P-07-90

Oskarshamn site investigation

Pumping tests and hydraulic injection tests in borehole KLX19A, 2007

Subarea Laxemar

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Golder Associates GmbH

October 2007

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

Abstract

Hydraulic injection tests have been performed in Borehole KLX19A at the Laxemar area, Oskarshamn. The tests are part of the general program for site investigations and specifically for the Laxemar sub-area. 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 pumping tests for water sampling and of the hydraulic injection tests in borehole KLX19A performed between 27th of November 2006 and 2nd of February 2007.

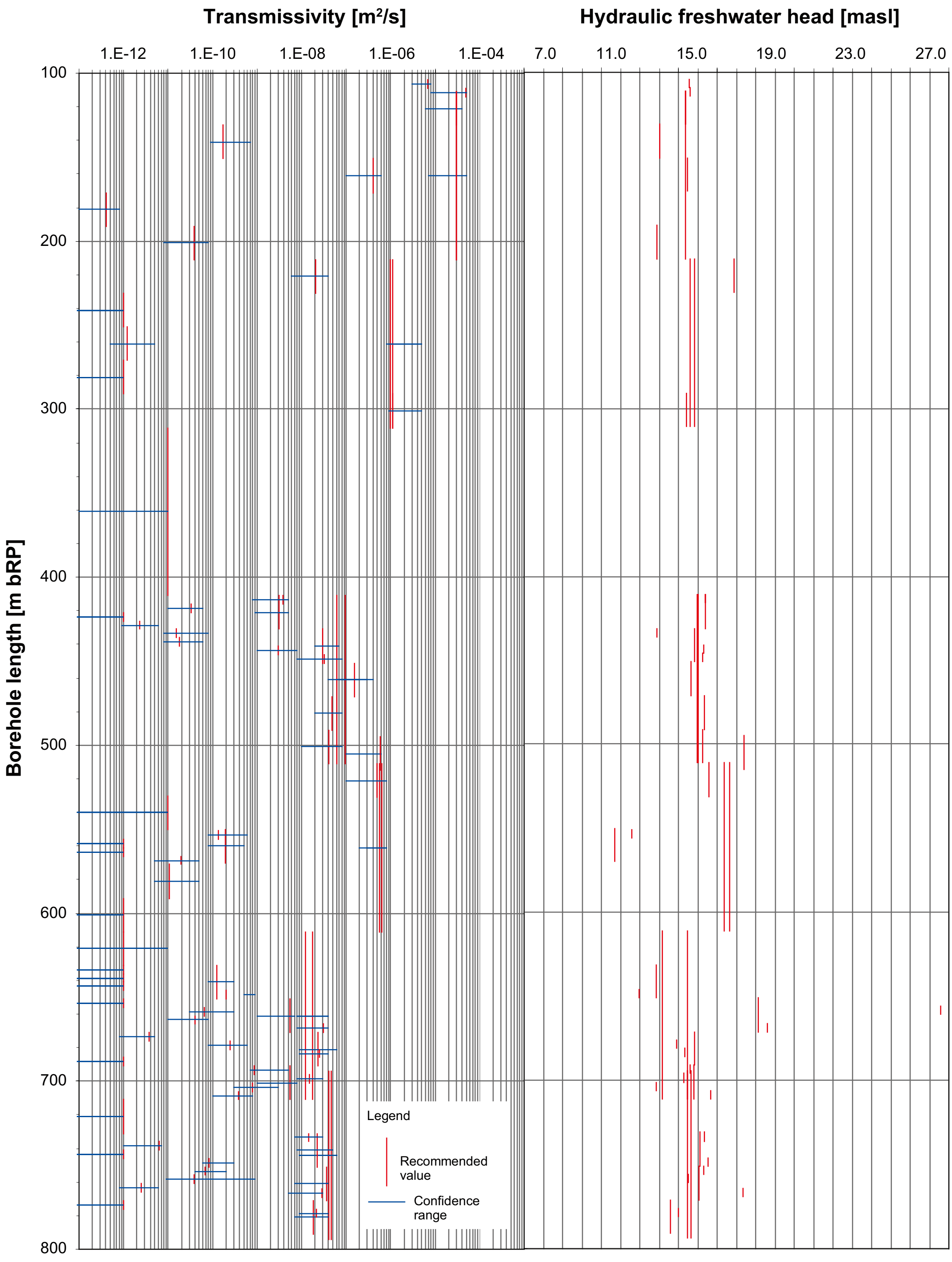
The objective of the hydrotests was to describe the rock around the borehole with respect of hydraulic parameters, mainly transmissivity (T) and hydraulic conductivity (K) at different measurement scales of 100 m, 20 m and 5 m sections. Transient evaluation during flow and recovery period provided additional information such as flow regimes, hydraulic boundaries and cross-over flows. Constant pressure injection tests were conducted between 104.00–794.00 m below ToC. The results of the test interpretation are presented as transmissivity, hydraulic conductivity and hydraulic freshwater head. The main objective of the pumping tests was to take water samples at certain depths for chemical analyses. However, the pumping test data were analysed to get hydraulic properties, as well.

Sammanfattning

Injektionstester har utförts i borrhål KLX19A 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 injektions-testerna i borrhål KLX19A. Testerna utfördes mellan den 27 November 2006 till den 2 Februari 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, 20 m och 5 m sektioner. Transient utvärdering under injektions- och återhämtningsfasen gav ytterligare information avseende flödesgeometri, hydrauliska gränser och sprickläckage. Injektionstester utfördes mellan 104,00–794,00 m borrhålslängd. Resultaten av testutvärderingen presenteras som transmissivitet, hydraulisk konduktivitet och grundvattennivå uttryckt i ekvivalent sötvattenpelare (fresh-water head).



Borehole KLX19A - Summary of results.

Contents

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/. Water sampling and hydraulic pump tests have been performed in KLX19A in two different sections. The selection of sampling sections and section length (20 m and 5 m) is based on preliminary results from the Difference flow logging and was made by SKB. The duration of pumping depended on the time for reaching acceptable uranine concentrations. Uranine is a conservative tracer used to tag the flush water utilised during drilling. 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/. These injection tests have been carried out after water sampling was finished.

Pumping tests and water sampling were carried out in borehole KLX19A during 27th November 2006 to 9th January 2007. Hydraulic injection tests were carried out between 9th of January and 2nd of February 2007 following the methodology described in SKB MD 323.001e and in the Activity Plan AP PS 400-06-144 (SKB controlling documents). Data and results were delivered to the SKB site characterization database SICADA and are traceable by the activity plan number.

The main objective of the pumping tests was to take water samples in certain depths for chemical analyses. 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. Additionally, the data of the pumping tests were analysed to characterize the rock respect to his hydraulic properties. This report describes the results and primary data evaluation of the hydraulic injection tests in borehole KLX19A. The commission was conducted by Golder Associates AB and Golder Associates GmbH.

Borehole KLX19A is situated in the Laxemar area approximately 3.0 km west of the nuclear power plant of Simpevarp, Figure 1-1. The borehole was drilled from May 2006 to September 2006 to a final depth of 800.07 m with an inner diameter of 76 mm and an inclination of –57.78°. The upper 6.30 m is cased with large diameter telescopic casing ranging from diameter 208–323 mm (OD).

The work was carried out in accordance with activity plan AP PS 400-06-144. 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.

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

Activity plan	Number	Version
Hydraulic pumping and injection tests in borehole KLX19A.	AP PS 400-06-144	1.0
Method descriptions	**Number**	**Version**
Analysis of injection and single-hole pumping tests.	SKB MD 320.004e	1.0
Hydraulic injection tests.	SKB MD 323.001e	1.0
Instruktion för rengöring av borrhålsutrustning och viss markbaserad utrustning.	SKB MD 600.004	1.0
Instruktion för längdkalibrering vid undersökningar i kärnborrhål.	SKB MD 620.010	1.0
Allmänna ordning-, skydds- och miljöregler för platsundersökningar Oskarshamn.	SKB SDPO-003	1.0
Miljökontrollprogram Platsundersökningar.	SKB SDP-301	1.0
Hantering av primärdata vid platsundersökningar.	SKB SDP-508	1.0

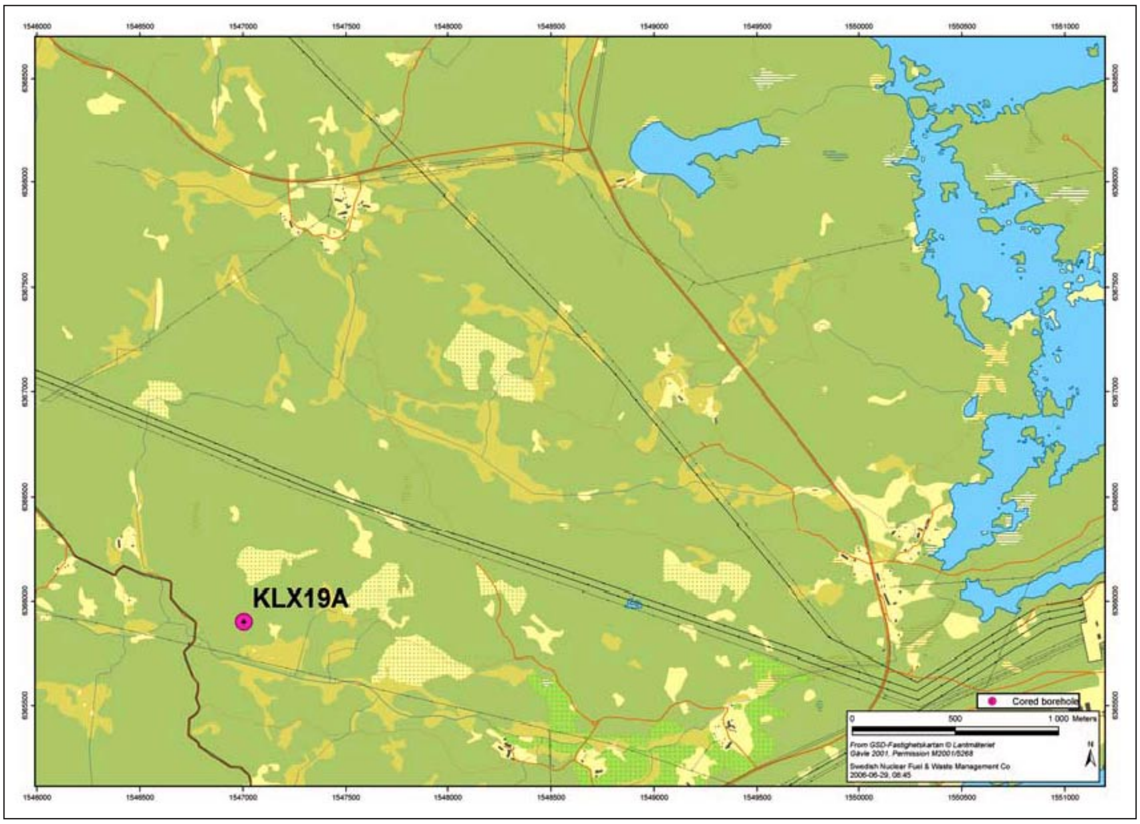


Figure 1-1. *The investigation area Laxemar, Oskarshamn with location of borehole KLX19A.*

2 Objective and scope

Two main tasks were carried out in borehole KLX19A. The first task was to conduct pumping tests in two different sections. The second task was to conduct constant head injection tests in different test sections with different length.

The main objective of the pumping tests in KLX19A was the sampling of water in two test sections for chemical analyses. Additionally, the pumping was conducted and analysed as constant rate pumping tests followed by a pressure recovery. The water sampling sections had a length of 20 m and 5 m and are selected based on the preliminary results of the Difference flow logging. The samples taken from section 495.00–515.00 m and 764.00–769.00 m were submitted for analysis according to SKB chemistry class 5.

