the water is therefore approximately		
		the same as that of the measuring section. Measured		
		groundwater level is therefore normally represented by		
		what is defined as point-water head. If pressure at the		
		measuring level is recalculated to a level for a column of		
		water with density of fresh water above the measuring		
		point it is referred to as fresh-water head and h is		
		indicated last by an f. Observation section (final level		
		during flow phase in observation section can be		
		expressed h <sub>opf</sub> ; the first index shows "where" and the		
		second index shows "what" and the last one		
		"recalculation")		

Borehole: KLX16A

# **APPENDIX 5**

SICADA data tables

Borehole: KLX16A

# **APPENDIX 5-1**

SICADA data tables (Injection tests)

SKB		SIC	CADA	/Data	Impo	rt Temp	late			Dified version v1.4 Ergodata AB 2004
File Identity							Compiled By			
Created By						Quality Check	<pre>K For Delivery</pre>			
Created						Deliv	/ery Approval			
Activity Type		KLX 16A				Project		AP PS 40	00-07-008	
, ,,		KLX 16A - Injectio	n test							
Activity Informa	ntion					Additional Activity	Data			
-						C10	P20	P200	P220	R25
							Field crew		evaluating	
		Stop Date		. ,	Section No	Company	manager	Field crew		Report
KLX 16A	2007-03-12 20:28	2007-03-18 22:51	12.50	433.55		Golder Associates	Stephan Rohs, Philipp	Philipp Wolf,		Stephan Rohs
							Wolf	Rohs,	Wolf	Rons
								Daniel		
								Nordbörg,		
								Linda		
								Höckert, Erik Lövgren		
								Lovgren		

	Table plu_s_hole_test_d	Table
PLU Injection and pumping, General information	PLU Injection and pumping, General information	

Column	Datatype	Unit	Column Description
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
start_date	DATE		Date (yymmdd hh:mm:ss)
stop_date	DATE		Date (yymmdd hh:mm:ss)
project	CHAR		project code
idcode	CHAR		Object or borehole identification code
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
section_no	INTEGER	number	Section number
test_type	CHAR		Test type code (1-7), see table description
formation_type	CHAR		1: Rock, 2: Soil (superficial deposits)
start_flow_period	DATE	yyyymmdd	Date & time of pumping/injection start (YYYY-MM-DD hh:mm:ss)
stop_flow_period	DATE	yyyymmdd	Date & time of pumping/injection stop (YYYY-MM-DD hh:mm:ss)
flow_rate_end_qp	FLOAT	m**3/s	Flow rate at the end of the flowing period
value_type_qp	CHAR		0:true value,-1 <lower meas.limit1:="">upper meas.limit</lower>
mean_flow_rate_qm	FLOAT	m**3/s	Arithmetic mean flow rate during flow period
q_measll	FLOAT	m**3/s	Estimated lower measurement limit of flow rate
q_measlu	FLOAT	m**3/s	Estimated upper measurement limit of flow rate
tot_volume_vp	FLOAT	m**3	Total volume of pumped or injected water
dur_flow_phase_tp	FLOAT	S	Duration of the flowing period of the test
dur_rec_phase_tf	FLOAT	S	Duration of the recovery period of the test
initial_head_hi	FLOAT	m	Hydraulic head in test section at start of the flow period
head_at_flow_end_hp	FLOAT	m	Hydraulic head in test section at stop of the flow period.
final_head_hf	FLOAT	m	Hydraulic head in test section at stop of recovery period.
initial_press_pi	FLOAT	kPa	Groundwater pressure in test section at start of flow period
press_at_flow_end_pp	FLOAT	kPa	Groundwater pressure in test section at stop of flow period.
final_press_pf	FLOAT	kPa	Ground water pressure at the end of the recovery period.
fluid_temp_tew	FLOAT	oC	Measured section fluid temperature, see table description
fluid_elcond_ecw	FLOAT	mS/m	Measured section fluid el. conductivity, see table descr.
fluid_salinity_tdsw	FLOAT	mg/l	Total salinity of section fluid based on EC, see table descr.
fluid_salinity_tdswm	FLOAT	mg/l	Tot. section fluid salinity based on water sampling, see
reference	CHAR		SKB report No for reports describing data and evaluation
comments	VARCHAR		Short comment to data
error_flag	CHAR		If error_flag = "*" then an error occured and an error
in_use	CHAR		If in_use = "*" then the activity has been selected as
sign	CHAR		Signature for QA data accknowledge (QA - OK)
lp	FLOAT	m	Hydraulic point of application

KL	Х	1	6A
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					section_		formation					mean_flow_rate			
idcode	start_date	stop_date	secup	seclow	no	test_type	_type	start_flow_period	stop_flow_period	flow_rate_end_qp	value_type_qp	_qm	q_measll	q_measlu	tot_volume_vp
KLX 16A	070313 09:41	070313 12:22	13.00	113.00	)	3	3 1	2007-03-13 10:32:48	2007-03-13 11:02:58	3.69E-04	0	4.51E-04	1.67E-08	8.33E-04	8.11E-01
KLX 16A	070313 14:12	070313 16:02	112.00	212.00	)	3	3 1	2007-03-13 15:00:08	2007-03-13 15:30:18	5.63E-04	0	5.84E-04	1.67E-08	8.33E-04	1.05E+00
KLX 16A	070313 17:54	070313 19:46	212.00	312.00	)	3	3 1	2007-03-13 18:44:46	2007-03-13 19:14:56	2.85E-04	0	2.95E-04	1.67E-08	8.33E-04	5.30E-01
KLX 16A	070313 21:41	070313 23:41	312.00	412.00	)	3	3 1	2007-03-13 22:39:16	2007-03-13 23:09:26	2.95E-06	0	3.67E-06	1.67E-08	8.33E-04	6.60E-03
KLX 16A	070314 13:12	070314 14:38	12.50	32.50	)	3	3 1	2007-03-14 13:56:34	2007-03-14 14:16:44	4.37E-04	0	5.02E-04	1.67E-08	8.33E-04	6.02E-01
KLX 16A	070314 22:12	070314 23:57	32.50	52.50	)	3	3 1	2007-03-14 23:15:47	2007-03-14 23:35:57	4.10E-06	0	4.50E-06	1.67E-08	8.33E-04	5.40E-03
KLX 16A	070315 00:34	070315 02:39	52.50	72.50	)	3	3 1	2007-03-15 01:17:40	2007-03-15 01:37:50	1.47E-06	0	1.52E-06	1.67E-08	8.33E-04	1.82E-03
KLX 16A	070315 06:50	070315 08:18	72.50	92.50	)	3	3 1	2007-03-15 07:36:18	2007-03-15 07:56:28	4.12E-06	0	4.27E-06	1.67E-08	8.33E-04	5.12E-03
KLX 16A	070315 08:52	070315 10:25	91.00	111.00	)	3	3 1	2007-03-15 09:42:53	2007-03-15 10:03:03	8.47E-06	0	9.15E-06	1.67E-08	8.33E-04	1.10E-02
KLX 16A	070315 10:59	070315 12:22	111.00	131.00	)	3	3 1	2007-03-15 11:39:56	2007-03-15 12:00:06	1.72E-06	0	1.78E-06	1.67E-08	8.33E-04	2.14E-03
KLX 16A	070315 13:31	070315 14:55	131.00	151.00	)	3	3 1	2007-03-15 14:13:36	2007-03-15 14:33:46	5.58E-04	0	5.76E-04	1.67E-08	8.33E-04	6.91E-01
KLX 16A	070315 15:35	070315 17:14	150.00	170.00	)	3	3 1	2007-03-15 16:32:21	2007-03-15 16:52:31	6.97E-06	0	7.33E-06	1.67E-08	8.33E-04	8.80E-03
KLX 16A	070315 17:51	070315 19:24	170.00	190.00	)	3	3 1	2007-03-15 18:41:50	2007-03-15 19:02:00	8.88E-06	0	9.17E-06	1.67E-08	8.33E-04	1.10E-02
KLX 16A	070315 20:00	070315 21:52	188.00	208.00	)	3	3 1	2007-03-15 20:50:45	2007-03-15 21:10:55	2.17E-07	0	2.50E-07	1.67E-08	8.33E-04	3.00E-04
KLX 16A	070315 22:44	070316 00:00	207.00	227.00	)	3	3 1	2007-03-15 23:26:19	2007-03-15 23:46:29	3.36E-04	0	3.43E-04	1.67E-08	8.33E-04	4.12E-01
KLX 16A	070316 00:47	070316 02:13	227.00	247.00	)	3	3 1	2007-03-16 01:30:59	2007-03-16 01:51:09	1.32E-05	0	1.35E-05	1.67E-08	8.33E-04	1.62E-02
KLX 16A	070316 07:36	070316 08:58	247.00	267.00	)	3	8 1	2007-03-16 08:16:35	2007-03-16 08:36:45	2.08E-05	0	2.17E-05	1.67E-08	8.33E-04	2.60E-02
KLX 16A	070316 10:58	070316 12:19	267.00	287.00	)	3	3 1	2007-03-16 11:36:56	2007-03-16 11:57:06	2.55E-04	0	2.63E-04	1.67E-08	8.33E-04	3.15E-01
KLX 16A	070316 13:27	070316 14:51	287.00	307.00	)	3	3 1	2007-03-16 14:09:25	2007-03-16 14:29:35	1.18E-05	0	1.27E-05	1.67E-08	8.33E-04	1.52E-02
KLX 16A	070316 15:27	070316 17:00	307.00	327.00	)	3	3 1	2007-03-16 16:18:44	2007-03-16 16:38:54	5.67E-07	0	6.83E-07	1.67E-08	8.33E-04	8.20E-04
KLX 16A	070317 08:35	070317 10:06	347.00	367.00	)	3	3 1	2007-03-17 09:24:20	2007-03-17 09:44:30	1.60E-06	0	1.77E-06	1.67E-08	8.33E-04	2.12E-03
KLX 16A	070317 10:38	070317 12:14	367.00	387.00	)	3	3 1	2007-03-17 11:32:40	2007-03-17 11:52:50	1.42E-06	0	1.75E-06	1.67E-08	8.33E-04	2.10E-03
KLX 16A	070317 12:48	070317 14:40	387.00	407.00	)	3	1	2007-03-17 13:38:20	2007-03-17 13:58:40	2.67E-07	0	3.22E-07	1.67E-08	8.33E-04	3.86E-04

			dur_flow_phas	dur_rec_phase_		head_at_flow_end			press_at_flow_	final_press_p	fluid_temp_t	fluid_elcond_e	fluid_salinity_	fluid_salinity_t			
idcode	secup	seclow		tf	initial_head_hi	_hp	final_head_hf	initial_press_pi	end_pp	f	ew	cw	tdsw	dswm	reference	comments	lp
KLX 16A	13.00	113.00	1800	3600			12.82	1031	1193	1062	8.3						63.00
KLX 16A	112.00	212.00	1800	1800			11.31	1900	1954	1902	9.6						162.00
KLX 16A	212.00	312.00	1800	1800			11.31	2789	2984	2785	11.0						262.00
KLX 16A	312.00	412.00	1800	1800			9.36			3693							362.00
KLX 16A	12.50	32.50	1200	1200			14.04	315	502	359	7.8						22.50
KLX 16A	32.50	52.50	1200	1200			12.34	493	696	496	7.4						42.50
KLX 16A	52.50	72.50	1200				11.31	668	866	668							62.50
KLX 16A	72.50	92.50		1200			11.24	841	1041	845					<u> </u>		82.50
KLX 16A	91.00	111.00	1200	1200			10.92	1009	1237	1009	7.9						101.00
KLX 16A	111.00	131.00		1200			11.07	1186	1385	1186	8.2				]		121.00
KLX 16A	131.00	151.00	1200	1200			11.16			š							141.00
KLX 16A	150.00	170.00	1200	1200			10.98	1533	1750	1532	8.8						160.00
KLX 16A	170.00	190.00	1200	1200			11.18	1705		1709	9.1						180.00
KLX 16A	188.00	208.00		2400			11.34	3		δ					[		198.00
KLX 16A	207.00	227.00	1200	1200			11.27	2036	2234	2033	9.7						217.00
KLX 16A	227.00	247.00	1200	1200			11.32	2214	2411	2214	10.0						237.00
KLX 16A	247.00	267.00	1200	1200			11.19	2386	2586	2383							257.00
KLX 16A	267.00	287.00	1200	1200			11.08	2563		2564	10.3						277.00
KLX 16A	287.00	307.00	1200	1200			11.34	2746	2933	2746	10.9				Į		297.00
KLX 16A	307.00	327.00	1200	1200			10.80	2923	3127	2947	11.2						317.00
KLX 16A	347.00	367.00	1200	1200			9.84	3269	3469	3281	11.7						357.00
KLX 16A	367.00	387.00	1200	1200			9.35	3446	3634	3463	12.0						377.00
KLX 16A	387.00	407.00	1200	2400			12.17	3627	3838	3642	. 12.3						397.00