The objective of the hydrotests in borehole KLX19A 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, 20 m and 5 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, 20 m and 5 m test sections, analyses and reporting.

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.

From 27th November 2006 to 9th January 2007 two pumping tests with different section lengths (20 m and 5 m) were performed (Table 2-3).

The following hydraulic injection tests were performed between 09th January and 02nd February 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 injection tests at borehole KLX19A.

No. of injection tests	Interval	Positions	Time/test	Total test time
12	100 m	111.00–794.00 m	125 min	25.0 hrs
29	20 m	111.00–791.00 m	90 min	43.5 hrs
40	5 m	104.00–781.00 m	90 min	60.0 hrs
Total:				128.5 hrs

* Excluding repeated tests.

Table 2-2. Information about KLX19A (from SICADA 2006-11-23).

Title	Value				
Old idcode name(s):	KLX19A				
Comment:	No comment exists				
Borehole length (m):	800.07				
Reference level:	TOC				
Drilling period(s):	**From date**	**To date**	**Secup (m)**	**Seclow (m)**	**Drilling type**
	2006-05-10	2006-05-22	0.20	99.33	Percussion drilling
	2006-06-03	2006-09-20	99.33	800.07	Core drilling
Starting point coordinate:	**Length (m)**	**Northing (m)**	**Easting (m)**	**Elevation (m.a.s.l.)**	**Coord system**
(centerpoint of TOC)	0.00	6365901.42	1547004.62	16.87	RT90-RHB70
	3.00	6365899.89	1547004.15	14.33	RT90-RHB70
Angles:	**Length (m)**	**Bearing**	**Inclination (– = down)**		
	0.000	197.13	–57.78		RT90-RHB70
Borehole diameter:	**Secup (m)**	**Seclow (m)**	**Hole diam (m)**		
	0.20	6.30	0.339		
	6.30	70.00	0.254		
	70.00	99.33	0.253		
	99.33	100.73	0.086		
	100.23	800.07	0.076		
	520.30	522.50	0.084		
Core diameter:	**Secup (m)**	**Seclow (m)**	**Core diam (m)**		
	99.33	100.23	0.072		
	100.23	800.07	0.050		
Casing diameter:	**Secup (m)**	**Seclow (m)**	**Case in (m)**	**Case out (m)**	
	0.00	92.75	0.200	0.208	
	0.20	6.20	0.310	0.323	
	6.20	6.30	0.280	0.323	
	92.75	98.70	0.200	0.210	
	98.70	98.75	0.170	0.210	
	520.40	522.40	0.076	0.082	
Cone dimensions:	**Secup (m)**	**Seclow (m)**	**Cone in (m)**	**Cone out (m)**	
	96.03	99.03	0.100	0.104	
	99.03	100.73	0.080	0.084	
Grove milling:	**Length (m)**	**Trace detectable**			
	110.000	YES			
	150.000	YES			
	200.000	YES			
	250.000	YES			
	303.000	YES			
	350.000	YES			
	403.000	YES			
	447.000	YES			
	507.000	YES			
	547.000	YES			
	597.000	YES			
	647.000	YES			
	697.000	YES			
	748.000	YES			
	778.000	YES			

2.2 Injection tests and water sampling

Pumping tests and water sampling were conducted according to the Activity Plan AP PS 400-06-144. The intention was to conduct constant rate tests. The main goal of the pumping tests was to reach an acceptable uranine concentration as fast as possible to take water samples from the borehole. An acceptable uranine concentration is 5% of the concentration from the water used during the drilling campaign. After start of pumping the water sampling and measuring of uranine content was performed by SKB. The decision, when to abort pumping and take the final water chemistry sample, was made by SKB.

Injection tests were conducted according to the Activity Plan AP PS 400-06-144 and the method description for hydraulic injection tests, SKB MD 323.001e (SKB internal documents). Tests were done in 100 m test sections between 111.00–794.00 m below ToC, in 20 m test sections between 111.00–791.00 m below ToC and in 5 m test sections between 104.00–781.00 m below ToC (see Table 2-3). The initial criteria for performing injection tests in 20 m and 5 m test sections was a measurable flow of Q > 0.001 L/min in the previous measured 100 m tests 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 KLX19A were conducted.

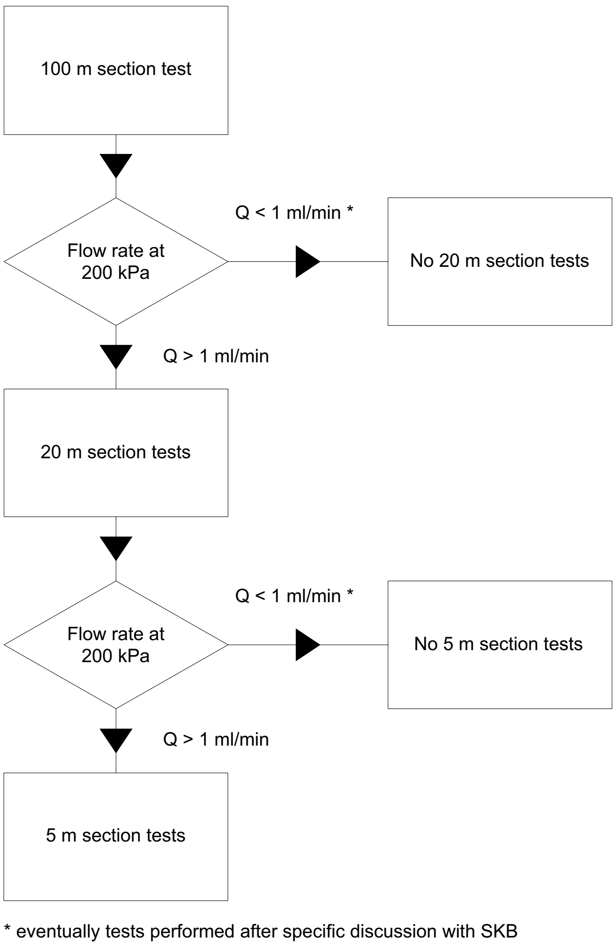


Figure 2-1. *Flow chart for test sections.*

Table 2-3. Tests performed.

Bh ID	Test section (m bToC)	Test type[1]	Test no	Test start (date, time)	Test stop (date, time)
KLX19A	111.00–211.00	3	1	070111 08:17	070111 10:39
KLX19A	211.00–311.00	3	1	070111 12:03	070111 12:47
KLX19A	211.00–311.00	3	2	070112 09:13	070112 14:01
KLX19A	211.00–311.00	3	3	070112 14:06	070112 15:20
KLX19A	311.00–411.00	3	1	070112 16:54	070112 18:28
KLX19A	411.00–511.00	3	1	070113 09:30	070113 11:44
KLX19A	411.00–511.00	3	2	070113 11:46	070113 12:57
KLX19A	511.00–611.00	3	1	070113 14:17	070113 16:33
KLX19A	511.00–611.00	3	2	070113 16:35	070113 17:43
KLX19A	611.00–711.00	3	1	070114 08:48	070114 11:01
KLX19A	611.00–711.00	3	2	070114 11:03	070114 12:42
KLX19A	694.00–794.00	3	1	070115 15:33	070115 17:24
KLX19A	694.00–794.00	3	2	070115 17:27	070115 21:48
KLX19A	111.00–131.00	3	1	070117 11:33	070117 13:30
KLX19A	131.00–151.00	3	1	070117 14:04	070117 15:56
KLX19A	151.00–171.00	3	1	070117 16:30	070117 17:52
KLX19A	171.00–191.00	4B	1	070117 18:23	070118 00:17
KLX19A	191.00–211.00	3	1	070118 08:17	070118 10:20
KLX19A	211.00–231.00	3	1	070118 10:53	070118 12:18
KLX19A	231.00–251.00	3	1	070118 13:06	070118 14:00
KLX19A	251.00–271.00	4B	1	070118 14:30	070118 15:53
KLX19A	271.00–291.00	3	1	070118 16:24	070118 17:13
KLX19A	291.00–311.00	3	1	070118 17:44	070118 19:04
KLX19A	411.00–431.00	3	1	070119 09:23	070119 10:47
KLX19A	431.00–451.00	3	1	070119 11:20	070119 12:40
KLX19A	451.00–471.00	3	1	070119 13:38	070119 14:58
KLX19A	471.00–491.00	3	1	070119 15:30	070119 16:52
KLX19A	491.00–511.00	3	1	070119 17:26	070119 18:46
KLX19A	511.00–531.00	3	1	070120 08:21	070120 09:42
KLX19A	530.00–550.00	3	1	070120 10:18	070120 11:14
KLX19A	550.00–570.00	3	1	070120 11:45	070120 13:02
KLX19A	571.00–591.00	4B	1	070120 13:39	070120 15:40
KLX19A	591.00–611.00	3	1	070120 16:19	070120 17:09
KLX19A	611.00–631.00	3	1	070120 17:41	070120 18:38
KLX19A	631.00–651.00	3	1	070121 08:29	070121 10:11
KLX19A	651.00–671.00	3	1	070121 13:18	070121 14:22
KLX19A	671.00–691.00	3	1	070121 14:52	070121 16:23
KLX19A	691.00–711.00	3	1	070121 16:56	070121 19:26
KLX19A	711.00–731.00	3	1	070122 08:46	070122 09:58
KLX19A	731.00–751.00	3	1	070122 10:50	070122 12:17
KLX19A	751.00–771.00	3	1	070122 13:36	070122 15:00
KLX19A	771.00–791.00	3	1	070122 15:43	070122 17:52
KLX19A	104.00–109.00	3	1	070124 09:08	070124 10:32
KLX19A	109.00–114.00	3	1	070124 10:57	070124 13:05
KLX19A	411.00–416.00	3	1	070124 17:05	070124 18:29
KLX19A	416.00–421.00	4B	1	070125 08:23	070125 09:40
KLX19A	421.00–426.00	3	1	070125 10:04	070125 10:52
KLX19A	426.00–431.00	4B	1	070125 11:16	070125 12:55
KLX19A	431.00–436.00	3	1	070125 13:20	070125 14:43
KLX19A	436.00–441.00	4B	1	070125 15:07	070125 16:20

Bh ID	Test section (m bToC)	Test type[1]	Test no	Test start (date, time)	Test stop (date, time)
KLX19A	441.00–446.00	3	1	070125 16:48	070125 18:12
KLX19A	446.00–451.00	3	1	070125 18:36	070125 19:58
KLX19A	551.00–556.00	3	1	070126 09:34	070126 11:08
KLX19A	556.00–561.00	4B	1	070126 11:34	070126 13:12
KLX19A	561.00–566.00	3	1	070126 13:58	070126 14:36
KLX19A	566.00–571.00	4B	1	070126 14:59	070126 16:39
KLX19A	631.00–636.00	4B	1	070126 17:42	070126 19:21
KLX19A	636.00–641.00	4B	1	070127 08:26	070127 09:20
KLX19A	641.00–646.00	4B	1	070127 09:47	070127 10:37
KLX19A	646.00–651.00	3	1	070127 11:03	070127 12:37
KLX19A	651.00–656.00	3	1	070127 13:03	070127 13:58
KLX19A	656.00–661.00	3	1	070127 14:22	070127 16:11
KLX19A	661.00–666.00	4B	1	070127 17:13	070127 19:22
KLX19A	666.00–671.00	3	1	070128 08:17	070128 09:42
KLX19A	671.00–676.00	4B	1	070128 10:07	070128 11:55
KLX19A	676.00–681.00	3	1	070128 12:22	070128 13:51
KLX19A	681.00–686.00	3	1	070128 14:19	070128 15:44
KLX19A	686.00–691.00	4B	1	070128 16:10	070128 17:06
KLX19A	691.00–696.00	3	1	070128 17:33	070128 18:59
KLX19A	696.00–701.00	3	1	070129 08:23	070129 09:47
KLX19A	701.00–706.00	3	1	070129 10:16	070129 11:59
KLX19A	706.00–711.00	3	1	070129 12:42	070129 14:12
KLX19A	731.00–736.00	3	1	070129 14:49	070129 16:18
KLX19A	736.00–741.00	4B	1	070129 16:43	070129 18:22
KLX19A	741.00–746.00	3	1	070129 18:54	070129 19:33
KLX19A	746.00–751.00	3	1	070130 08:14	070130 09:54
KLX19A	751.00–756.00	3	1	070130 10:20	070130 12:02
KLX19A	756.00–761.00	3	1	070130 12:47	070130 14:29
KLX19A	761.00–766.00	4B	1	070130 14:54	070130 16:35
KLX19A	766.00–771.00	3	1	070130 17:00	070130 18:21
KLX19A	771.00–776.00	4B	1	070131 08:08	070131 09:01
KLX19A	776.00–781.00	3	1	070131 09:28	070131 11:02
KLX 19A	495.00–515.00	1B	1	061128 19:53	061205 15:52
KLX 19A	764.00–769.00	1B	1	061207 15:07	070109 12:28

1) 1B: Pumping test (submersible pump); 3: Injection test; 4B Pulse injection test.

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, down-hole 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 1–8.

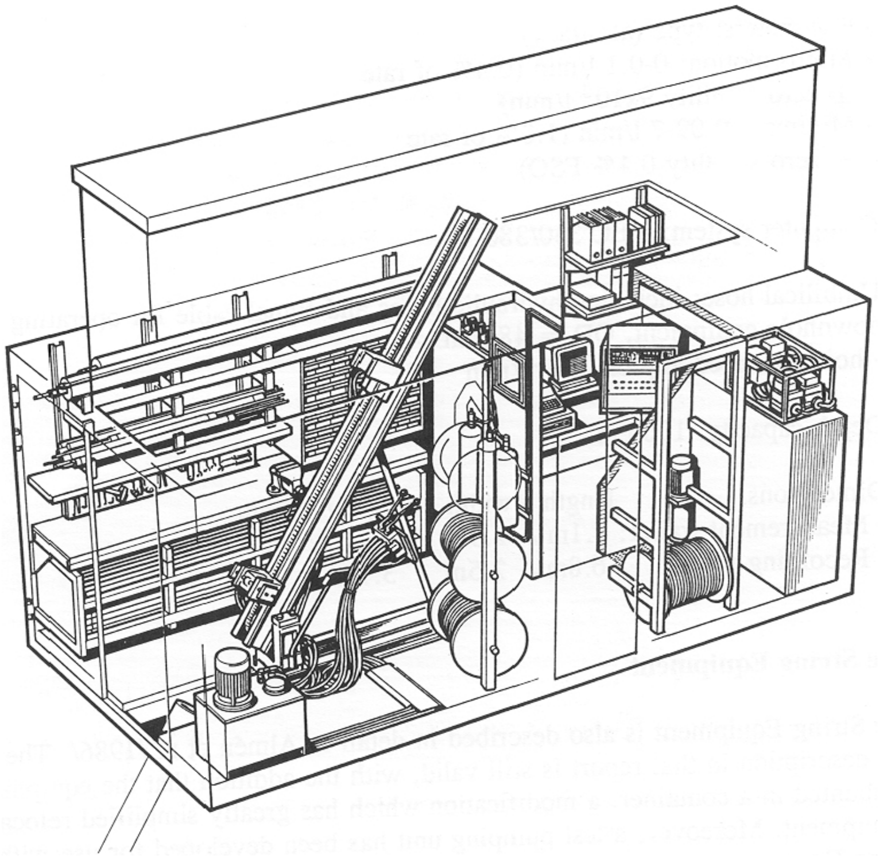


Figure 3-1. *A view of the layout and equipment of PSS2.*

Photo 1. *Hydraulic rig.*

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

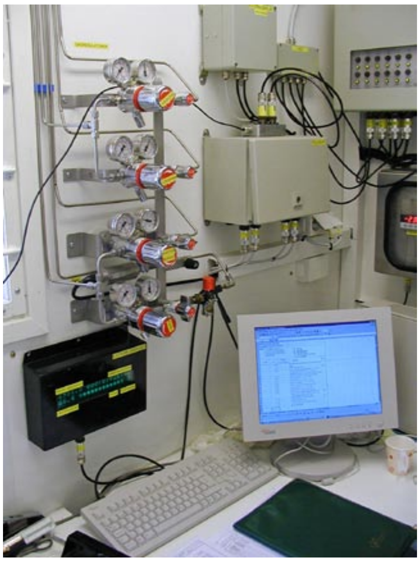


Photo 3. *Computer room, displays and gas regulators.*

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

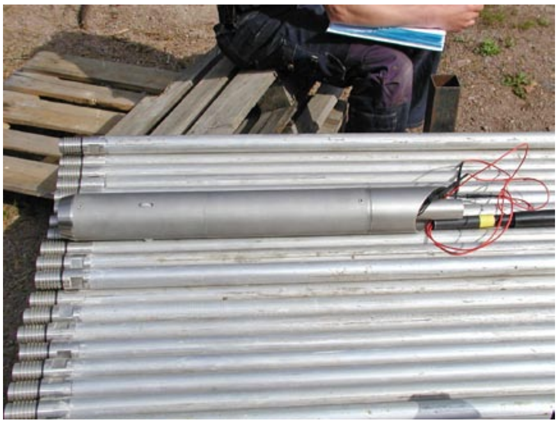


Photo 5. *Positioner, bottom end of down-in-hole string.*

Photo 6. *Packer and gauge carrier.*

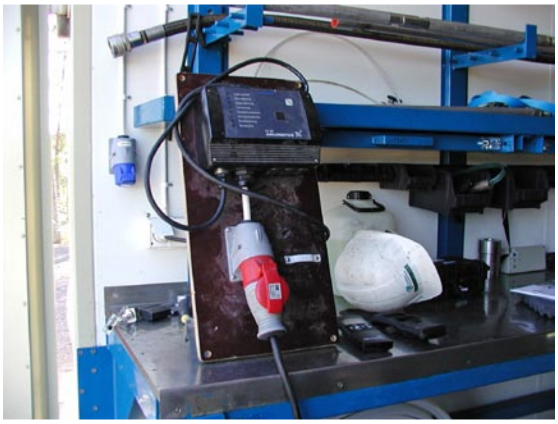


Photo 7. *Top of test string with shunt valve and nylon line down to the pump basket.*

Photo 8. *Control board of the pump with remote control.*

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 and
- 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 (± 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.

For the two conducted pump tests a 3”-pump (Grundfos SQE 5-70) was placed in a pump basket and connected to the test string at about 50–90 m below ToC. The pumping frequency of the pump is set with a remote control on surface. The flow can be regulated additionally with a shunt-valve on top of the test string, a nylon line connects the valve with the pump basket, so that the water can circulate and the pump cannot run out of water (Photo 7 and Photo 8).

The tool scheme is presented in Figure 3-2.

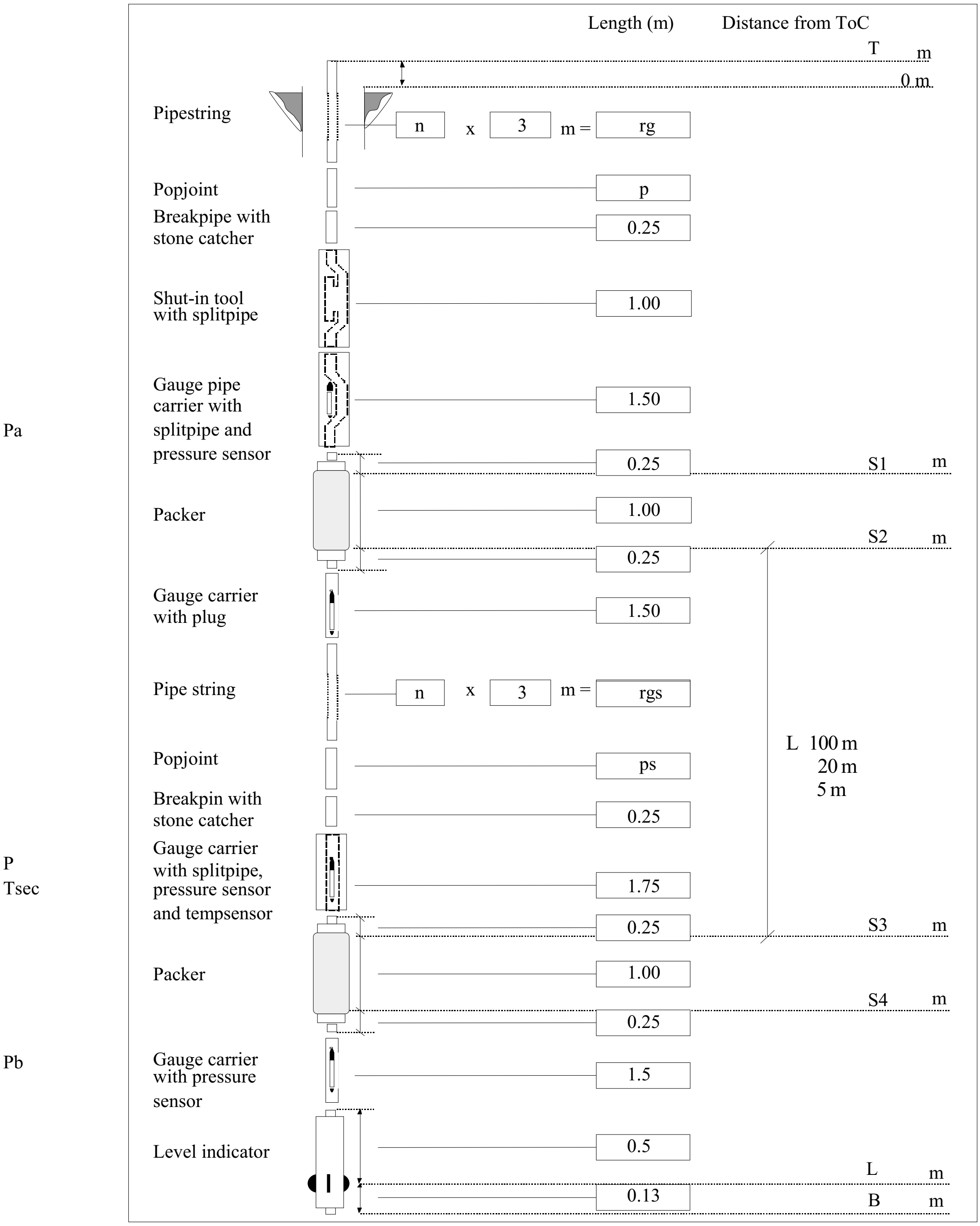


Figure 3-2. *Schematic drawing of the down-hole equipment in the PSS2 system.*

3.2 Sensors

Table 3-1. Technical specifications of sensors

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

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 (m³)	Type	Position (m fr ToC)	Position	Function	Outer diameter (mm)
KLX19A	111.00–211.00	0.454	p_a p T p_b L	109.11 210.37 210.20 213.01 213.25	Test section	Signal cable Pump string Packer line	9.1 33 6
KLX019A	111.00–131.00	0.091	p_a p T p_b L	109.11 130.37 130.20 133.01 133.25	Test section	Signal cable Pump string Packer line	9.1 33 6
KLX19A	104.00–109.00	0.023	p_a p T p_b L	102.11 108.37 108.20 111.01 111.25	Test section	Signal cable Pump string Packer line	9.1 33 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.