Column         Datatype         Unit         Column Description           atking_upe         CHAR         Attribution         Attribution           atking_upe         CHAR         Attribution         Attribution           atsupe         DATE         Date (ymmod trummse)           atsupe         DATE         Date (ymmod trummse)           atsupe         CHAR         Test byte code (1*7) ats table description!           atsupe         CHAR         Test byte code (1*7) ats table description!           atsupe         CHAR         Test byte code (1*7) ats table description!           atsupe         CHAR         Test byte code (1*7) ats table description!           atsupe         CHAR         Test byte code (1*7) ats table description!           atsupeupe         CHAR         Test byte code (1*7) ats table description!           atsupeupe         CHAR         Test byte code (1*7) ats table description!           atsupeupe         CHAR         Dats table description!	Tabl			ole_test_ed1 nping/injection. Basic evaluation
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page data         DATE         Date (ymmod hummas)           project         CHAR         project orde           decup         FLOAT         m         Upper section imit (m)           sector         FLOAT         m         Lower sector imit (m)           sector         NITESER         number         Sector number           sector         FLOAT         m         Lower sector imit (m)           sector         FLOAT         m         Hummas           formation type         CHAR         Formation type code (1-7), see table description)           formation type         FLOAT         m         Planned ordinary test interval during test compasing.           sector, tass         FLOAT         m         Planned ordinary test interval during test compasing.           sector, tass         FLOAT         m"2/s         Transmissivity.           sector, tass         FLOAT         m"3/s         Estransmissivity.           sector, tass         FLOAT         m"3/s         Estrasscon word mumber of taswalan				
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discoleCHAROpject or borchois derification codesectorFLOATmUpper sector limit (m)sectorNTEGERnumberSector numbersector, noNTEGERnumberSector numbersector, noFLOATmPlaned collinary test interval cursing sets cells, see desc.sector, classFLOATmPlaned collinary test interval cursing sets cells, see desc.sector, classFLOATmPlaned collinary test interval cursing sets cells, see desc.sector, classFLOATmPlaned collinary test interval cursing sets cells, see desc.sector, classFLOATmPlaned collinary test interval cursing sets cells, see desc.sector, classFLOATmPlaned collinary test interval cursing sets cells, see desc.setter, classFLOATmPlaned collinary test interval cursing sets cells, descriptionsetter, classFLOATmPlaned collinary test interval cursing sets cells, descriptionsetter, classCHAREst cells, c				
succe         FLOAT         m         Upper section limit (m)           section _no         NTGSER         number         Section number           section _no         NTGSER         number         Section number           isst_pper         CHAR         Formation type code : 1. Rock, 2. Soi (superficial deposits)           p         FLOAT         m         Hydraulic point of application for test section, see desc.           section _same_opacity _1.3         FLOAT         m         Hydraulic point of application for test section, see desc.           size_type1.2         FLOAT         m         Planet of otheray set interval solution set interv				
sector         FLOAT         m         Lower sector inft (m)           sector, no         INTEGER         number         Sector number           sector, no         CHAR         Test type code (1-7), see table description!           sector, no         PLOAT         m         Hydraulic point of application for test section, see descr.           sector, no         PLOAT         m         PloAt         Specific coaped(1-2), sections, see descr.           sector, no         PLOAT         m         Specific coaped(1-2), sections, see descr.         Specific coaped(1-2), sections, sections, see table description.           raine, Systep_1         CHAR         Transmissive, nove see table description.         Specific coaped(1-2), sections endue of the 0           transmissive_nove         FLOAT         m*2/s         Transmissive, nove is best choice of 1, else 0           transmissive_nove         FLOAT         m*2/s         Transmissive, nove is best choice of 1, else 0           transmissive_nove         FLOAT         m         Backgreater, for Tigenerally beLay, see descr.           with_0, cont, nove         FLOAT         m*3/s         Estimated upper meas. limit, 10/works need.           transmissive_nove         FLOAT         m*3/s         Estimated upper meas. limit, 10/works need.           transmissive_nove         FLOAT         m*3/s </td <td></td> <td></td> <td>m</td> <td></td>			m	
sector.po         NITE CER         number         Sector number           set_ype         CHAR         Test type code (1-7), see table description!           p         FLOAT         m         Hydraulic pont of application for test section, see table description!           gpeapacity_Q_3         FLOAT         m         Planned ordinary test interval during test campaign.           gpedis_Uppe_Q_3         FLOAT         m"218         Specific capacity (08) of fest section, see table description           sub_up_ype_Q_3         FLOAT         m"218         Specific capacity (08) of fest section, see table description           sub_up_ype_Q_3         FLOAT         m"218         Transmissivity page meas.limit.110-apper meas.limit.110-apper meas.limit.110-apper meas.limit.110-apper meas.limit.10-apper meas.limit.110-apper meas.limit.10-apper meas.limit.110-apper meas.limit.10-apper meas.limit.10-ap				
http://www.inter.com/page       CHAR       Test type code (-17), see table description!         schem_class       FLOAT       m       Hydrauic point of application for test section, see descr.         schem_class       FLOAT       m       Planned ordinary test interval during test campaign.         schem_class       FLOAT       m"278       Specific capabit (036) for test section, see descr.         wilke_type_q_s       CHAR       Other value-float-code (176, see table description)         mammissivity_more       FLOAT       m"278       Tarmanissivity_mits and an Os, see table description         main_amissivity_more       FLOAT       m"278       Tarmanissivity_mits based on Moye (1667)         bc_m       CHAR       Est theore code 1 means Trays is based construction of T cells of the other means test charts of T cells of the other means test charts of T cells of the other means test charts of T cells of the other means test charts of T cells of the other means (176, channel, b)       FLOAT       m Binferred width of formation for waluaded TB see descript.         massitub_type_th       CHAR       Estimated lower means. limit to evaluated TB see description         u_meal_b       FLOAT       m SB 's storaitivity Bewelth of formation to T walued TB see description         u_meal_b       FLOAT       m SB 's storaitivity Bewelth of formation to T walued TB see description         u_meal_b       FLOAT       m SB 's storaitivity Bew				
formation type         CHAR         Formation type code: 1: Rock 2: Soil (apperfield deposit)           p         FLOAT         m         Hydraulic point of pellocitation for test sector, see descr.           secler_class         FLOAT         m         Planned ordinary test interval during test campaign.           spec_capacity_L_S         FLOAT         m*2/s         Specific capacity (Os) of test section, see table description           sub_Lype_1         CHAR         Ottox = value.1:0s/cover meas.imt, 1:10-yepper meas.imt.           sub_Lype_1         CHAR         Best choice code. 1: means To is best choice of T, else 0           transmissivity_more         FLOAT         m*2/s         Transmissivity_more meas.imt.1:10-yepper meas.imt.           bc_m         CHAR         Best choice code. 1: means Tory is best choice of T, else 0           runsmissivity_more         FLOAT         m*2/s         Transmissivity.TM. based on Mye (1967)           bc_more_l_D         FLOAT         m         Butter thichness repr. for T(general) bellu), see descr.           sub_d_n_channes         FLOAT         m*3/s         Estimated upper meas.imnt 1: Thusper meas.imnt.           byd_cond         FLOAT         m*3/s         Estimated upper meas.imnt of evaluated TB           sub_d_n_code         FLOAT         m         Stocearabity.Bewith of formation.gew			number	
p         FLOAT         m         Hydraulic point of application for test section, see descr.           spec_tape_ty_s         FLOAT         m         Penedordmay fast interval during test section, see datale descript.           spec_tape_ty_s         CHAR         Data value./10/s of test section.         Specific capacity (QIs) of test section.         Specific capacity				
selen glass FLOAT m Planed ordnay fielt interval during test campaign. spect.capacity_q_s FLOAT m*2/s Specific capacity (0)/s) of test sector, see table descript. Cutue value_10s-quere meas.limit.10/supper meas.limit. bulle_type_q FLOAT m*2/s Transmissivity based on C/s, see table description wile_type_q FLOAT m*2/s Transmissivity pager meas.limit. bc_t_n CHAR Best choice odds - I means TO is best choice of T, else 0 transmissivity_m CHAR Taramissivity. bc_tm CHAR Best choice odds - I means TO is best choice of T, else 0 transmissivity_more FLOAT m*2/s Transmissivity_more meas.limit. bc_tm CHAR Best choice odds - I means To yes best choice of T, else 0 transmissivity_more FLOAT m*3/s TB-Flow capacity in 10 formation for valuated TB bc_tm CHAR Best choice odds - I means tho transmissivity. bt_measl_b FLOAT m*3/s Estimated uper meas.limit of valuated TB see description bt_measl_b FLOAT m*3/s Estimated uper meas.limit of valuated TB see description bt_measl_b FLOAT m SB*: Assumed SB-setorativity. summasivity_II FLOAT m*2/s TTransmissivity of formation. place for valuated TB see description transmissivity_II FLOAT m*2/s Estimated uper meas.limit of valuated TB see description transmissivity_II FLOAT m*2/s Estimated uper meas.limit of evaluated TB see description transmissivity_II FLOAT m*2/s TTransmissivity of formation. place for evaluated TI see description transmissivity_II FLOAT m*2/s Estimated uper meas.limit of evaluated TB. transmissivity_II FLOAT m*2/s Estimated uper meas.limit for evaluated TT. transmissivity_II FLOAT m*2/s Estimated uper meas.limit for evaluated TI see description transmissivity_II FLOAT m*2/s Estimated uper meas.limit for evaluated TI. transmissivity_II FLOAT m*2/s Est			m	
spec_gapaly_g_s         FLOAT         m*2s         Specific capacity (O/s) of test section, see table description           wale_type_ga         CHAR         Citure value-1:0fs/dower meas.limit.12/exuper meas.				
value_type_t         CHAR         Cinue value_till         Cinue value_tillill         Cinue value_till				
Immediativity_tig         FLOAT         m**2/s         Transmissivity based on Qis, see table description           value_type_tig         CHAR         Best choice code. I means TQ is best choice of T, else 0           transmissivity_may         FLOAT         m**2/s         Transmissivity_TM, based on Moye (1967)           bc_tim         CHAR         Best choice code. I means Tray is best choice of T, else 0           value_type_tim         CHAR         Estimated code code. I means Tray is best choice of T, else 0           value_type_tim         CHAR         Citrue value.1:TM-object means limit, 1:TM-upper means limit, 1:M-upper means limit, 1:TM-upper m			111 2/5	
subs_type_transmissive_TM         CHAR         Dure value_1TG-choper measumit.           bc_tq         CHAR         Best choice code. 1 means TQ is best choice of T, else 0           marsmissive_TM         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           bc_tm         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         CHAR         Dest choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         CHAR         Best choice code. 1 means TQ is best choice of T, else 0           wale_type_tm         FLOAT         m**3/s         Estimated lower meas. limit of evaluated TB,see description           ssumed_sb         FLOAT         m**3/s         Estimated lower meas. limit of evaluated TB,see description           ssumed_sb         FLOAT         m**2/s         TT transmissivy of formation, 2D radel tow model.see           ransmissivy, TK         FLOAT         m**2/s         Estimated lower meas. limit for evaluated TT see description           stransmissivy, TK         FLOAT <t< td=""><td></td><td></td><td>m**2/s</td><td></td></t<>			m**2/s	
bc_tq         CHAR         Best choice ocle. 1 means To is best choice of T, else 0           transmissivity_moy         FLOAT         m*2/s         Transmissivity_TM, based on Moye (1967)           bc_tm         CHAR         Other value.17M-Over meas.limit, 15M-upper meas.limit,				
Instantisely work         FLOAT         m**2/s         Transmissivity.TA, based on Moye (1967)           bc_tm         CHAR         Ditue value,1:TM-loyeer meas.limit.1TM-upper meas.limit.           hydr_cond_moye         FLOAT         m         bc_tm           formation_with,b         FLOAT         m         bc_tm           formation_with,b         FLOAT         m         bc_tm           formation_with,b         FLOAT         m         Binferred with of formation for evaluated TB.           formation_with,b         FLOAT         m         Binferred with of formation for evaluated TB.           gt         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB.           gt         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB.           gt         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB.           gt         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB.           gt         FLOAT         m         Strativity.Brewidth of formation.D         Dode.see description           gt         FLOAT         m**2/s         Timeremeas.limit or evaluated TT.         Timeremeas.limit or evaluated TT.           gt         FLOAT         m**2/s         Estimated uper meas.limit or evaluated TT. <td></td> <td></td> <td></td> <td></td>				
bc_m         CHAR         Best choice code: 1 means Troncy is best choice of T, else 0           value_type_tm         CHAR         Citrue value,-1:TM-forwer means.limit,1:TM-supper means.limit,           formation_wdth_b         FLOAT         m         b:Aquifer thickness repr. for T (generally b=Lu), size descr.           wdth_of_channel_b         FLOAT         m         B:Inferred vidit of formation or valuated TB see description          measl_b         FLOAT         m"3/s         Estimated lower meas. limit of evaluated TB see description          measl_b         FLOAT         m"3/s         Estimated upper meas. limit of evaluated TB see description           _ameasl_b         FLOAT         m"3/s         Estimated upper meas. limit of evaluated TB see description           _sexage_factor_if         FLOAT         m         SB: storativity,Bewidth of formation, 2D reddel,see           vdule_type_tr         CHAR         Citrue value,1:TT-surgerweas.limit, 1:TT-upper meas.limit, or valued, 2, see description           vdule_type_tr         CHAR         Best choice code. 1 means T is best choice of 1, else 0           _uneasl_q_s         FLOAT         m"2/s         Estimated vare meas.limit or valued T1, see table descr           _uneasl_q_s         FLOAT         m"2/s         Estimated upper meas.limit or valued T1, see table descr.           _uneasl_q_s         FLOAT			m**2/s	
value_type_tm         CHAR         Oftw value_1*TM-dower meas.limit, 1*TM-upper meas.limit, hydr_cond_moye         FLOAT         m/s         K_M: Hydraulic conductivity based on Moye (1967)           formation_with         FLOAT         m         D:Aduler flukhess serp. for Tigenerally b=LW), see descr.           width_of_phanel_b         FLOAT         m         B:Inferred width of formation for evaluated TB           tb         FLOAT         m**3/s         Estimated lower meas. limit of evaluated TB, see description           u_measl_b         FLOAT         m**3/s         Estimated upper meas. limit of evaluated TB, see description           stassmed_sb         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB, see description           stassmed_sb         FLOAT         m**3/s         Estimated upper meas.limit of evaluated TB, see description           stassmed_sb         FLOAT         m         SS:stassmithy Service for evaluated TF, see description           transmissivity_11         FLOAT         m**2/s         Estimated upper meas.limit for evaluated TF, see description           transmissivity_11         FLOAT         m**2/s         Estimated upper meas.limit for evaluated TF, see description           transmissivity_11         FLOAT         m**2/s         Estimated upper meas.limit for evaluated TF, see description           transmissivity_11         FLOAT			20	
hyd_cond_moye         FLOAT         m/s         K_M: Hydraulic conductivity based on Moye (1967)           formation_wdmb_b         FLOAT         m         b:Aquifer thickness repr. for Tigenerally b=Lw), see descr.           ittmatel_prove         FLOAT         m**3/s         TB-flow capacity in 1D formation of 1T & with B see descr.           i_measl_b         FLOAT         m**3/s         Estimated lower meas. limit of evaluated TB see description           ssumed_sb         FLOAT         m         SB-storativity, B-with of formation, 1D modelse.           u.measl_b         FLOAT         m         SB-storativity, B-with of formation, 2D radial flow model.see           ssumed_sb         FLOAT         m         SB-storativity, B-with of formation, 2D radial flow model.see           value_type_t         CHAR         Ottow value_titor for valuation of Leskage factor           taule_type_t         CHAR         Best choice code. 1 means TT is best choice of T, else 0           use_type_t         FLOAT         m**2/s         Estimated uper meas. limit for valuated TT.see table descr.           u_measl_q_s         FLOAT         m**2/s         Estimated uper meas. limit for valuated TT.see descr.           u_measl_q_s         FLOAT         m**2/s         Estimated uper meas. limit for valuated TT.see descr.           u_measl_q_s         FLOAT         m**2/s         <	-			•
formation_width_b         FLOAT         m         b Aquifer thickness rep. for Tigenerally b=Lw) see descr.           width_g_hannel_b         FLOAT         m*3/s         TB-flow capacity in 19 formation of 7 & width B, see descr.           Lineasl_tb         FLOAT         m*3/s         Estimated lower meas. limit for evaluated TB, see description           u_measl_b         FLOAT         m*3/s         Estimated lower meas. limit of evaluated TB, see description           sasumed_sb         FLOAT         m         SB:S=storativity.B=width of formation,1D model,see description           sasumed_sb         FLOAT         m         SB:S=storativity.B=width of formation,2D model,see           leakage_factor_if         FLOAT         m         SB:S=storativity.B=width of formation,2D model,see           value_type_tt         CHAR         Otrue value,-1:TF-lower meas. limit for evaluated TT-see table descr           u_measl_q_s         FLOAT         m*2/s         Estimated lower meas. limit for evaluated TT, see table descr.           u_measl_q_s         FLOAT         m*2/s         Estimated lower meas. limit for evaluated TT, see table descr.           u_measl_q_s         FLOAT         m*2/s         Estimated lower meas. limit for evaluated TT, see table descr.           u_measl_q_s         FLOAT         m*2/s         Estimated lower meas. limit for evaluated TT, see table descr.      <			m/s	
width_of_channel_b     FLOAT     m     B:Inferred width of formation for evaluated TB       b     FLOAT     m*3/s     TB:Flow capacity in 1D formation of T & width B, see description       u_measl_b     FLOAT     m*3/s     Estimated tower meas. limit for evaluated TB:see description       sb     FLOAT     m     SB:Sestorativity.B=width of formation, 1D model, see description       sb     FLOAT     m     SB:Sestorativity.B=width of formation, 2D model, see description       leakage_factor_if     FLOAT     m     Lf:D model for evaluated TB:see description       ransmissivity_it     FLOAT     m*2/s     Transmissivity of formation, 2D radial flow model, see       value_type_tt     CHAR     Otrue value,-1:TT-forwer meas. limit for evaluated TT; see table descr       u_measl_q_s     FLOAT     m*2/s     Estimated uoper meas. limit for evaluated TT; see table descr.       u_measl_q_s     FLOAT     m*2/s     Estimated uoper meas. limit for evaluated Tr, see table descr.       sasumed_s     FLOAT     m*2/s     Estimated uoper meas. limit for evaluated Tr, see description       storativity_s     FLOAT     m*2/s     Estimated uoper meas. limit for evaluated Tr, see description       storativity_s     FLOAT     m*2/s     Estimated uoper meas. limit for evaluated Tr, see description       u_measl_q_s     FLOAT     m*2/s     Estimated uoper evaluated Tr, see descr				
b         FLOAT         m*3/s         TB:Flow capacity in 1D formation of T & width B, see descr.           L_measl_tb         FLOAT         m*3/s         Estimated lower meas. limit of evaluated TB;see description           sumed_sb         FLOAT         m<3/s				
Lmessl_tb         FLOAT         m*3/s         Estimated upper meas. limit for evaluated TB, see description           u_measl_tb         FLOAT         m         SB:-sector/UN_B=width of formation, 1D model, see description           assumed_sb         FLOAT         m         SB:-sector/UN_B=width of formation, 2D model, see description           assumed_sb         FLOAT         m         SB:-sector/UN_B=width of formation, 2D model, see description           transmissivity_ft         FLOAT         m*2/s         TT:ransmissivity of formation, 2D radial flow model, see           value_type_tt         CHAR         Ottrue value, 1:TT <description< td="">         2D radial flow model, see           value_type_tt         CHAR         Ottrue value, 1:TT         2D radial flow model, see           u_measl_q_s         FLOAT         m*2/s         Estimated upper meas. limit for evaluated TT, see description           storativity_st         FLOAT         m*2/s         Estimated upper meas. limit for evaluated TT, see description           storativity_st         FLOAT         m*2/s         Estimated upper meas. limit for evaluated TT, see description           storativity_st         FLOAT         m*2/s         Estimated upper meas. limit for evaluated TT, see description           storativity_tor         FLOAT         m*2/s         Estimated upper meas. limit for evaluated ttrante the evaluation of tev</description<>				
L_measl_tb         FLOAT         m**3/s         Estimated upper meas. limit of evaluated TB,see description           ab         FLOAT         m         SBS-storativity,B=width of formation, Dmodel,see description           assumed_sb         FLOAT         m         SB*: Assumed SB. Storativity,B=width of formation, see           transmissivity_tt         FLOAT         m         Lf:1D model for evaluation of Leakage factor           transmissivity_tt         FLOAT         m**2/s         TT:Transmissivity of formation, 2D radial flow model.see           upmeasl_q_s         FLOAT         m**2/s         Estimated upper meas. limit for evaluated TT, see table descr           upmeasl_q_s         FLOAT         m**2/s         Estimated upper meas. limit for evaluated TT, see table descr.           source_q_s         FLOAT         m**2/s         Estimated upper meas. limit for evaluated TT, see descr, total divity_see descr.           sumed_s         FLOAT         m**2/s         Estimated upper meas. limit for evaluated TT, see descr, total divity_see descr.           sumed_s         FLOAT         m**2/s         Estimated upper meas. limit for evaluated to flexage coeff.           seakage_coeff         FLOAT         m/s         Ks1:3D model evaluation of leakage coeff.           rule_type_ksf         FLOAT         m/s         Estimated upper meas.limit for evaluated Ksf, see table descr.			m**3/s	
sb     FLOAT     m     SB:S=storativity,B=width of formation,1D model,see descript.       assumed_sb     FLOAT     m     SB': Assumed SB,S=storativity,B=width of formation,see       leakage_factor_if     FLOAT     m     L1:D model for evaluation of Leakage factor       transmissivity_it     FLOAT     m**2/s     TT:Transmissivity of formation, 2D radial flow model,see       value_type_tt     CHAR     Ottrue value,-1:TT-dower meas.limit.TT-upper meas.limit,       bc_it     CHAR     Best choice code. 1 means Till is best choice of 7, else 0       L_measl_q_s     FLOAT     m**2/s     Estimated lower meas. limit for evaluated TT, see description       storativity_s     FLOAT     m**2/s     Estimated lower meas. limit for evaluated TT, see description       storativity_s     FLOAT     m**2/s     Estimated lower meas. limit for evaluated TT, see descr.       sasumed_s     FLOAT     m**2/s     Estimated lower meas.limit for evaluated TT, see descr.       ri     FLOAT     m     Radius of influence     :1,0 or 1, see descr.       ri     FLOAT     m     Radius of influence     :1,0 or 1, see descr.       ri,dex     FLOAT     m/s     Ksf3O model evaluation of hexage coeff.see desc.       value_type_ksf     CHAR     Otrue value,-1:Ksf-lower meas.limit,1:Ksf-upper meas.limit,       u_measl_ksf     FLOAT     m/s			m**3/s	Estimated upper meas. limit of evaluated TB,see description
assumed_sb         FLOAT         m         SB*: Assumed_SB,S=storativity,B=width of formation,see           leakage_factor_If         FLOAT         m         Lf:1D model for evaluation of Leakage factor           transmissivity,tt         FLOAT         m**2/s         T:Transmissivity of formation,2D radial flow model,see           value_type_tt         CHAR         Otrue value,-1:TT-dower meas.limit for evaluated TT,see able descr           bc_tt         CHAR         Estimated upper meas.limit for evaluated TT,see able descr           u_measl_q_s         FLOAT         m**2/s         Estimated upper meas.limit for evaluated TT,see description           storativity_s         FLOAT         Mssumed Storativity_S         mstoration,see descr.           assumed_sc         FLOAT         mstoration based on 2D and flow.see descr.           assumed_sc         FLOAT         m         Radius of influence           ri_index         CHAR         mindex-index of andius of influence :-1,0 or 1, see descr.           value_type_ktf         CHAR         mindex-index of andius of influence :-1,0 or 1, see descr.           value_type_ktf         FLOAT         m/s         Ksf.3D model evaluation of hydraulic conductivity, see desc.           value_type_ktf         FLOAT         m/s         Estimated lower meas.limit for evaluated Ksf.see table descr.           see_torisea			m	
transmissivity_tt     FLOAT     m**2/s     TT:Transmissivity of formation, 2D radial flow model, see       value_jtype_tt     CHAR     Ottrue value, 1:TT-tower meas.limit, 1TT-supper meas.limit,       L_measl_q_s     FLOAT     m**2/s     Estimated lower meas. limit for evaluated TT, see table descr       L_measl_q_s     FLOAT     m**2/s     Estimated upper meas. limit for evaluated TT, see descr, is assumed_s       savumed_s     FLOAT     M**2/s     Estimated upper meas. limit for evaluated TT, see descr, is assumed_s       bc_s     FLOAT     Maius of influence     Tr. index-index of radius of influence :-1.0 or 1, see descr.       in index-index of radius of influence     FLOAT     m     Radius of influence       in index-index of radius of influence     FLOAT     m's     Kf:3D model evaluation of locativity, see desc.       value_type_kf     CHAR     Citrue value, 1:Ks/1:oupper meas.limit, time, to evalue to feakage coeff, see desc     Kf:3D model evaluation of indrauited Ks/, see table desc.       u_measl_ksf     FLOAT     m/s     Estimated uper meas.limit for evaluated Ks/, see table descr.       assumed_ssf     FLOAT     m/s     Estimated uper meas.limit for evaluated Ks/, see table descr.       assumed_ssf     FLOAT     m/s     Estimated uper meas.limit for evaluated Ks/, see table descr.       assumed_ssf     FLOAT     m/s     Estimated uper meas.limit for evaluated Ks/, see table descr. <td></td> <td></td> <td></td> <td></td>				