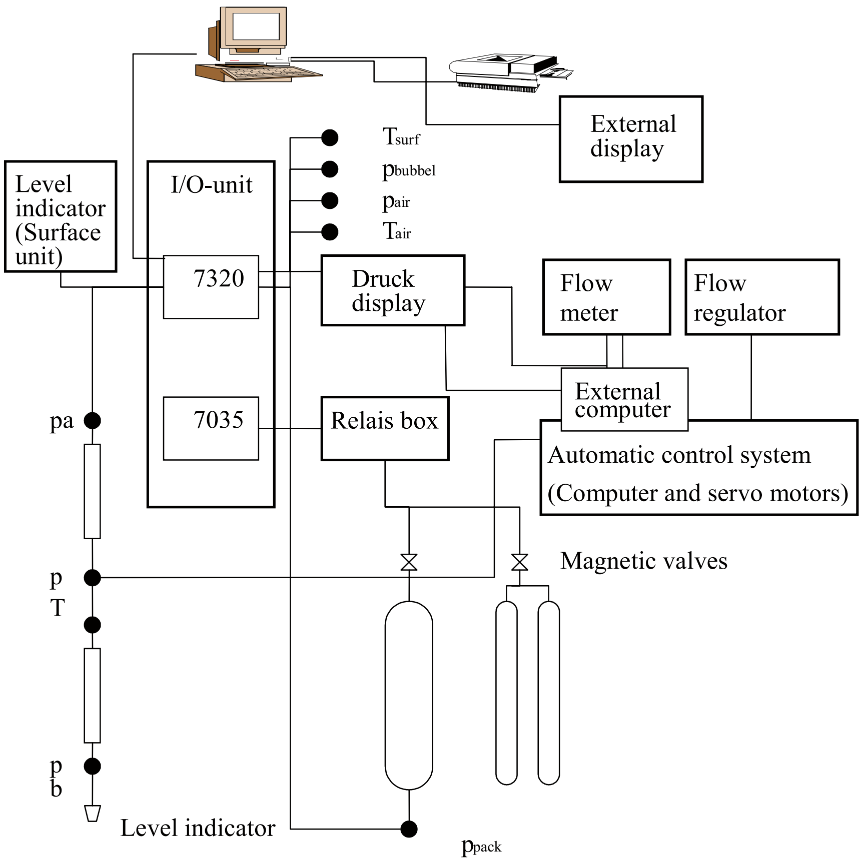


Figure 3-3. *Schematic drawing of the data acquisition system and the flow regulation control system in PSS2.*

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 out of the borehole HLX14.
- 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).

In addition to the above described constant head injection tests, pumping tests with the main objective of taking water samples were conducted in two sections. These tests were conducted as constant rate withdrawal phases (CRw) followed by a pressure recovery (CRwr).

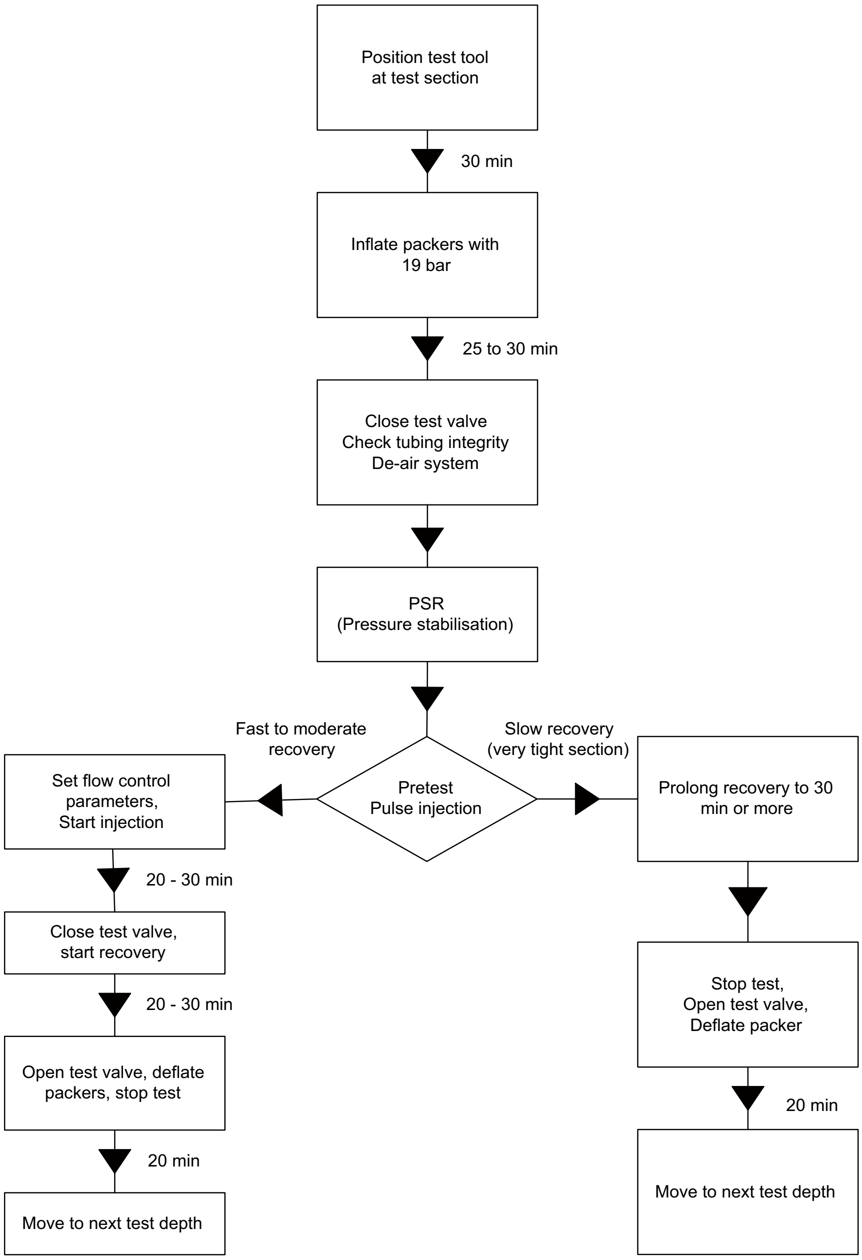


Figure 4-1. *Flow chart for hydraulic injection test performance.*

4.3.2 Test procedure

Injection tests

A typical constant head injection 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.

Pump tests

To take water samples from two sections, pumping test were conducted. The selection of these sampling sections is based on Difference flow logging. The duration of pumping depended on the uranine concentration of the pumped water. After start of pumping, each day a water sample was taken by SKB and the uranine concentration was measured by SKB. After reaching a value of lower than 5% from starting concentration, a final water sample (class 5) was taken by SKB. This decision was made by the Hydrogeochemist and the activity leader.

A pump test cycle includes the following phases: 1) Transfer of down-hole equipment to the test section. 2) Packer inflation. 3) Pressure stabilisation. 4) Constant rate withdrawal. 5) Pressure recovery. 6) Packer deflation.

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

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	…

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

The first pump section is located between 764.00 and 769.00 m bToC and the pumping took place from November 28th to December 5th 2006. A total of 160.7 hours pumping was followed by a recovery phase of 2.7 hours. The decision to stop the recovery was made by the activity leader. The second sampling section was from 495.00–515.00 m bToC. The pumping took place between December 7th 2006 and January 9th 2007 and lasted 785 hours. This pumping phase was followed by a 3.6 hours recovery period.

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.

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-Lohman 1952/ method was further improved for the use of type curve derivatives and for different flow models.

Constant rate and pressure recovery tests are analysed using the method described by /Gringarten 1986/ and /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/Pump 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.

- Calculation of initial estimates of the model parameters by using the Ramey Plot /Ramey et al. 1975/. This plot is typically not presented in the appendix.
- 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.

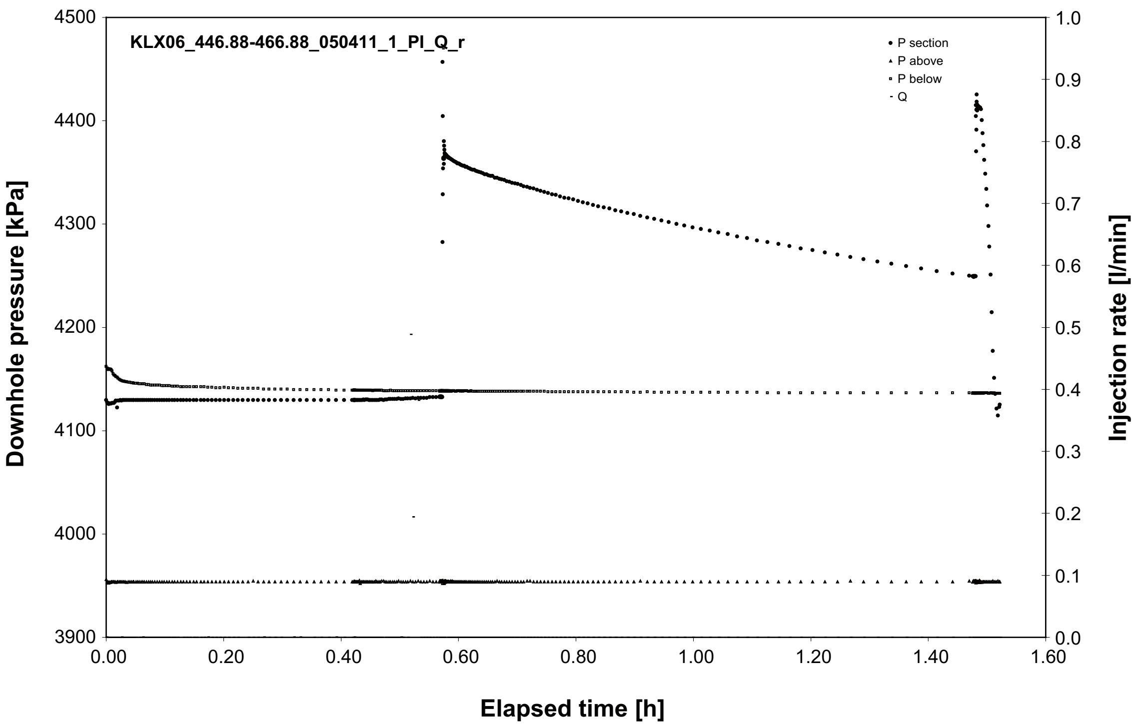


Figure 4-2. *Typical pressure versus time plot of a Pulse injection test.*

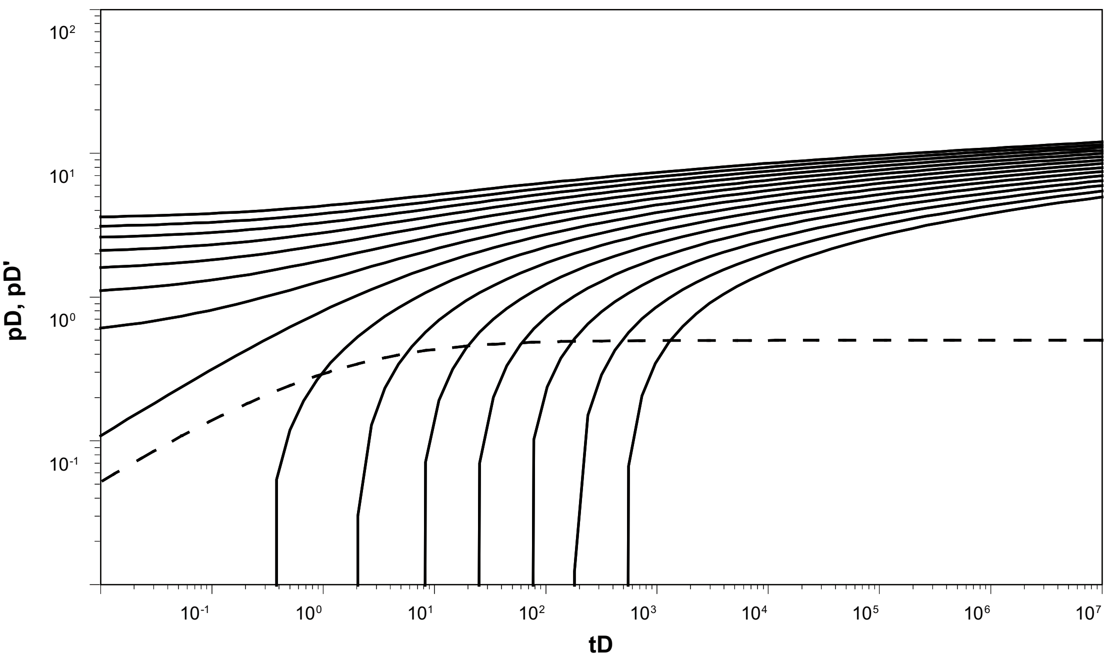


Figure 4-3. *Deconvolution type curve set for pulse test analysis.*

4.5.4 Correlation between storativity and skin factor

For the analysis of the conducted hydraulic tests below 100 m depth a storativity of $1 \cdot 10^{-6}$ 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 $e^{2\xi}/S$. This means that in such cases the skin factor can only be calculated when assuming the storativity as known.

Recovery phase (CHir/CRwr)

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:

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

The equation above has two unknowns, the storativity (S) and the skin factor (ξ) 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_2.

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 /Rhen 2005/.

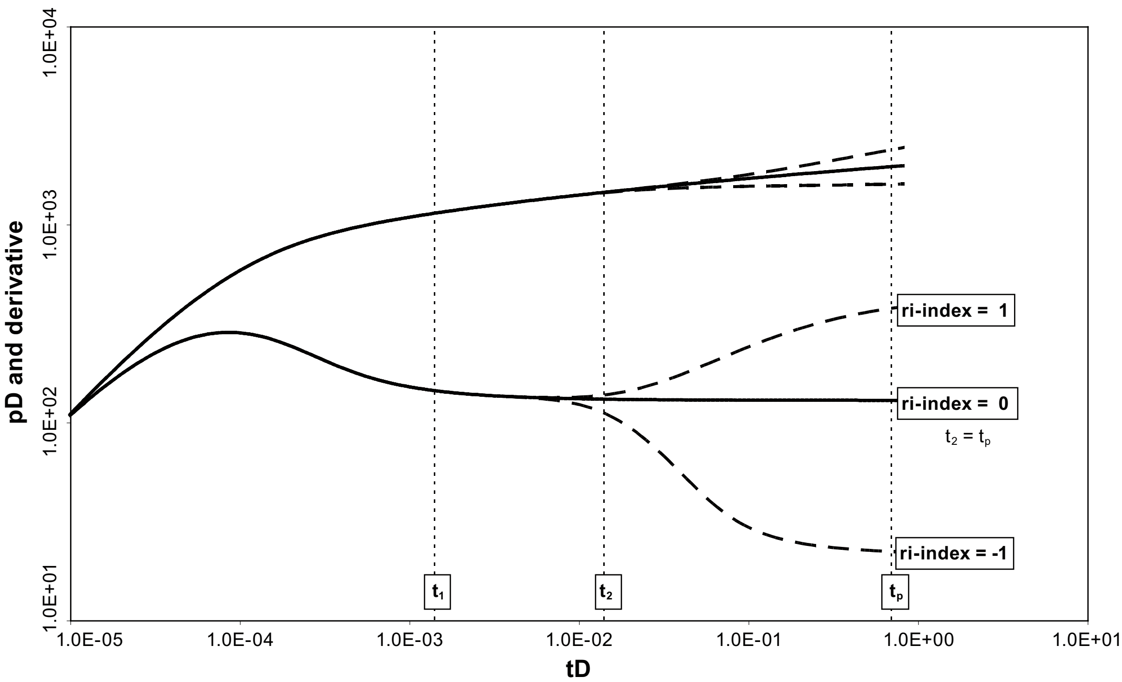


Figure 4-4. *Schematic plot of the assignments for the ri-indices.*

Calculation of the radius of influence

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

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

T_T recommended inner zone transmissivity [m²/s]

t_2 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 /Rhen et al. 2006/:

$S_T = 0.0007 \times T_T^{0.5}$ [–]

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 meters 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/m³ (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.

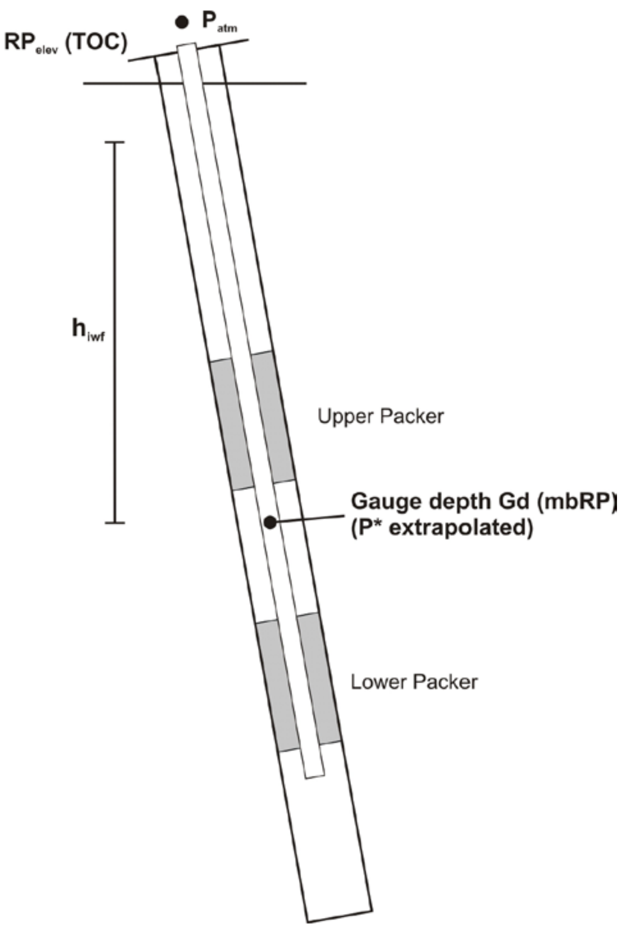


Figure 4-5. Schematic methodologies for calculation of the freshwater head.

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 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

Deviating from the relating Activity Plan, the 20 m pumping section was shifted by 4 m due to difficulties finding appropriate packer positions. The interval was moved from 499.00 to 519.00 m bToC to 495.00–515.00 m after clearance with SKB.

All 100 m injection tests with a flow of more than 1 mL/min at a difference pressure of 200 kPa were repeated with a difference pressure as high as possible. The aim of these additional tests was to observe possible reactions in surrounding boreholes which were equipped with pressure transducers and packersystems by SKB. Measurements in the observation holes were done by SKB. These additional tests were performed in all 100 m test sections except 111.00–211.00 m and 311.00–411.00 m bToC.

5 Results

In the following, results of all tests are presented and analysed. Chapters 5.1 to 5.3 present the 100 m, 20 m and 5 m injection tests, respectively. The pump tests are presented in Chapter 5.4. 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. Similarly, the results of the analysis of both pumping tests are presented in Chapter 5.4. 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 400-06-144; SKB controlling document).

5.1 100 m single-hole injection tests

In the following, the 100 m section tests conducted in borehole KLX19A are presented and analysed. All 100 m section tests with a flow rate of more than 1 mL/min at a pressure difference of 200 kPa were repeated with a pressure difference as high as possible. That was done according to discussions with SKB to measure possible reaction in observation holes, which were equipped with a packer system and pressure gauges by SKB.

5.1.1 Section 111.00–211.00 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 very fast 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 using a pressure difference of 200 kPa. The automatic regulation system worked well. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 48.3 L/min at start of the CHi phase to 46.2 L/min at the end, indicating a very high interval transmissivity (consistent with the pulse recovery). The CHi phase is adequate for qualitative analysis. The CHir phase shows no problems and is adequate for quantitative analysis, too.

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 show a flat derivative at late times, indicating radial flow. Due to the high flow rate and the noisy data, the early time data are not representative for the formation. A two shell composite flow model was used for the analysis of the CHi phase. The CHir phase was analysed using a homogeneous radial flow model with wellbore storage and skin. The analysis is presented in Appendix 2-1.

Selected representative parameters

The recommended transmissivity of $2.4 \cdot 10^{-4}$ m^2/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 $7.0 \cdot 10^{-5}$ m^2/s to $5.0 \cdot 10^{-4}$ m^2/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 1,806.1 kPa.

The analyses of the CHi and CHir phases show some minor inconsistencies as far as the flow models concerned. This can be attributed to the high flow and the poor early time data quality. No further analysis is recommended.

5.1.2 Section 211.00–311.00 m, test no. 1 and 2, injection

Comments to test

The first test was aborted due to a technical problem with the Test valve. The test valve was not working properly due to two damaged o-rings inside the valve. The tool had to be pulled out and the test valve was replaced. Afterwards, a second test was conducted in this section.

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 fast 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 using a pressure difference of 204 kPa. A slight hydraulic connection to the adjacent zones was observed. The pressure above the interval increased during the injection by 3 kPa. The pressure increase in the bottom zone was time delayed and showed hydraulic communication via fractures. The pressure started to increase about 10 minutes after start of the injection and continued increasing during the remaining time of the test to a final value of +6 kPa compared to its starting pressure. The injection rate decreased from 41 L/min at start of the CHi phase to 27 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 both phases show a horizontal stabilisation at middle times followed by a downward trend, indicating increasing transmissivity or a change in flow dimension away from the borehole. A two shell composite flow model with increasing transmissivity was used for the analysis of both phases. Both phases show no clear stabilisation at late times. The analysis is presented in Appendix 2-2.

Selected representative parameters

The recommended transmissivity of $1.1 \cdot 10^{-5}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the better data and derivative quality. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-6}$ m^2/s to $5.0 \cdot 10^{-5}$ m^2/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 2,630.9 kPa.

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

5.1.3 Section 211.00–311.00 m, test no. 3, injection

Comments to test

The intention for this additional test was to conduct a constant head injection with a high pressure difference to observe potential reactions in observation holes. The test was conducted subsequently after the first test in this section. The packers were not deflated in between.

The test was composed of a constant pressure injection test phase with a pressure difference of 353 kPa, followed by a pressure recovery phase. A small hydraulic connection to both adjacent zones was observed. The pressure in the bottom zone rose with a delay of about 10 minutes by maximum 7 kPa. P above increased by 3 kPa during the injection phase. The injection rate control during the CHi phase was not very good. After 7 Minutes of injection the regulation unit opened an additional valve and the flow rate jumped from 39.7 to 42.7 L/min. From this point the regulation unit worked well and the rest of the injection phase is of good quality. The injection rate decreased from 45 L/min at start of the CHi phase to 38.6 L/min at the end, indicating a relatively high interval transmissivity (consistent with test 2 in this section). The recovery phase (CHir) shows no problems and is 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 a horizontal part at late times indicating a flow dimension of 2 (radial flow). A homogeneous radial flow model was chosen for the analysis of this phase. The derivative of the CHir phase shows a horizontal stabilisation at middle times followed by a downward trend, indicating an increase of transmissivity or a change in flow dimension at some distance from the borehole. A two shell composite flow model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-2a.

Selected representative parameters

The recommended transmissivity of $9.7 \cdot 10^{-6}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows the better data and derivative quality. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-6}$ m^2/s to $5.0 \cdot 10^{-5}$ m^2/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 2,633.0 kPa.

The analyses of the CHi and CHir phases show inconsistency regarding the chosen flow models. This can be explained with the poor data quality of the first part of the CHi phase. The transmissivity of the CHi phase is equal to the transmissivity of the outer zone of the CHir phase. The analyses of both phases show good consistency with the analyses of the phases of test 2. No further analysis is recommended.