value_type_trime       CHAR       0:true value_1:1T-slower meas.limit, 1:TT-super meas.limit,         bc_tt       CHAR       Best choice cde: 1 means TT is best choice of T, else 0         L_measl_q_s       FLOAT       m**2/s       Estimated lower meas.limit for evaluated TT, see table descr         storativity_s       FLOAT       m**2/s       Estimated lower meas.limit for evaluated TT, see table descr.         assumed_s       FLOAT       S:Storativity of formation based on 2D rad flow, see descr.         assumed_s       FLOAT       Assumed Storativity.2D model evaluation, see table descr.         bc_s       FLOAT       m       Radius of influence         ri_index       CHAR       ri index-index of radius of influence ::1, 0 r1, see descr.         ri_index       FLOAT       m/s       Ksf:3D model evaluation of leakage coeff, see desc         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of reakage coeff, see desc         hydr_cond_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table descr.         assumed_ssf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table descr.         assumed_ssf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table descr.         assumed_sstrap_ssf       FLOAT       m/s       Stimat	leakage_factor_lf	FLOAT	m	Lf:1D model for evaluation of Leakage factor
bc_tt       CHAR       Best choice code. 1 means TT is best choice of T, else 0         L_measl_q_s       FLOAT       m**2/s       Estimated uover meas. limit for evaluated TT, see table descr         u_measl_q_s       FLOAT       Storativity. 25       Storativity. 20       measl_ont for evaluated TT, see table descr.         assumed_s       FLOAT       Storativity. 20       model evaluation, see table descr.         bc_s       FLOAT       Best choice of S (Storativity. 20       model evaluation, see table descr.         if       FLOAT       m       Radius of influence       ni index=index of radius of influence i-1.0 or 1, see descr.         ri_index       CHAR       ri index=index of radius or influence i-1.0 or 1, see descr.       storativity. 20         value_type_ksf       CHAR       Ottrue value1:Ksf <lower descr.<="" evaluated="" for="" ksf,="" meas.limit="" see="" table="" td="">         u_measl_ksf       FLOAT       m/s       Estimated uover meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       m/s       Estimated uover meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       m/s       Estimated uover meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       m/s       Estimated uover meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       Stort</lower>	transmissivity_tt	FLOAT	m**2/s	TT:Transmissivity of formation, 2D radial flow model, see
"	value_type_tt	CHAR		0:true value,-1:TT <lower meas.limit,1:tt="">upper meas.limit,</lower>
u_measl_q_s       FLOAT       m**2/s       Estimated upper meas. limit for evaluated TT, see description         storativity_s       FLOAT       S:Storativity of formation based on 2D rad flow, see descr.         assumed_s       FLOAT       Assumed Storativity.2D model evaluation, see table descr.         bc_s       FLOAT       m       Radius of influence         ri       RLOAT       m       Radius of influence         ri_index       CHAR       ri index=index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K/b*2D rad flow model evaluation of leakage coeff, see desc.         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of hydraulic conductivity, see desc.         u_measl_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table desc.         u_measl_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       m/s       Estimated store reavely and ksf.       Storativity.1:Ksf-upper meas.limit.1:Ksf-upper meas.limit.1:Ksf-uppe	bc_tt	CHAR		Best choice code. 1 means TT is best choice of T, else 0
storativity_s       FLOAT       S:Storativity of formation based on 2D rad flow,see descr.         assumed_s       FLOAT       Assumed Storativity,2D model evaluation, see table descr.         bc_s       FLOAT       m       Radius of influence         ri       FLOAT       m       Radius of influence         ri_index       CHAR       ri index=index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K/b^/2D rad flow model evaluation of hydraulic conductivity,see desc.         value_type_ksf       CHAR       Ottrue value,-1:Ksf-lower meas.limit,1:Ksf-upper meas.limit,         l_measl_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf,see table descr.         u_measl_ksf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf,see table descr.         sec_storage_ssf       FLOAT       m/s       Estimated storage.3D model evaluation, see table descr.         assumed_sisf       FLOAT       1/m       Ssf:Assumed Spec.storage.3D model evaluation, see table descr.         c       FLOAT       n**3/pa       C: Wellbore storage coefficient; flow or recovery period         cd       FLOAT       s       Estimated stop time of evaluation, see table description         td1       FLOAT       s       Stort time for evaluated parameter from start	l_measl_q_s	FLOAT	m**2/s	Estimated lower meas. limit for evaluated TT,see table descr
assumed_s       FLOAT       Assumed Storativity, 2D model evaluation, see table descr.         bc_s       FLOAT       Best choice of S (Storativity), see descr.         ri       Radius of influence       ri index-index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K/b':2D rad flow model evaluation of leakage coeff, see desc         hydr_cond_ksf       FLOAT       1/s       K/b':2D rad flow model evaluation of hydraulic conductivity, see desc.         value_type_ksf       CHAR       Ottrue value, -1:Ksf-lower meas.limit, 1:Ksf-upper meas.limit, 1:L_measl_ksf         l_measl_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table descr.         u_measl_ksf       FLOAT       m/s       Stf:Specific storage, 3D model evaluation, see table descr.         c       FLOAT       1/m       Stf:Specific storage, 2D model evaluation, see table descr.         c       FLOAT       1/m       Stf:Specific storage, 2D model evaluation, see table descr.         c       FLOAT       1/m       Stf:Specific storage coefficient; flow or recovery period         cd       FLOAT       Stimated stor time of evaluated parameter from start flow period         cd       FLOAT       s       <	u_measl_q_s	FLOAT	m**2/s	Estimated upper meas. limit for evaluated TT,see description
bc_s       FLOAT       m       Radius of influence         ri       FLOAT       m       Radius of influence         ri_index       CHAR       ri index=index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K/b^22D rad flow model evaluation of leakage coeff, see desc         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of hydraulic conductivity, see desc.         value_type_ksf       CHAR       Ottrue value,-1:Ksf-clower meas.limit, 1:Ksf-upper meas.limit,        measi_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table descr         spec_storage_ssf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf, see table descr         assumed_ssf       FLOAT       m/m       Ssf:Specific storage,3D model evaluation, see table descr         c       FLOAT       1/m       Ssf:Assumed Spec.storage.3D model evaluation, see table descr         cd       FLOAT       m*3/pa       C: Wellbore storage coefficient         skin       FLOAT       s       Estimated start time of evaluation, see table descr         tdt1       FLOAT       s       Start time for evaluated parameter from start of flow period         tt2       FLOAT       s       Start time for evaluated parameter from start of flow p	storativity_s	FLOAT		S:Storativity of formation based on 2D rad flow, see descr.
n       FLOAT       m       Radius of influence         ri_index       CHAR       ri index=index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K/b':2D rad flow model evaluation of leakage coeff, see desc         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of hydraulic conductivity, see desc.         value_type_ksf       CHAR       Ottrue value, -1:Ksf-lower meas.limit, 1:Ksf-upper meas.limit,         l_measl_ksf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table descr.         spec_storage_ssf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table descr.         spec_storage_ssf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table descr.         c       FLOAT       1/m       Ssf:Specific storage, 3D model evaluation, see table descr.         c       FLOAT       1/m       Ssf:Ascumed Spec.storage.coefficient; flow or recovery period         cd       FLOAT       C: Wellbore storage coefficient; flow or recovery period, see descr.         dt1       FLOAT       s       Estimated stor; time of evaluated prasmeter form start of flow period         td2       FLOAT       s       Stor time for evaluated prasmeter from start of recovery         td1       FLOAT	assumed_s	FLOAT		Assumed Storativity, 2D model evaluation, see table descr.
n_index       CHAR       ri index=index of radius of influence :-1,0 or 1, see descr.         leakage_coeff       FLOAT       1/s       K'/b'-2D rad flow model evaluation of leakage coeff, see desc         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of hydraulic conductivity, see desc.         value_type_ksf       CHAR       Ottrue value, 1:Ksf       Char meas.limit, 1:Ksf>upper meas.limit, 1:Ksf>upper meas.limit, 1:Ksf>upper meas.limit, 1:Ksf>upper meas.limit, 1:Ksf>upper meas.limit, 1:Ksf>upper meas.limit, 1:Stspecific storage, 3D model evaluation, see table desc.         u_measl_ksf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf, see table desc.         u_measl_ksf       FLOAT       1/m       Ssf:Specific storage, 3D model evaluation, see table descr.         assumed_ssf       FLOAT       1/m       Ssf:Assumed Spec.storage, 3D model evaluation, see table descr.         c       FLOAT       m**3/pa       C: Wellbore storage coefficient; flow or recovery period.         cd       FLOAT       s       Estimated start time of evaluation, see table description         tt1       FLOAT       s       Estimated start time of evaluated parameter from start of recovery         dt2       FLOAT       s       Start time for evaluated parameter from start of recovery         td2       FLOAT       s       Start time for evaluated parameter from start of recove	bc_s	FLOAT		Best choice of S (Storativity) ,see descr.
leakage_coeff       FLOAT       1/s       K'/b':2D rad flow model evaluation of leakage coeff.see desc         hydr_cond_ksf       FLOAT       m/s       Ksf:3D model evaluation of hydraulic conductivity.see desc.         value_type_ksf       CHAR       Ottrue value,-1:Ksf-lower meas.limit, 1:Ksf-upper meas	ri	FLOAT	m	Radius of influence
hydr_cond_ksfFLOATm/sKsf:3D model evaluation of hydraulic conductivity, see desc.value_type_ksfCHAR0:true value, -1:Ksf <lower desc.<="" evaluated="" for="" ksf,="" meas.limit="" see="" table="" td="">u_measl_ksfFLOATm/sEstimated lower meas.limit for evaluated Ksf, see table descrspec_storage_ssfFLOAT1/mSsf:Specific storage, 3D model evaluation, see table descr.assumed_ssfFLOAT1/mSsf:Specific storage, 3D model evaluation, see table descr.cFLOAT1/mSsf:Assumed Spec. storage, 3D model evaluation, see table des.cFLOATm**3/paC: Wellbore storage coefficient; flow or recovery periodcdFLOATSSkin factor,best estimate of flow/recovery period, see descr.skinFLOATsEstimated start time of evaluation, see table descriptiondt1FLOATsStart time for evaluated parameter from start flow periodt2FLOATsStart time for evaluated parameter from start of flow periodte1FLOATsStart time for evaluated parameter from start of recoverydte2FLOATsStop time for evaluated parameter from start of recoveryp_hornerFLOATsStop time for evaluated parameter from start of recoverytarsmissivity_t_nIrFLOATm**2/sT_NLR Transmissivity based on None Linear Regressionstorativity_s_nIrFLOATm**2/sSult see done storage coefficient, see descr.tarsmissivity_t_nIrFLOATm**2/sSult see done coefficient, see done coefficient, see done coefficient, see done</lower>	ri_index	CHAR		ri index=index of radius of influence :-1,0 or 1, see descr.
value_type_ksf       CHAR       0:true value,-1:Ksf <lower meas.limit,1:ksf="">upper meas.limit,         l_measl_ksf       FLOAT       m/s       Estimated lower meas.limit for evaluated Ksf,see table desc.         u_measl_ksf       FLOAT       m/s       Estimated upper meas.limit for evaluated Ksf,see table desc.         spec_storage_ssf       FLOAT       1/m       Ssf:Specific storage,3D model evaluation,see table desc.         c       FLOAT       1/m       Ssf:Assumed Spec.storage,3D model evaluation,see table desc.         c       FLOAT       m**3/pa       C: Wellbore storage coefficient; flow or recovery period         cd       FLOAT       s       Estimated stop time of evaluation, see table description         skin       FLOAT       s       Estimated stop time of evaluation. see table description         dt1       FLOAT       s       Estimated stop time of evaluated parameter from start flow period         t2       FLOAT       s       Start time for evaluated parameter from start of flow period         t2       FLOAT       s       Start time for evaluated parameter from start of flow period         t2       FLOAT       s       Stop time for evaluated parameter from start of flow period         t2       FLOAT       s       Stop time for evaluated parameter from start of flow period         t4=1       FLOA</lower>	leakage_coeff	FLOAT	1/s	K'/b':2D rad flow model evaluation of leakage coeff,see desc
measl_ksfFLOATm/sEstimated lower meas.limit for evaluated Ksf,see table desc.u_measl_ksfFLOATm/sEstimated upper meas.limit for evaluated Ksf,see table descrspec_storage_ssfFLOAT1/mSsf:Specific storage,3D model evaluation,see table descr.assumed_ssfFLOAT1/mSsf:Assumed Spec.storage,3D model evaluation,see table descr.cFLOAT1/mSsf:Assumed Spec.storage,3D model evaluation,see table descr.cFLOAT1/mSsf:Assumed Spec.storage,3D model evaluation,see table descr.cFLOATm**3/paC: Wellbore storage coefficientcdFLOATSsin factor.best estimate of flow/recovery periodcdFLOATsEstimated start time of evaluation, see table descriptiondt1FLOATsStart time for evaluated parameter from start flow periodt2FLOATsStart time for evaluated parameter from start of flow periodt2FLOATsStop time for evaluated parameter from start of recoverydte1FLOATsStop time for evaluated parameter from start of recoverytarasmissivity_t_nirFLOATsStop time for evaluated parameter from start of recoveryp_hornerFLOATsStop time for evaluated parameter from start of recoverytarasmissivity_t_nirFLOATsStop time for evaluated parameter from start of recoverytarasmissivity_t_nirFLOATsStop time for evaluated parameter from start of recoverytarasmissivity_s_nirFLOATm**2/sT_NLR Transm	hydr_cond_ksf	FLOAT	m/s	Ksf:3D model evaluation of hydraulic conductivity, see desc.
u_meas_ksfFLOATm/sEstimated upper meas.limit for evaluated Ksf, see table descrspec_storage_ssfFLOAT1/mSsf:Specific storage, 3D model evaluation, see table descr.assumed_ssfFLOAT1/mSsf:Assumed Spec. storage, 3D model evaluation, see table desc.cFLOATm**3/paC: Wellbore storage coefficient; flow or recovery periodcdFLOATm**3/paC: Wellbore storage coefficient; flow or recovery period.skinFLOATSkin factor;best estimate of flow/recovery period, see descr.dt1FLOATsEstimated start time of evaluation, see table descriptiondt2FLOATsEstimated start time of evaluation, see table descriptiont1FLOATsStart time for evaluated parameter from start flow periodt2FLOATsStart time for evaluated parameter from start of recoverydte1FLOATsStop time for evaluated parameter from start of recoveryp_homerFLOATsStop time for evaluated parameter from start of recoveryp_homerFLOATsStop time for evaluated parameter from start of recoveryp_homerFLOATkPap*-Homer extrapolated pressure, see table descriptiontransmissivity_e_nirFLOATm**2/sT_NLR Transmissivity based on None Linear Regressionstorativity_s_nirFLOATm**2/sT_NLR Transmissivity based on None Linear Regressionstorativity_s_nirFLOATm**3/paWellbore storage cofficient, based on NLR, see descr.c_nirFLOATm**3/pa	value_type_ksf	CHAR		0:true value,-1:Ksf <lower meas.limit,1:ksf="">upper meas.limit,</lower>
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assumed_ssf       FLOAT       1/m       Ssf*:Assumed Spec.storage.3D model evaluation, see table des.         c       FLOAT       m**3/pa       C: Wellbore storage coefficient; flow or recovery period         cd       FLOAT       CD: Dimensionless wellbore storage coefficient         skin       FLOAT       Skin factor;best estimate of flow/recovery period, see descr.         dt1       FLOAT       s       Estimated start time of evaluation, see table description         dt2       FLOAT       s       Estimated start time of evaluation, see table description         t1       FLOAT       s       Estimated start time of evaluated parameter from start flow period         t2       FLOAT       s       Start time for evaluated parameter from start of flow period         dte1       FLOAT       s       Start time for evaluated parameter from start of recovery         p_horner       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nIr       FLOAT       m**3/pa       O:true value,-1:T_NLR         value_type_t_nir       CHAR       O:true value,-1:T_NLR	u_measl_ksf	FLOAT	m/s	Estimated upper meas.limit for evaluated Ksf,see table descr
c       FLOAT       m**3/pa       C: Wellbore storage coefficient; flow or recovery period         cd       FLOAT       CD: Dimensionless wellbore storage coefficient         skin       FLOAT       Skin factor;best estimate of flow/recovery period, see descr.         dt1       FLOAT       s       Estimated start time of evaluation, see table description         dt2       FLOAT       s       Estimated stop time of evaluated parameter from start flow period         t2       FLOAT       s       Start time for evaluated parameter from start of flow period         t41       FLOAT       s       Start time for evaluated parameter from start of flow period         t2       FLOAT       s       Start time for evaluated parameter from start of recovery         dte1       FLOAT       s       Start time for evaluated parameter from start of recovery         p_horner       FLOAT       s       Stap time for evaluated parameter from start of recovery         p_horner       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       m**3/pa       O:true value,-1:T_NLR         value_type_t_nr       CHAR       O:true value,-1:T_NLR         c_nlr       FLOAT       m**3/pa       Wellbore storage coefficient, based on NLR, see descr.	spec_storage_ssf	FLOAT	1/m	Ssf:Specific storage,3D model evaluation,see table descr.
cd       FLOAT       CD: Dimensionless wellbore storage coefficient         skin       FLOAT       Skin factor;best estimate of flow/recovery period,see descr.         dt1       FLOAT       s       Estimated start time of evaluation, see table description         dt2       FLOAT       s       Estimated start time of evaluation, see table description         t1       FLOAT       s       Start time for evaluated parameter from start flow period         t2       FLOAT       s       Start time for evaluated parameter from start of flow period         tde1       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_homer       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_homer       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_homer       FLOAT       s       Stop time for evaluated parameter from start of recovery         storativity_s_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       m**3/pa       Ottrue value,-1:T_NLR         value_type_t_nr       CHAR       Ottrue value,-1:T_MLR-stower meas.Timit, 1:>upper meas.Timit         bc_nir       FLOAT       m**3/pa       Wellbore storage coefficient, based on NLR, se	assumed_ssf	FLOAT	1/m	Ssf*:Assumed Spec.storage,3D model evaluation,see table des.
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t2       FLOAT       s       Stop time for evaluated parameter from start of flow period         dte1       FLOAT       s       Start time for evaluated parameter from start of recovery         dte2       FLOAT       s       Start time for evaluated parameter from start of recovery         p_horner       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       kPa       p*.Horner extrapolated pressure, see table description         transmissivity_t_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       m**2/s       T_NLR=storativity based on None Linear Regression,see         value_type_t_nlr       CHAR       S_NLR=storativity based on None Linear Regression,see         ot_nlr       CHAR       0:true value,-1:T_NLR         c_nlr       FLOAT       m**3/pa         skin_nlr       FLOAT       Dimensionless wellbore storage constant, see table descrip.         skin_nlr       FLOAT       Skin factor based on Non Linear Regression,see         value_type_t_grf       FLOAT       m**2/s       T_GRF:Transmissivity based on Genelized Radial Flow,see         value_type_t_grf       CHAR       0:true value,-1:T_GRF       could chade accin         value_type_t_grf </td <td></td> <td></td> <td></td> <td></td>				
dte1       FLOAT       s       Start time for evaluated parameter from start of recovery         dte2       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       kPa       p*:Horner extrapolated pressure, see table description         transmissivity_t_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       m**2/s       T_NLR=storativity based on None Linear Regression,see         value_type_t_nlr       CHAR       S_NLR=storativity based on None Linear Regression,see         ot_nlr       CHAR       O:true value,-1:T_NLR         c_nlr       CHAR       Best choice code. 1 means T_NLR is best choice of T, else 0         c_nlr       FLOAT       m**3/pa       Wellbore storage coefficient, based on NLR, see table descrip.         skin_nlr       FLOAT       m**3/pa       Wellbore storage constant, see table descrip.         skin_nlr       FLOAT       Skin factor based on Non Linear Regression,see         value_type_t_grf       FLOAT       m**2/s       T_GRF:Transmissivity based on Genelized Radial Flow,see         value_type_t_grf       CHAR       0:true value,-1:T_GRF <lower meas.limit,<="" td=""><td></td><td></td><td></td><td></td></lower>				
dte2       FLOAT       s       Stop time for evaluated parameter from start of recovery         p_horner       FLOAT       kPa       p*:Horner extrapolated pressure, see table description         transmissivity_t_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression.see         value_type_t_nlr       CHAR       O:true value,-1:T_NLR       None Linear Regression,see         c_nlr       CHAR       O:true value,-1:T_NLR       NLR is best choice of T, else 0         c_nlr       FLOAT       m**3/pa       Wellbore storage coefficient, based on NLR, see descr.         cd_nir       FLOAT       Dimensionless wellbore storage constant, see table descrip.         skin_nlr       FLOAT       Skin factor based on Non Linear Regression,see         value_type_t_grf       FLOAT       Skin factor based on Non Linear Regression,see desc.         transmissivity_t_grf       FLOAT       Skin factor based on Non Linear Regression,see desc.         transmissivity_t_grf       FLOAT       m**2/s       T_GRF:Transmissivity based on Genelized Radial Flow,see         value_type_t_grf       CHAR       0:true value,-1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit         bc_t_grf       CHAR       0:true val</lower>				
p_homer       FLOAT       kPa       p*.Homer extrapolated pressure, see table description         transmissivity_t_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       S_NLR=storativity based on None Linear Regression.see         value_type_t_nlr       CHAR       0:true value,-1:T_NLR         bc_t_nlr       CHAR       0:true value,-1:T_NLR         c_nlr       FLOAT       m**3/pa         vellbore storage coefficient, based on NLR, see descr.       odescrip.         cd_nlr       FLOAT       Dimensionless wellbore storage constant, see table descrip.         skin_nlr       FLOAT       Skin factor based on Non Linear Regression,see         value_type_t_grf       FLOAT       m**2/s       T_GRF:Transmissivity based on Genelized Radial Flow,see         value_type_t_grf       CHAR       0:true value,-1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit         bc_t_grf       CHAR       0:true value,-1:T_GRF is best choice of T, else 0</lower>				
transmissivity_t_nlr       FLOAT       m**2/s       T_NLR Transmissivity based on None Linear Regression         storativity_s_nlr       FLOAT       S_NLR=storativity based on None Linear Regression         value_type_t_nlr       CHAR       O:true value,-1:T_NLR         bc_t_nlr       CHAR       O:true value,-1:T_NLR         c_nlr       FLOAT       m**3/pa         vellbore storage coefficient, based on NLR, see descr.       Dimensionless wellbore storage constant, see table descrip.         skin_nlr       FLOAT       m**2/s         transmissivity_t_grf       FLOAT       m**2/s         value_type_t_grf       CHAR       O:true value,-1:T_GRF         value_type_t_grf       CHAR       O:true value,-1:T_GRF				
storativity_s_nlr       FLOAT       S_NLR=storativity based on None Linear Regression, see         value_type_t_nlr       CHAR       0:true value,-1:T_NLR <lower 1:="" meas.limit,="">upper meas.limit         bc_t_nlr       CHAR       Best choice code. 1 means T_NLR is best choice of T, else 0         c_nlr       FLOAT       m**3/pa       Wellbore storage coefficient, based on NLR, see descr.         cd_nlr       FLOAT       Dimensionless wellbore storage constant, see table descrip.         skin_nlr       FLOAT       Skin factor based on Non Linear Regression,see desc.         transmissivity_t_grf       FLOAT       m**2/s       T_GRF:Transmissivity based on Genelized Radial Flow,see         value_type_t_grf       CHAR       0:true value,-1:T_GRF<lower 1:="" meas.limit,="">upper meas.limit         bc_t_grf       CHAR       Best choice code. 1 means T_GRF is best choice of T, else 0</lower></lower>	-			
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bc_t_nlr     CHAR     Best choice code. 1 means T_NLR is best choice of T, else 0       c_nlr     FLOAT     m**3/pa     Wellbore storage coefficient, based on NLR, see descr.       cd_nlr     FLOAT     Dimensionless wellbore storage constant, see table descrip.       skin_nlr     FLOAT     Skin factor based on Non Linear Regression,see desc.       transmissivity_t_grf     FLOAT     m**2/s     T_GRF:Transmissivity based on Genelized Radial Flow,see       value_type_t_grf     CHAR     0:true value,-1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit       bc_t_grf     CHAR     Best choice code. 1 means T_GRF is best choice of T, else 0</lower>				_ , , , , , , , , , , , , , , , , , , ,
c_nlr     FLOAT     m**3/pa     Wellbore storage coefficient, based on NLR, see descr.       cd_nlr     FLOAT     Dimensionless wellbore storage constant, see table descrip.       skin_nlr     FLOAT     Skin factor based on Non Linear Regression, see desc.       transmissivity_t_grf     FLOAT     m**2/s     T_GRF:Transmissivity based on Genelized Radial Flow, see       value_type_t_grf     CHAR     0:true value, -1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit       bc_t_grf     CHAR     Best choice code. 1 means T_GRF is best choice of T, else 0</lower>				
cd_nlr     FLOAT     Dimensionless wellbore storage constant, see table descrip.       skin_nlr     FLOAT     Skin factor based on Non Linear Regression, see desc.       transmissivity_t_grf     FLOAT     m**2/s     T_GRF:Transmissivity based on Genelized Radial Flow, see       value_type_t_grf     CHAR     0:true value, -1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit       bc_t_grf     CHAR     Best choice code. 1 means T_GRF is best choice of T, else 0</lower>				
skin_nlr     FLOAT     Skin factor based on Non Linear Regression, see desc.       transmissivity_t_grf     FLOAT     m**2/s     T_GRF:Transmissivity based on Genelized Radial Flow, see       value_type_t_grf     CHAR     0:true value, -1:T_GRF <lower 1:="" meas.limit,="">upper meas.limit       bc_t_grf     CHAR     Best choice code. 1 means T_GRF is best choice of T, else 0</lower>			m**3/pa	-
transmissivity_t_grf         FLOAT         m**2/s         T_GRF:Transmissivity based on Genelized Radial Flow,see           value_type_t_grf         CHAR         0:true value,-1:T_GRF <lower meas.limit,1:="">upper meas.limit           bc_t_grf         CHAR         Best choice code. 1 means T_GRF is best choice of T, else 0</lower>				
value_type_t_grf       CHAR       0:true value,-1:T_GRF <lower meas.limit,1:="">upper meas.limit         bc_t_grf       CHAR       Best choice code. 1 means T_GRF is best choice of T, else 0</lower>			m**0/-	
bc_t_grf CHAR Best choice code. 1 means T_GRF is best choice of T, else 0			m**2/s	
SUDATIVITY SUGATION SECTION SUCRETIVITY DASED ON GENERALIZED RADIAL FIOW. SEE DES.				
flow_dim_grf FLOAT Inferred flow dimesion based on Generalized Rad. Flow model				
comment VARCHAR no_unit Short comment to the evaluated parameters			no_unit	
error_flag CHAR If error_flag = "*" then an error occured and an error				
in_use CHAR If in_use = "*" then the activity has been selected as sign CHAR Signature for QA data accknowledge (QA - OK)				_ ,