5.1.4 Section 311.00–411.00 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 very slow recovery of the pulse test indicated a very low formation transmissivity. The slow recovery is supported by the packer compliance. Based on this result a constant pressure test was performed manually without using the regulation unit. After only a few minutes, the flowrate dropped below the measurement limit of 1 mL/min and the injection phase was aborted after ten minutes. None of the test phases is analysable.

The measured data is presented in Appendix 2-3.

Selected representative parameters

Based on the test response the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.1.5 Section 411.00–511.00 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 recovery of the pulse test indicated a moderate to 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 using a pressure difference of 204 kPa. A slight hydraulic connection to the bottom zone was observed. The pressure in the bottom zone increased during the injection by 10 kPa. The automatic regulation system worked well. However, the recorded early time data is noisy. The injection rate decreased from 3.4 L/min at start of the CHi phase to 1.6 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 both phases show a horizontal part at middle times and a downward trend at late times indicating a change in flow dimension or the transition to a zone of higher transmissivity. Both phases were analysed using a radial two shell composite flow model with increasing transmissivity at some distance from the borehole. The analysis is presented in Appendix 2-4.

Selected representative parameters

The recommended transmissivity of $9.5 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be $6.0 \cdot 10^{-7}$ m^2/s to $3.0 \cdot 10^{-6}$ m^2/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 4,274.7 kPa.

The analyses of the CHi and CHir phases show good consistency regarding the chosen flow models and the derived values for transmissivity and skin. No further analysis is recommended.

5.1.6 Section 411.00–511.00 m, test no. 2, injection

Comments to test

The intention for this additional test was to conduct a constant head injection with a high pressure difference to observe potential reactions in observation holes. The test was conducted subsequently after the first test in this section. The packers were not deflated in between.

The test was composed of a constant pressure injection test phase with a pressure difference of 353 kPa, followed by a pressure recovery phase. A small hydraulic connection to the bottom zone was observed. The bottom zone pressure did increase by 18 kPa during the CHi phase. The injection rate control during the CHi phase was good and it took less than 1 minute to get into the range of the target pressure +/–10 kPa. But it took nearly five minutes to get really stable conditions with a stable injection pressure. The injection rate decreased from 8.6 L/min at start of the CHi phase to 3.0 L/min at the end, indicating a moderate to high interval transmissivity (consistent with test 1 in this section). The recovery phase (CHir) shows no problems and is 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 both phases show a horizontal stabilisation at middle times followed by a downward trend, indicating an increase of transmissivity or a change in flow dimension at some distance from the borehole. A two shell composite flow was chosen for the analysis of the CHI and CHir phase. The analysis is presented in Appendix 2-4a.

Selected representative parameters

The recommended transmissivity of $6.1 \cdot 10^{-7}$ m²/s was derived from the analysis of the CHi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be $4.0 \cdot 10^{-7}$ m²/s to $2.0 \cdot 10^{-6}$ m²/s. The flow dimension displayed during the test is 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 4,275.4 kPa.

The analyses of the CHi and CHir phases show good consistency. The results of test 1 in this section are consistent with the results of this test. No further analysis is recommended.

5.1.7 Section 511.00–611.00 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 recovery of the pulse test indicated a moderate to 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 using a pressure difference of 202 kPa. No hydraulic connection to the adjacent zones was observed. The automatic regulation system worked well. The injection rate decreased from 6.6 L/min at start of the CHi phase to 3.5 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 both phases show a downward trend at middle times followed by a horizontal stabilisation at late times, indicating radial flow. This is characteristic for a transition to a zone of higher transmissivity. Both phases were analysed using a radial two shell composite flow model with increasing transmissivity at some distance from the borehole. The analysis is presented in Appendix 2-5.

Selected representative parameters

The recommended transmissivity of $5.5 \cdot 10^{-6}$ m²/s was derived from the analysis of the CHir phase (outer zone), which shows the most reliable data and derivative quality. The confidence range for the interval transmissivity is estimated to be $3.0 \cdot 10^{-6}$ m²/s to $8.0 \cdot 10^{-6}$ m²/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 5,105.8 kPa.

The analyses of the CHi and CHir phases show good consistency regarding the chosen flow models and the derived values for transmissivity and skin. No further analysis is recommended.

5.1.8 Section 511.00–611.00 m, test no. 2, injection

Comments to test

The intention for this additional test was to conduct a constant head injection with a high pressure difference to observe potential reactions in observation holes. The test was conducted subsequently after the first test in this section. The packers were not deflated in between.

The test was composed of a constant pressure injection test phase with a pressure difference of 451 kPa, followed by a pressure recovery phase. No hydraulic connection to the adjacent zones was observed. The injection rate control during the CHi phase was good. However, the early time data of the CHi phase are noisy. The injection rate decreased from 10.9 L/min at start of the CHi phase to 6.1 L/min at the end, indicating a moderate to high interval transmissivity (consistent with test 1 in this section). The recovery phase (CHir) shows no problems and is 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 both phases show a downward trend at middle times and a horizontal stabilisation at late times, which is characteristic for a flow dimension of 2 (radial flow). The downward trend was interpreted as the transition to a zone of higher transmissivity at some distance to the borehole. A two shell composite flow model was chosen for the analysis of the CHI and CHir phase. The analysis is presented in Appendix 2-5a.

Selected representative parameters

The recommended transmissivity of $6.2 \cdot 10^{-6}$ m²/s was derived from the analysis of the CHir phase (outer zone), which shows the most reliable and best data and derivative quality. The confidence range for the interval transmissivity is estimated to be $2.0 \cdot 10^{-6}$ m²/s to $8.0 \cdot 10^{-6}$ m²/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 5,108.4 kPa.

The analyses of the CHi and CHir phases show good consistency. The results of test 1 in this section are consistent with the results of this test. No further analysis is recommended.

5.1.9 Section 611.00–711.00 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 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 using a pressure difference of 201 kPa. A hydraulic connection to the bottom zone was observed. The bottom zone pressure increased with a short time delay after start of the injection slowly to +35 kPa at the end of the injection. The recorded early time data of the CHi phase is noisy and of poor quality due to the time needed by the system to get stable conditions. The injection rate decreased from 0.74 L/min at start of the CHi phase to 0.46 L/min at the end, indicating a medium to low interval transmissivity (consistent with the pulse recovery). The CHir phase and the late time data of the CHi 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 derivative of the CHi phase shows an upward trend at middle times, which is most likely caused by the poor data quality for early and middle time data. The analysis was conducted using a radial two shell composite flow model. The derivative of the CHir phase shows a horizontal stabilisation at late times, indicating radial flow. A radial homogeneous 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 $1.2 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/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 5,902.9 kPa.

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

5.1.10 Section 611.00–711.00 m, test no. 2, injection

Comments to test

The intention for this additional test was to conduct a constant head injection with a high pressure difference to observe potential reactions in observation holes. The test was conducted subsequently after the first test in this section.

The test was composed of a constant pressure injection test phase with a pressure difference of 450 kPa, followed by a pressure recovery phase. A hydraulic communication to the bottom zone was observed. With a short time delay the bottom pressure increased during the injection phase to a maximum value of +76 kPa at the end of the perturbation phase. No communication to the upper zone was observed. The injection rate control during the CHi phase was good, but the system needed some time to get stable conditions. The injection rate decreased from 3.9 L/min at start of the CHi phase to 0.9 L/min at the end, indicating a moderate interval transmissivity (consistent with test 1 in this section). Both phases are of good quality and 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 a horizontal stabilisation at middle and late times, indicating a flow dimension of 2 (radial flow). The CHi phase was analysed using a radial homogeneous flow model. The CHir phase shows an upward trend at late times, indicating a change in flow dimension or the transition to a zone of lower transmissivity. This phase was analysed using a radial two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-6a.

Selected representative parameters

The recommended transmissivity of $1.8 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows good data and derivative quality and a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/s. The flow dimension displayed during the test is 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 5,889.9 kPa.

The analyses of the CHi and CHir phases show good consistency. The results of test 1 in this section are consistent with the results of this test. No further analysis is recommended.

5.1.11 Section 694.00–794.00 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 recovery of the pulse test indicated a moderate to 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 using a pressure difference of 205 kPa. A slight hydraulic connection to the bottom zone was observed and the pressure Pb inceased by about 10 kPa due to the injection. No hydraulic connection to the upper zone was observed. The automatic regulation system worked well. The injection rate decreased from 5.7 L/min at start of the CHi phase to 1.2 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 both phases show an upward trend at middle times followed by a horizontal stabilisation at late times, indicating radial flow. This stabilisation is ambiguous at the CHir phase. However, both phases were analysed using a radial two shell composite flow model with decreasing transmissivity at some distance from theborehole. The analysis is presented in Appendix 2-7.

Selected representative parameters

The recommended transmissivity of $4.6 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows the clearest horizontal stabilisation at late times. Due to the slight communication to the bottom zone, this value should be regarded on the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-8}$ m^2/s to $6.0 \cdot 10^{-7}$ m^2/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 6,578.9 kPa.

The analyses of the CHi and CHir phases show good consistency regarding the chosen flow models and the derived values for transmissivity and skin. No further analysis is recommended.

5.1.12 Section 694.00–794.00 m, test no. 2, injection

Comments to test

The intention for this additional test was to conduct a constant head injection with a high pressure difference to observe potential reactions in observation holes. The test was conducted subsequently after the first test in this section.

The test was composed of a constant pressure injection test phase with a pressure difference of 453 kPa, followed by a pressure recovery phase. A hydraulic communication to the bottom zone was observed. The bottom pressure increased after start of the injection by about 60 kPa. No communication to the upper zone was observed. The injection rate control during the CHi phase was good, but the system needed some time to get stable conditions. The injection rate decreased from 6.8 L/min at start of the CHi phase to 2.3 L/min at the end, indicating a moderate to relatively high interval transmissivity (consistent with test 1 in this section). Both phases are of good quality and 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 a horizontal stabilisation at late times, indicating a flow dimension of 2 (radial flow). The CHi phase was analysed using a radial two shell composite flow model. The CHir phase shows an upward trend at middle times followed by a horizontal stabilisation and afterwards a downward trend. The CHir phase was analysed using a radial two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-7a.

Selected representative parameters

The recommended transmissivity of $4.1 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase (outer zone), which shows good data and derivative quality and a clear horizontal stabilisation. Due to the hydraulic connection to the bottom zone the derived transmissivity should be regarded at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-8}$ m^2/s to $6.0 \cdot 10^{-7}$ m^2/s. The flow dimension displayed during the test is 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 6,577.0 kPa.

The analyses of the CHi and CHir phases show good consistency. The results of test 1 in this section are consistent with the results of this test. No further analysis is recommended.

5.2 20 m single-hole injection tests

In the following, the 20 m section tests conducted in borehole KLX19A are presented and analysed.

5.2.1 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 fast 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 using a pressure difference of 205 kPa. Although it took some time for the regulation unit to get stable conditions, the regulation unit worked well. A hydraulic communication to the section above was observed. During the perturbation phase, the pressure in the section above increased by 6 kPa. The injection rate decreased from 48.5 L/min at start of the CHi phase to 45.4 L/min at the end, indicating a high interval transmissivity (consistent with the pulse recovery). Both phases 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 show a horizontal stabilisation at middle and late times, indicating radial flow. A radial homogeneous flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-8.

Selected representative parameters

The recommended transmissivity of $3.0 \cdot 10^{-4}$ m^2/s was derived from the analysis of the CHi phase, which shows the best derivative quality. Due to the hydraulic communication, this value is at the upper limit of the confidence range for the interval, which is estimated to be $6.0 \cdot 10^{-5}$ m^2/s to $4.0 \cdot 10^{-4}$ m^2/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 1,145.8 kPa.

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

5.2.2 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 recovery of the pulse test indicated a relatively 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The automatic regulation system worked well. The injection rate decreased from 70 mL/min at start of the CHi phase to 9.0 mL/min at the end, indicating a relatively 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 phase shows an upward trend at middle times and a flat part at late time data, which is indicative for a flow dimension of 2 (radial flow). The CHi phase was analysed using a two shell composite flow model. The derivative of the CHir phase shows a unit slope in middle and late times, which is indicative for a transition to a zone with lower transmissivity at some distance to the borehole or it indicates a closed system. A two shell composite model with decreasing transmissivity away from the borehole was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-9.

Selected representative parameters

The recommended transmissivity of $1.7 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHi phase (outer zone). The inner zone was interpreted as the skin zone. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-10}$ m^2/s to $7.0 \cdot 10^{-9}$ m^2/s. The analysis was conducted using a flow dimension of 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 1,297.7 kPa.

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

5.2.3 Section 151.00–171.00 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 moderate 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 2.4 L/min at start of the CHi phase to 1.9 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases are of good quality and 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 both phases show a clear horizontal stabilisation at middle and late times, indicating a flow dimension of 2 (radial flow). An infinite acting radial homogeneous flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-10.

Selected representative parameters

The recommended transmissivity of $4.1 \cdot 10^{-6}$ m^2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality and a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-6}$ m^2/s to $6.0 \cdot 10^{-6}$ m^2/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 1,477.0 kPa.

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

5.2.4 Section 171.00–191.00 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 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.

During the brief injection phase of the pulse injection a total volume of about 6.9 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 219 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $3.2 \cdot 10^{-11}$ m^3/Pa. It should be noted though thatthere 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 a continuing upward trend with a change in inclination at about half time on the log-log scale. This can be interpreted as the transition through the skin zone. The PI phase was analysed using a radial two shell composite flow model. The analysis is presented in Appendix 2-11.

Selected representative parameters

The recommended transmissivity of $4.2 \cdot 10^{-12}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-12}$ to $8.0 \cdot 10^{-12}$ m^2/s.

The analysis was conducted using a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity.

5.2.5 Section 191.00–211.00 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 slow 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. Due to the low flow rate, close to the measurement limit, the CHi data quality is very poor. The injection rate decreased from about 2 mL/min at start of the CHi phase to around 1 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Due to the low flow rate and the data quality the CHi phase could not be analysed. The CHir shows no problems and is 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. The response of the CHir phase indicates a transition from wellbore storage and skin dominated flow to pure formation flow. However, radial flow could not be reached. An infinite acting homogeneous radial flow model was used for the analysis. The analysis is presented in Appendix 2-12.

Selected representative parameters

The recommended transmissivity of $3.8 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHir phase, which is the only analysable phase of this test. Due to the low interval transmissivity the confidence range is estimated to be $8.0 \cdot 10^{-11}$ m^2/s to $8.0 \cdot 10^{-10}$ m^2/s. The analysis was conducted assuming a flow dimension of 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 1,791.3 kPa.

Although the transmissivity is very low, the data and derivative of the CHir phase are of good quality and give reliable results, even though they are within a range of about one order of magnitude for the transmissivity. The extrapolated static formation pressure is due to the short duration uncertain. No further analysis is recommended.

5.2.6 Section 211.00–231.00 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 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 using a pressure difference of 199 kPa. No hydraulic connection to the adjacent zones was observed. The automatic regulation system worked well. The injection rate decreased from 0.20 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). The CHir phase and the CHi 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 times (radial flow) followed by an upward trend indicating a change in transmissivity or in flow dimension. The CHi phase was analysed using a two shell composite flow model. The derivative of the CHir phase shows a dip after wellbore storage and skin effects. At late times, the derivative shows an upward trend indicating the transition to a zone of lower transmissivity. A two shell composite model with decreasing transmissivity was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-13.

Selected representative parameters

The recommended transmissivity of $2.0 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be $6.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/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 1,995.2 kPa.

The analyses of the CHi and CHir phases show good consistency regarding the chosen flow models and the derived transmissivities. No further analysis is recommended.

5.2.7 Section 231.00–251.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 50 kPa in 20 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). However, to confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. After start of the injection, the flow rate dropped very quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-14.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.2.8 Section 251.00–271.00 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 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 analysed.

During the brief injection phase of the pulse injection a total volume of about 12 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 220 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $5.4 \cdot 10^{-11}$ m^3/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 a continuing upward trend which can be interpreted to the fact that the dimensionless test time is to small and semi-logarithmic asymptotic solution was not achieved (due to the relative small transmissivity). The PI phase was analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-15.

Selected representative parameters

The recommended transmissivity of $1.2 \cdot 10^{-11}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $5.0 \cdot 10^{-12}$ to $5.0 \cdot 10^{-11}$ m^2/s. The analysis was conducted with a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity and the short duration of the test.

No further analysis is recommended.

5.2.9 Section 271.00–291.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 46 kPa in 20 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). However, to confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. After start of the injection, the flow rate dropped very quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-16.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.2.10 Section 291.00–311.00 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 fast 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 using a pressure difference of 205 kPa. No hydraulic connection to the adjacent zones was observed. The regulation unit needed some time to get stable conditions, but the rate control was good. The injection rate decreased from 40.0 L/min at start of the CHi phase to 27.6 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 both phases show a horizontal stabilisation at middle times followed by a downward trend, indicating increasing transmissivity or a change in flow dimension away from the borehole. A two shell composite flow model with increasing transmissivity was used for the analysis of both phases. Both phases show no clear stabilisation at late times. The relatively high wellbore storage (C) is a result of an increased interval volume due to fractures at about 299 m below ToC. The analysis is presented in Appendix 2-17.

Selected representative parameters

The recommended transmissivity of $1.1 \cdot 10^{-5}$ m²/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 $9.0 \cdot 10^{-6}$ m²/s to $5.0 \cdot 10^{-5}$ m²/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 2,628.8 kPa.

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

5.2.11 Section 411.00–431.00 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 recovery of the pulse test indicated a moderate 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The automatic regulation system worked well. The injection rate decreased from 34 mL/min at start of the CHi phase to 14 mL/min at the end, indicating a relatively low interval transmissivity (consistent with the pulse recovery). The data of both phases are of good quality and show no problems. They are both 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 flat derivative at middle times. At late times the derivative shows an upward trend. This was interpreted as the transition to a zone of lower transmissivity. The CHi phase was analysed using a two shell composite flow model. The derivative of the CHir phase is consistent with the CHi phase. It shows an upward trend after a stabilisation at middle times. A two shell composite model with wellbore storage and skin was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-18.

Selected representative parameters

The recommended transmissivity of $3.2 \cdot 10^{-8}$ m²/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 $9.0 \cdot 10^{-9}$ m²/s to $5.0 \cdot 10^{-8}$ m²/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 3,623.9 kPa.

The analyses of the CHi and CHir phases show consistency regarding the chosen flow models and derived transmissivities. No further analysis is recommended.

5.2.12 Section 431.00–451.00 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 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 using a pressure difference of 200 kPa. A slight hydraulic connection to the bottom zone was observed. The Pb pressure increased during the injection phase by 5 kPa. The rate control system worked well during the perturbation phase. The injection rate decreased from 0.69 L/min at start of the CHi phase to 0.33 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir and the CHi 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 both phases show a flat part at middle and late times, indicating a flow dimension of 2 (radial flow). An infinite acting homogeneous radial flow model was chosen for the analysis of both phases. The analysis is presented in Appendix 2-19.

Selected representative parameters

The recommended transmissivity of $3.0 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which has a better derivative quality. The confidence range for the interval transmissivity is estimated to be $2.0 \cdot 10^{-7}$ m^2/s to $7.0 \cdot 10^{-7}$ m^2/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 3,782.2 kPa.

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

5.2.13 Section 451.00–471.00 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 recovery of the pulse test indicated a medium to 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 using a pressure difference of 201 kPa. A slight hydraulic connection to the bottom zone was observed. The Pb pressure increased during the injection phase by 6 kPa. The rate control system worked well during the perturbation phase. The injection rate decreased from 2.98 L/min at start of the CHi phase to 1.49 L/min at the end, indicating a relatively high interval transmissivity (consistent with the pulse recovery). The CHir and the CHi 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 flat part at middle times, followed by a downward trend at late times, which is characteristic for a transition to a higher permeable zone. The CHir phase shows a flat derivative at middle times and a downward trend at late times, as well. Both phases were analysed using a two shell composite flow model. The analysis is presented in Appendix 2-20.

Selected representative parameters

The recommended transmissivity of $1.5 \cdot 10^{-6}$ m^2/s was derived from the analysis of the CHir phase (outer zone); the inner zone was interpreted as skin effected. The confidence range for the interval transmissivity is estimated to be $7.0 \cdot 10^{-7}$ m^2/s to $4.0 \cdot 10^{-6}$ m^2/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 3,944.1 kPa.

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

5.2.14 Section 471.00–491.00 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 recovery of the pulse test indicated a moderate to 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The automatic regulation system worked well. However, the recorded early time data of the CHi phase are noisy. The injection rate decreased from 0.37 L/min at start of the CHi phase to 0.28 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows relatively fast recovery but is still 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 flat during the middle and late times. The derivative of the CHir phase shows a steep downward trend at middle times, which is consistent with a high positive skin. At late times the CHir derivative shows a horizontal stabilization. Both phases were analysed using an infinite acting homogeneous radial flow model. The analysis is presented in Appendix 2-21.

Selected representative parameters

The recommended transmissivity of $4.8 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows the best data quality. The confidence range for the interval transmissivity is estimated to be $2.0 \cdot 10^{-7}$ m^2/s to $8.0 \cdot 10^{-7}$ m^2/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 4,114.6 kPa.

The analyses of the CHi and CHir phases show inconsistency regarding the derived transmissivity. This can be attributed to the fast recovery of the CHir phase. No further analysis is recommended.

5.2.15 Section 491.00–511.00 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 recovery of the pulse test indicated a moderate 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 using a pressure difference of 200 kPa. A small hydraulic connection to the bottom zone was observed. During the injection phase the pressure below the bottom packer increased by 5 kPa. The automatic regulation system worked well. However, the recorded data of the CHi phase are noisy. The injection rate decreased from 0.32 L/min at start of the CHi phase to 0.19 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). The CHir phase shows relatively fast recovery but is still 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. No clear flat part or slope could be distinguished. Radial flow was assumed. The derivative of the CHir phase shows a steep downward trend at middle times, which is consistent with a high positive skin. At late times the CHir derivative shows a horizontal stabilization, which is very sensitive to the derivative smoothing factor. Both phases were analysed using an infinite acting homogeneous radial flow model. The analysis is presented in Appendix 2-22.

Selected representative parameters

The recommended transmissivity of $4.8 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows the most stable derivative. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-7}$ m^2/s to $8.0 \cdot 10^{-7}$ m^2/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 4,277.7 kPa.

The analyses of the CHi and CHir phases show consistency regarding the derived transmissivity and the flow models. No further analysis is recommended.

5.2.16 Section 511.00–531.00 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 fast 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 6.8 L/min at start of the CHi phase to 3.7 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 the derivative of the CHi phase shows a downward trend at late middle times and a horizontal stabilisation at late times. A two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a flat part at middle times followed by a downward trend and a second stabilisation at a lower level. This is indicative for the transition to a zone of higher transmissivity at some distance to the borehole. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-23.

Selected representative parameters

The recommended transmissivity of $4.9 \cdot 10^{-6}$ m^2/s was derived from the analysis of the CHi phase (outer zone), which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-6}$ m^2/s to $8.0 \cdot 10^{-6}$ m^2/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 4,444.2 kPa.

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

5.2.17 Section 530.00–550.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure increased by approx. 4 kPa in 20 minutes and stabilised. The very slow recovery of the preliminary pulse injection test indicated a very low formation transmissivity. To confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. The flow rate dropped quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-24.