							formation_				value_type_q_		value_type_t		transmissivity_m
idcode	start_date	stop_date	secup	seclow	section_no	test_type	_	lp	seclen_class	spec_capacity_q_s		transmissivity_tq		bc_tq	oye
KLX 16A	070313 09:41	070313 12:22	13.00	113.00		:	3 1	63.00	100	2.23E-05	(	)			2.91E-05
KLX 16A	070313 14:12	070313 16:02	112.00	212.00			3 1	162.00	100	1.02E-04	(				1.33E-04
KLX 16A	070313 17:54	070313 19:46	212.00	312.00			3 1	262.00	100	1.43E-05	(	)			1.87E-05
KLX 16A	070313 21:41	070313 23:41	312.00	412.00			3 1	362.00	100	1.46E-07	(	)			1.90E-07
KLX 16A	070314 13:12	070314 14:38	12.50	32.50			3 1	22.50	20	2.29E-05	0				2.40E-05
KLX 16A	070314 22:12	070314 23:57	32.50	52.50			3 1	42.50	20	1.98E-07	(	)			2.07E-07
KLX 16A	070315 00:34	070315 02:39	52.50	72.50			3 1	62.50	20	7.27E-08	0	)			7.60E-08
KLX 16A	070315 06:50	070315 08:18	72.50	92.50			3 1	82.50	20	2.16E-07	0				2.06E-07
KLX 16A	070315 08:52	070315 10:25	91.00	111.00			3 1	101.00	20	3.81E-07	(	)			3.64E-07
KLX 16A	070315 10:59	070315 12:22	111.00	131.00			3 1	121.00	20	8.46E-08	0				8.85E-08
KLX 16A	070315 13:31	070315 14:55	131.00	151.00			3 1	141.00	20	8.05E-05	(	)			8.42E-05
KLX 16A	070315 15:35	070315 17:14	150.00	170.00			3 1	160.00	20	3.15E-07	0	)			3.29E-07
KLX 16A	070315 17:51	070315 19:24	170.00	190.00			3 1	180.00	20	3.57E-07	0	)			3.74E-07
KLX 16A	070315 20:00	070315 21:52	188.00	208.00			3 1	198.00	20	1.06E-08	(	)			1.11E-08
KLX 16A	070315 22:44	070316 00:00	207.00	227.00			3 1	217.00	20	1.66E-05	(				1.74E-05
KLX 16A	070316 00:47	070316 02:13	227.00	247.00			3 1	237.00	20	6.56E-07	(	)			6.68E-07
KLX 16A	070316 07:36	070316 08:58	247.00	267.00			3 1	257.00	20	1.02E-06	(				1.07E-06
KLX 16A	070316 10:58	070316 12:19	267.00	287.00		1	3 1	277.00	20	1.25E-05	0	)			1.31E-05
KLX 16A	070316 13:27	070316 14:51	287.00	307.00			3 1	297.00	20	6.17E-07	(	)			6.46E-07
KLX 16A	070316 15:27	070316 17:00	307.00	327.00			3 1	317.00	20	2.73E-08	(				2.85E-08
KLX 16A	070317 08:35	070317 10:06	347.00	367.00			3 1	357.00	20	7.85E-08	(	)			8.21E-08
KLX 16A	070317 10:38	070317 12:14	367.00	387.00			3 1	377.00	20	7.39E-08	0	)			7.73E-08
KLX 16A	070317 12:48	070317 14:40	387.00	407.00			3 1	397.00	20	1.24E-08	0				1.30E-08

					hydr_cond_m	formation_wi	width_of_channel					assumed_s	leakage_fact		value_type			
idcode	secup	seclow	bc_tm	value_type_tm	oye	dth_b	_b	tb	I_measl_tb	u_measl_tb	sb	b	or_lf				l_measl_q_s	u_measl_q_s
KLX 16A	13.00	113.00	(	) (	2.91E-07									7.20E-05	0	1	1.00E-05	3.00E-04
KLX 16A	112.00	212.00	C	0 0	1.33E-06									1.61E-04	0	1	9.00E-05	4.00E-04
KLX 16A	212.00	312.00	(	) C	1.87E-07									4.96E-05	0	1	2.00E-05	8.00E-05
KLX 16A	312.00	412.00	C	) C	1.90E-09									6.38E-08	0	1	1.00E-08	2.00E-07
KLX 16A	12.50	32.50	C	) (	1.20E-06									6.16E-05	0	1	1.00E-05	2.00E-04
KLX 16A	32.50	52.50	C	) C	1.04E-08									5.37E-07	0	1	3.00E-07	7.00E-07
KLX 16A	52.50			) (	3.80E-09									2.30E-07	0	1	6.00E-08	5.00E-07
KLX 16A	72.50	92.50	C	) C	1.03E-08									5.11E-07	0	1	2.00E-07	8.00E-07
KLX 16A	91.00	111.00	0	) (	1.82E-08									5.52E-07	0	1	2.00E-07	8.00E-07
KLX 16A	111.00	131.00	C	) (	4.43E-09									1.58E-07	0	1	8.00E-08	4.00E-07
KLX 16A	131.00	151.00	C	) (	4.21E-06									1.99E-04	0	1	9.00E-05	9.00E-04
KLX 16A	150.00		4	) (C	1.65E-08									5.92E-07	÷	1	1.00E-07	2.00E-06
KLX 16A	170.00	4	······	) (	1.87E-08									1.69E-07	0	1	5.00E-07	5.00E-06
KLX 16A	188.00		J	0 0	5.55E-10									1.20E-08		1	9.00E-07	6.00E-08
KLX 16A	207.00	÷	k,	) (	8.70E-07							<u> </u>		5.32E-05		1	1.00E-05	9.00E-05
KLX 16A	227.00	· · · · · · · · · · · · · · · · · · ·	·	) (	3.34E-08									1.77E-06		1	8.00E-07	5.00E-06
KLX 16A	247.00			) (	5.35E-08									2.14E-06		1	9.00E-07	5.00E-06
KLX 16A	267.00	287.00	0	) (	6.55E-07							j		2.20E-05	0	1	9.00E-06	5.00E-05
KLX 16A	287.00			) C	3.23E-08									1.87E-06		1	9.00E-07	5.00E-06
KLX 16A	307.00	327.00	C	) (	1.43E-09									1.05E-08	0	1	9.00E-09	3.00E-08
KLX 16A	347.00	4	······	) (	4.11E-09	······								6.68E-08		1	3.00E-08	8.00E-08
KLX 16A	367.00			) (	3.87E-09									2.88E-07		1	9.00E-08	7.00E-07
KLX 16A	387.00	407.00	0	0 0	6.50E-10									1.46E-08	0	1	8.00E-09	4.00E-08

								leakage c	hydr_cond_ks	value tvpe k	s I measi k	u measl k		assumed ss					
idcode	secup	seclow	storativity_s	assumed_s	bc_s	ri	ri_index	oeff	f	f	sf		spec_storage_ssf	f –	c	cd	skin	dt1	dt2
KLX 16A	13.00	113.00	1.00E-03	1.00E-03		36.04	1								3.43E-09	3.8E-04	1.60	8.4	30.0
KLX 16A	112.00	212.00	1.00E-06	1.00E-06		341.39	C	)							1.82E-08	2.0E+00	-0.34	63.6	666.0
KLX 16A	212.00	312.00	1.00E-06	1.00E-06		254.33	C	)							6.74E-09	7.4E-01	-3.90	307.2	1072.8
KLX 16A	312.00	412.00	1.00E-06	1.00E-06		48.16	-1								4.72E-10	5.2E-02	-2.50	#NV	#NV
KLX 16A	12.50	32.50	1.00E-03	1.00E-03		#NV	1								1.03E-07	1.1E-02	8.60	#NV	#NV
KLX 16A	32.50	52.50	1.00E-03	1.00E-03		66.99	C	)							2.90E-10	3.2E-05	12.10	99.6	485.4
KLX 16A	52.50	72.50	1.00E-03	1.00E-03		93.86	C								4.19E-10	4.6E-05	17.60	#NV	#NV
KLX 16A	72.50	92.50	1.00E-03	1.00E-03		66.16	C	)							6.78E-07	7.5E-02	12.50	9.0	615.6
KLX 16A	91.00	111.00	1.00E-03	1.00E-03		67.45	C	)							4.99E-09	5.5E-04	5.90	100.2	874.8
KLX 16A	111.00	131.00	1.00E-06	1.00E-06		49.34	C	)							2.08E-11	2.3E-03	5.22	148.8	950.4
KLX 16A	131.00	151.00	1.00E-06	1.00E-06		293.91	C								1.57E-08	1.7E+00	5.60	57.0	925.2
KLX 16A	150.00	170.00	1.00E-06	1.00E-06		#NV	-1								8.29E-10	9.1E-02	4.84	#NV	#NV
KLX 16A	170.00	190.00	1.00E-06	1.00E-06		6.79	-1								1.27E-10	1.4E-02	-1.91	3.6	22.2
KLX 16A	188.00	208.00	1.00E-06	1.00E-06		25.90	C	)							5.22E-11	5.8E-03	1.60	87.6	1069.2
KLX 16A	207.00	227.00	1.00E-06	1.00E-06		211.34	C	)							5.09E-11	5.6E-03	10.53	58.2	1198.8
KLX 16A	227.00	247.00	1.00E-06			90.26	C	)							7.06E-11	7.8E-03		51.6	846.0
KLX 16A	247.00	267.00	1.00E-06	1.00E-06		94.65	C	)							6.22E-11	6.9E-03	6.07	27.6	910.8
KLX 16A	267.00	287.00	1.00E-06	1.00E-06		169.48	C	)							3.18E-10	3.5E-02	2.41	33.6	1108.8
KLX 16A	287.00	307.00	1.00E-06	1.00E-06		91.51	C	)							2.47E-09	2.7E-01	11.94	78.0	943.2
KLX 16A	307.00	327.00	1.00E-06	1.00E-06		25.05	C	)	l						3.90E-11	4.3E-03	-1.87	123.0	1098.0
KLX 16A	347.00	367.00	1.00E-06	1.00E-06		39.78	C	)							9.73E-10	1.1E-01	-0.50	34.2	1022.4
KLX 16A	367.00	387.00	1.00E-06	1.00E-06		7.47	1								7.43E-11	8.2E-03	1.26	10.2	20.4
KLX 16A	387.00	407.00	1.00E-06	1.00E-06		3.44	1								5.72E-11	6.3E-03	0.24	10.2	19.2

									storativity_s_	value_type_t_n						value_type_t_g		storativity_s_	flow_dim_g	
idcode	secup	seclow	t1	t2	dte1	dte2	p_horner	transmissivity_t_nlr	nir			c_nir	cd_nir	skin_nlr	transmissivity_t_grf	rf	bc_t_grf	grf	rf	comment
KLX 16A	13.00	113.00	)				1038.2													
KLX 16A	112.00	212.00	)	1			1900.3						1							
KLX 16A	212.00						2784.4													
KLX 16A	312.00	412.00					3645.8													
KLX 16A	12.50	32.50					335.2													
KLX 16A	32.50	52.50					496.3													
KLX 16A	52.50	72.50		1		1	663.8						1							1
KLX 16A	72.50	92.50					840.8													
KLX 16A	91.00	111.00					1001.7													
KLX 16A	111.00						1180.6						1							1
KLX 16A	131.00						1358.9													
KLX 16A	150.00						1525.4						ļ							ļ
KLX 16A	170.00	190.00					1704.5													
KLX 16A	188.00	208.00					1865.2													
KLX 16A	207.00	227.00		ļ			2032.5													ļ
KLX 16A	227.00						2209.9													L
KLX 16A	247.00						2385.5	and a second descent descent descent descent descent												L
KLX 16A	267.00						2561.4						ļ							ļ
KLX 16A	287.00	307.00					2740.5						I					L		ļ
KLX 16A	307.00	327.00					2911.7													
KLX 16A	347.00	367.00				ļ	3254.3		ļ		ļ		ļ					ļ		ļ
KLX 16A	367.00			ļ		ļ	3425.7						ļ					ļ		ļ
KLX 16A	387.00	407.00	)				3629.4													1

Tabl	le	• = =	ole_test_obs sections of single hole test
Column	Datatype	Unit	Column Description
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
idcode	CHAR		Object or borehole identification code
start_date	DATE		Date (yymmdd hh:mm:ss)
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
obs_secup	FLOAT	m	Upper limit of observation section
obs_seclow	FLOAT	m	Lower limit of observation section
pi_above	FLOAT	kPa	Groundwater pressure above test section, start of flow period
pp_above	FLOAT	kPa	Groundwater pressure above test section, at stop flow period
pf_above	FLOAT	kPa	Groundwater pressure above test section at stop recovery per
pi_below	FLOAT	kPa	Groundwater pressure below test section at start flow period
pp_below	FLOAT	kPa	Groundwater pressure below test section at stop flow period
pf_below	FLOAT	kPa	Groundwater pressure below test section at stop recovery per
comments	VARCHAR		Comment text row (unformatted text)

idcode	start_date	stop_date	secup	seclow	section_no	obs_secup	obs_seclow	pi_above	pp_above	pf_above	pi_below	pp_below	pf_below	comments
KLX 16A	070313 09:41	070313 12:22	13.00	113.00		114.00	433.55	#NV	#NV	#NV	1027	1027	1028	
KLX 16A	070313 14:12	070313 16:02	112.00	212.00		213.00	433.55	800	801	802	1906	1909	1906	
KLX 16A	070313 17:54	070313 19:46	212.00	312.00		313.00	433.55	1683	1684	1683	2790	2790	2789	
KLX 16A	070313 21:41	070313 23:41	312.00	412.00		413.00	433.55	2574	2574	2549	3754	3726	3705	
KLX 16A	070314 13:12	070314 14:38	12.50	32.50		33.50	433.55	#NV	#NV	#NV	314	314	314	
KLX 16A	070314 22:12	070314 23:57	32.50	52.50		53.50	433.55	84	85	86	490	491	491	
KLX 16A	070315 00:34	070315 02:39	52.50	72.50		73.50	433.55	263	264	265	668	668	668	
KLX 16A	070315 06:50	070315 08:18	72.50	92.50		93.50	433.55	440	441	442	845	845	846	
KLX 16A	070315 08:52	070315 10:25	91.00	111.00		112.00	433.55	607	608	608	1009	1010	1009	
KLX 16A	070315 10:59	070315 12:22	111.00	131.00		132.00	433.55	785	786	787	1187	1187	1187	
KLX 16A	070315 13:31	070315 14:55	131.00	151.00		152.00	433.55	963	965	966	1364	1368	1365	
KLX 16A	070315 15:35	070315 17:14	150.00	170.00		171.00	433.55	1128	1127	1127	1533	1533	1533	
KLX 16A	070315 17:51	070315 19:24	170.00	190.00		191.00	433.55	1305	1305	1305	1710	1710	1710	
KLX 16A	070315 20:00	070315 21:52	188.00	208.00		209.00	433.55	1467	1467	1467	1870	1870	1870	
KLX 16A	070315 22:44	070316 00:00	207.00	227.00		228.00	433.55	1636	1638	1637	2037	2039	2038	
KLX 16A	070316 00:47	070316 02:13	227.00	247.00		248.00	433.55	1814	1814	1815	2215	2215	2215	
KLX 16A	070316 07:36	070316 08:58	247.00	267.00		268.00	433.55	1993	1992	1992	2394	2393	2392	
KLX 16A	070316 10:58	070316 12:19	267.00	287.00		288.00	433.55	2170	2171	2171	2570	2625		
KLX 16A	070316 13:27	070316 14:51	287.00	307.00		308.00	433.55	2350		2350				
KLX 16A	070316 15:27	070316 17:00	307.00	327.00		328.00	433.55	2528	2527	2528	2922	2922	2922	
KLX 16A	070317 08:35	070317 10:06	347.00	367.00		368.00	433.55	2882	2882	2882	3276	3298	3279	
KLX 16A	070317 10:38	070317 12:14	367.00	387.00		388.00	433.55	3059	3059	3059	3455	3453	3453	
KLX 16A	070317 12:48	070317 14:40	387.00	407.00		408.00	433.55	3238	3238	3239	3968	3865	3793	

Borehole: KLX16A

## **APPENDIX 5-2**

SICADA data tables (Pulse injection tests)

File Identity Created By Created

Activity Type

Activity Information

SI	CAD	A/Dat	a Imp	ort Tem	plate			(Simplified versio		
		File Time Zone		Qualit	Compiled By y Check For Deliver Delivery Approva	V				
HY665 PLU Pulse Test				Projec	t	PLU	KLX 16A			
			1	Additional Activity	Data C40 Company	1160	P20	P200	P220	R240

					C30	C40 Company	1160	P20	P200		R240 Length
Idcode	Start Date	Stop Date	Secup (m)	Seclow (m)	Company evaluating data	performing field work		Field crew manager		Person evaluating data	calibration
KLX 16A	2007-03-16 17:41				-	Golder Associates		Ū	Philipp Wolf,	Stephan Rohs,	type
								Philipp Wolf	Stephan Rohs, Daniel Nordbörg, Linda Höckert, Erik Lövgren	Philipp Wolf	

Tabl	е	plu_slu	g_test_ed
		Slug- & pulse test, calcul	ated and evaluated results
Column	Datatype	Unit	Column Description
site	CHAR		Investigation site name
dcode	CHAR		Object or borehole identification code
secup	FLOAT	m	
seclow	FLOAT	m	Lower section limit (m)
start_date	DATE		Date (yymmdd hh:mm:ss)
stop_date	DATE		Date (yymmdd hh:mm:ss)
activity type	CHAR		Activity type code
sign	CHAR		Activity QA signature
error_flag	CHAR		*: Data for the activity is erroneous and should not be used
est_type	CHAR		Type of test, one of 7, see table description
ormation_type	CHAR		1: Rock, 2: Soil (superficial deposits)
start_flow_period	DATE		Date and time of flow phase start (YYYYMMDD hhmmss)
dur_flow_penod	FLOAT	s	Time for the flowing phase of the test (tp)
dur_rec_phase_tf	FLOAT	s	
			Time for the recovery phase of the test (tF)
nitial_head_h0	FLOAT FLOAT	m	Initial formation hydraulic head, see table description
nitial_displacem_dh0		m	Initial displacement of hydraulic head, see table description
displacem_dh0_p	FLOAT	m	Initial displacement of slugtest, see table description
displacem_dh0_f	FLOAT	m	Initial displacement of bailtest, see table description
nead_at_flow_end_hp	FLOAT	m	Hydraulic head at end of flow phase, see table description
inal_head_hf	FLOAT	m	Hydraulic head at the end of the recovery, see table descr.
nitial_press_pi	FLOAT	kPa	Initial formation pressure
nitial_press_diff_dp0	FLOAT	kPa	Initial pressure change from pi at time dt=0,pulse test
press_change_dp0_p	FLOAT	kPa	Initial pressure change;pulse test-measured
press_at_flow_end_pp	FLOAT	kPa	Final pressure at the end of the flowing period
final_press_pf	FLOAT	kPa	Final pressure at the end of the recovery period
formation_width_b	FLOAT	m	b:Interpreted formation thickness repr. for evaluated T,see
ransmissivity_ts	FLOAT	m**2/s	Ts: Transmissivity based on slugtest, see table description
value_type_ts	CHAR		0:true value,-1:Ts <lower meas.limit,1:ts="">upper meas.limit</lower>
oc_ts	CHAR		Best choice code.1 means Ts is best choice of transm.,else 0
ransmissivity_tp	FLOAT	m**2/s	TP: Transmissivity based on pulse test, see table descript.
value_type_tp	CHAR		0:true value,-1:Tp <lower meas.limit,1:tp="">upper meas.limit</lower>
oc_tp	CHAR		Best choice code.1 means Tp is best choice of transm.,else 0
_meas_limit_t	FLOAT	m**2	Estimated lower measurement limit for Ts orTp,see descript.
u_meas_limit_t	FLOAT	m**2	Estimated upper measurement limit for Ts & Tp, see descript.
storativity_s	FLOAT		S= Storativity, see table description
assumed_s	FLOAT		S*=assumed storativity, see table description
skin	FLOAT		Skin factor
assumed skin	FLOAT		Asumed skin factor
· · · <u>-</u> · · ·	FLOAT	m**3/pa	Well bore storage coefficient
, luid temp tew	FLOAT	oC	Fluid temperature in the test section, see table description
luid_elcond_ecw	FLOAT	mS/m	Fluid electric conductivity in test section, see table descri
luid_salinity_tdsw	FLOAT	mg/l	Total salinity of the test section fluid (EC), see descr.
luid_salinity_tdswm	FLOAT	-	Total salinity of the test section fluid (co), see descr.
		mg/l	
#1	FLOAT	s	Estimated start time of evaluation, see table description
lt2	FLOAT	S	Estimated stop time of evaluation, see table description
eference	CHAR		SKB report No for reports describing data and evaluation
comments	CHAR		Short comment to evaluated parameters

#### Page 5-2/4

			(m	) (m)					(s)	(s	) (m	) (m	) (m)	) (m	(m	) (m)	(kPa)	(kPa)
							formation_			dur_rec_	initial_he	initial_disp	displace	displace		final_hea	initial_pr	initial_press_
idcode	start_date	stop_date	secup	seclow	section_no	test_type	type	start_flow_period	dur_flow_phase_tp	phase_tf	ad_h0	lacem_dh0	m_dh0_p	m_dh0_f	р	d_hf	ess_pi	diff_dp0
KLX 16A	070316 17:41	070316 22:23	327.00	347.00		4B	1	2007-03-16 18:21:27	10	942	)						3108	272
KLX 16A	070317 15:37	070317 22:20	406.00	426.00		4B	1	2007-03-17 16:18:19	10	2160	)						3802	240
KLX 16A	070318 19:10	070318 22:51	421.10	433.55		4B	1	2007-03-18 19:48:48	10	942	)					Τ	3792	261

	(m)	(m)	(kPa	) (kPa	) (kPa	) (m	(m**2/s)			(m**2/s)			(m**2)	(m**2	)				(m**3/pa)	(oC)	) (mS/m)	) (mg/l)	(mg/l)	(s)	(S)		
			hange_	ow_end_p	final_pre	n_width_	transmiss	value_typ		transmis valu	e_ty	1	_meas_limi	u_meas_lim	storativit	assumed		assumed		fluid_te	cond_ec	linity_td	inity_tds				
idcode	secup	seclow	dp0_p	р	ss_pf	b	ivity_ts	e_ts	bc_ts	sivity_tp pe_t	p b	c_tp t	_t	it_t	y_s	_s	skin	_skin	с	mp_tew	w	sw	wm	dt1	dt2	reference	comments
KLX 16A	327.00	347.00		3380	3114					3.90E-11	0	1	2.00E-11	2.00E-10	1.00E-06	1.00E-06	-0.2		9.70E-11	11.4				#NV	#NV		
KLX 16A	406.00	426.00		4042	3872					9.30E-12	0	1	5.00E-12	5.00E-11	1.00E-06	1.00E-06	-1.4		3.30E-11	12.5	i			#NV	#NV		
KLX 16A	421.10	433.55		4053	3806	i				5.40E-11	0	1	3.00E-11	1.00E-10	1.00E-06	1.00E-06	0.2		3.00E-11	12.5	i			772.92	2883.96		

Tal	ble	le_test_obs ections of single hole test	
Column	Datatype	Unit	Column Description
site	CHAR		Investigation site name
activity_type	CHAR		Activity type code
idcode	CHAR		Object or borehole identification code
start_date	DATE		Date (yymmdd hh:mm:ss)
secup	FLOAT	m	Upper section limit (m)
seclow	FLOAT	m	Lower section limit (m)
sign	CHAR		Activity QA signature
error_flag	CHAR		*: Data for the activity is erroneous and should not be used
obs_secup	FLOAT	m	Upper limit of observation section
obs_seclow	FLOAT	m	Lower limit of observation section
pi_above	FLOAT	kPa	Groundwater pressure above test section, start of flow period
pp_above	FLOAT	kPa	Groundwater pressure above test section, at stop flow period
pf_above	FLOAT	kPa	Groundwater pressure above test section at stop recovery per
pi_below	FLOAT	kPa	Groundwater pressure below test section at start flow period
pp_below	FLOAT	kPa	Groundwater pressure below test section at stop flow period
pf_below	FLOAT	kPa	Groundwater pressure below test section at stop recovery per
comments	VARCHAR		Comment text row (unformatted text)

			(m)	(m)		(m)	(m)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	(kPa)	
idcode	start_date	stop_date	secup	seclow	section_no	obs_secup	obs_seclow	pi_above	pp_above	pf_above	pi_below	pp_below	pf_below	comments
KLX 16A	070316 17:41	070316 22:23	327.00	347.00		348.00	433.50	2706	2706	2706	3099	3098	3098	
KLX 16A	070317 15:37	070317 22:20	406.00	426.00		427.00	433.50	3408	3408	3408	4021	3820	3820	
KLX 16A	070318 19:10	070318 22:51	421.10	433.55		#NV	#NV	3538	3539	3539	4043	3811	3925	