Selected representative parameters

Based on the test response (very slow pulse recovery) the interval transmissivity is lower than $1.0 \cdot 10^{-10}$ m^2/s. No static pressure could be derived.

No further analysis recommended.

5.2.18 Section 550.00–570.00 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 slow recovery during the PSR phase (closed test valve) indicated a very low interval transmissivity. To verify a low flow, the Pulse injection test was skipped and the constant pressure injection phase (CHi) followed by a recovery phase (CHir) was conducted.

The CHi phase was conducted using a pressure difference of 251 kPa. No hydraulic connection to the adjacent zones was observed. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 backpressure. No pressure loss occurred during the injection phase. The injection rate decreased from 4.5 mL/min at start of the CHi phase to 2.6 ml/min at the end, indicating a low interval transmissivity. Due to the very low flow rate the recorded data of the flow rate is noisy and the results of the CHi phase should be regarded carefully. The CHir shows no problems and is 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. Due to the poor data quality the CHi phase is not very conclusive. However, in case of the present test an infinite acting homogenous radial flow model was used for the analysis of the CHi phase. The response of the CHir phase shows a very steep derivative at middle and late times, which is indicative for a high positive skin. Radial flow was not reached. An infinite acting homogeneous radial flow model was chosen for the analysis. The analysis is presented in Appendix 2-25.

Selected representative parameters

The recommended transmissivity of $2.0 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHir phase, which is very noisy but shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-10}$ m^2/s to $5.0 \cdot 10^{-9}$ m^2/s. The analysis was conducted using a flow dimension of 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 4,715.0 kPa. Due to the short test duration and the uncertainness concerning the flow model, this value is uncertain.

The analyses of the CHi and CHir phases show some inconsistency regarding the derived transmissivity. This inconsistency is caused by the high skin of the CHir phase and the short test duration. No further analysis recommended.

5.2.19 Section 571.00–591.00 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 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 tests was analysed.

During the brief injection phase of the pulse injection a total volume of about 13 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 240 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $5.92 \cdot 10^{-11}$ m^3/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 a continuing upward trend with a change in inclination at about half time and a horizontal stabilisation at end times on the log-log scale. This can be interpreted as the transition through the skin zone. The PI phase was analysed using a radial two shell composite flow model. The analysis is presented in Appendix 2-26.

Selected representative parameters

The recommended transmissivity of $1.1 \cdot 10^{-10}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $5.0 \cdot 10^{-11}$ to $5.0 \cdot 10^{-10}$ m^2/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.

5.2.20 Section 591.00–611.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 128 kPa in 16 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). However, to confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. After start of the injection, the flow rate dropped very quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-27.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis is recommended.

5.2.21 Section 611.00–631.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 10 kPa in 12 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-10}$ m^2/s). However, to confirm a flow below 1 mL/min a pulse injection and a manual injection without using the regulation unit were performed. After start of injection, the flow rate dropped very quickly below 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-28.

Selected representative parameters

Based on the test response the interval transmissivity is lower than $1.0 \cdot 10^{-10}$ m^2/s.

No further analysis is recommended.

5.2.22 Section 631.00–651.00 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 slow recovery of the pulse test indicated a relatively 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 using a pressure difference of 205 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 9.3 mL/min at start of the

CHi phase to 2.8 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Due to the low flow rate the CHi data is noisy. The recovery phase shows no problems and is 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 no clear horizontal stabilisation. A flow dimension of 2 was assumed and a homogenous flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows an upward trend during the entire test time. This is indicative for the transition to a zone of lower transmissivity at some distance to the borehole. The pressure response is dominated by wellbore and skin effects. No radial flow was reached. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-29.

Selected representative parameters

The recommended transmissivity of $1.2 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHi phase, which is noisy but still of amenable quality. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-10}$ m^2/s to $3.0 \cdot 10^{-9}$ m^2/s. The analysis was conducted using a flow dimension of 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 5,397.2 kPa.

The analyses of the CHi and CHir phases show some minor inconsistencies, mainly caused by the low interval transmissivity. No further analysis is recommended.

5.2.23 Section 651.00–671.00 m, test no. 2, injection

Comments to test

The first test (test no. 1) was disrupted during injection because of a power breakdown inside the testing container.

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 of the pulse test indicated a moderate 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 0.39 L/min at start of the CHi phase to 0.06 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 a steep upward trend at middle and late times without a horizontal stabilisation. A two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a flat part at middle times followed by an upward trend. This is indicative for the transition to a zone of lower transmissivity at some distance to the borehole or a change in flow dimension. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-30.

Selected representative parameters

The recommended transmissivity of $5.4 \cdot 10^{-8}$ m²/s was derived from the analysis of the CHir phase (inner zone), which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-8}$ m²/s to $7.0 \cdot 10^{-8}$ m²/s. The flow dimension displayed during the test is 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 5,612.5 kPa.

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

5.2.24 Section 671.00–691.00 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 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 using a pressure difference of 212 kPa. Hydraulic connection to the lower zone was observed where the pressure increased 28 kPa during injection and decreased 14 kPa during recovery. The upper zone showed no indication of a hydraulic connection. The injection rate decreased from 1.5 L/min at start of the CHi phase to 0.4 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 shows an upward trend at middle times with a horizontal stabilisation at late times. A two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a transition from wellbore storage and skin dominated flow to pure formation flow. The CHir phase was analysed using an infinte acting homogeneous radial flow model with wellbore storage and skin. The analysis is presented in Appendix 2-31.

Selected representative parameters

The recommended transmissivity of $2.3 \cdot 10^{-7}$ m²/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-8}$ m²/s to $6.0 \cdot 10^{-7}$ m²/s. The flow dimension displayed during the test is 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 5,743.3 kPa.

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

5.2.25 Section 691.00–711.00 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 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 using a pressure difference of 199 kPa. A small hydraulic connection for the section below was observed, the bottom pressure rose by 7 kPa during injection. The pressure in the section above was stable during the injection. The injection unit did not work very well and the pressure in the interval decreased by 6 kPa during the CHi phase. The injection rate decreased from 0.49 L/min at the start of the CHi phase to 0.13 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Both phases 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 a horizontal stabilisation at late times indicating radial flow. A two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a downward trend at late times. This is indicative for the transition to a zone of higher transmissivity at some distance to the borehole. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-32.

Selected representative parameters

The recommended transmissivity of $5.4 \cdot 10^{-8}$ m^2/s was derived from the analysis of the CHi phase, which shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-8}$ m^2/s to $8.0 \cdot 10^{-8}$ m^2/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 5,906.2 kPa.

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

5.2.26 Section 711.00–731.00 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 further intention was to conduct a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir).

However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 17 kPa in 19 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). However, a pulse injection test was performed and the pressure response indicated a low formation transmissivity, as well. To confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. The flow rate dropped quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases is analysable.

The measured data is presented in Appendix 2-33.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis is recommended.

5.2.27 Section 731.00–751.00 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 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 0.12 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

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 a horizontal stabilisation at middle to late times, indicating radial flow. A homogenous flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows a horizontal stabilisation at middle to late times. The CHir phase was analysed using a homogeneous flow model with wellbore storage and skin. The analysis is presented in Appendix 2-34.

Selected representative parameters

The recommended transmissivity of $2.3 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase, which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m^2/s to $5.0 \cdot 10^{-7}$ m^2/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 6,235.2 kPa.

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

5.2.28 Section 751.00–771.00 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 fast 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 using a pressure difference of 204 kPa. The lower zone showed a hydraulic connection during injection with an increase of 56 kPa and a decrease during recovery of 30 kPa. The upper zone showed no indication of a hydraulic connection. The injection rate decreased from 2.9 L/min at start of the CHi phase to 1.1 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 shows an upward trend at late middle times with a horizontal stabilisation at late times, indicating radial flow. A two shell composite flow model was chosen for the analysis of the CHi phase. The derivative of the

CHir phase shows a continuous upward trend at middle and late times. This is indicative for the transition to a zone of lower transmissivity at some distance to the borehole or for a flow dimension lower than 2. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-35.

Selected representative parameters

The recommended transmissivity of $3.6 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase (outer zone), which shows a horizontal stabilisation. Due to hydraulic communication to the bottom zone, this value should be regarded as the upper limit for the interval transmissivity. The confidence range for the interval transmissivity is estimated to be $7.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/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 6,397.8 kPa.

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

5.2.29 Section 771.00–791.00 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 using a pressure difference of 204 kPa. The lower zone had a steadily increasing pressure. During injection this pressure increased additionally by about 10 kPa, indicating hydraulic communication. No communication to the upper zone was observed. The injection rate decreased from 1.8 L/min at start of the CHi phase to 0.3 L/min at the end, indicating a medium transmissivity (consistent with the pulse recovery). The regulation unit needed some time to regulate constant pressure. Only middle and late time data are sufficient for quantitative analysis. The CHir phase shows no problems and is 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 stabilisation at middle to late times. A homogenous flow model was chosen for the analysis of the CHi phase. The derivative of the CHir phase shows an upward trend with a horizontal stabilisation at late times. This is indicative for the transition to a zone of lower transmissivity at some distance to the borehole. The CHir phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-36.

Selected representative parameters

The recommended transmissivity of $1.8 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be $7.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/s. The flow dimension displayed during the test is 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 6,546.2 kPa.

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

5.3 5 m single-hole injection tests

In the following, the 5 m section tests conducted in borehole KLX19A are presented and analysed.

5.3.1 Section 104.00–109.00 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 fast recovery of the pulse test indicated a very 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 50 L/min at start of the CHi phase to 40 L/min at the end, indicating a very high interval transmissivity (consistent with the pulse recovery). Due to the very high flow rate the derivative of the CHi phase is a little noisy. The derivative data of the CHir phase is a bit sparse as a result of a quick pressure recovery. Both phases 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 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 similar to the response of the CHi phase and a homogeneous flow model was chosen for the analysis too. The analysis is presented in Appendix 2-37.

Selected representative parameters

The recommended transmissivity of $6.8 \cdot 10^{-5}$ m^2/s was derived from the analysis of the CHi phase, which shows a horizontal stabilization and the best derivative quality. The confidence range for the interval transmissivity is estimated to be $3.0 \cdot 10^{-5}$ m^2/s to $8.0 \cdot 10^{-5}$ m^2/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 965.3 kPa.

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

5.3.2 Section 109.00–114.00 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 fast recovery of the pulse test indicated a very high formation transmissivity. Based on this result a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) was conducted. Due to a technical problem the injection was aborted and repeated. Only the CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 198 kPa. A slight hydraulic connection to the adjacent zones was observed. During the injection the pressure increased 2.2 kPa below, and 6.5 kPa above the interval. The injection rate decreased from 43 L/min at start of the CHi phase to 42 L/min at the end, indicating a very high interval transmissivity (consistent with the pulse recovery). The derivative of the CHir phase is a bit sparse as a result of a quick pressure recovery. Both phases 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 a horizontal stabilisation at middle and late times, indicating radial flow. A two shell composite flow model with decreasing transmissivity away from the borehole was used for the analysis of the CHi phase. The derivative of the CHir phase shows a steep downward trend in late early times, indicating a high positive skin. At middle and late times it shows a horizontal stabilization, which is very sensitive to the derivative smoothing factor. The analysis is presented in Appendix 2-38.

Selected representative parameters

The recommended transmissivity of $4.9 \cdot 10^{-4}$ m²/s was derived from the analysis of the CHi phase (outer zone), which shows a clear horizontal stabilization and the better derivative quality. Due to the hydraulic connection to the sections above and below the interval, the derived transmissivity should be regarded as the upper limit of the confidence range. Thus the confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-5}$ m²/s to $5.0 \cdot 10^{-4}$ m²/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 1,007.1 kPa.

The analyses of the CHi and CHir phases show some inconsistencies regarding the chosen flow models. The derived transmissivity values are consistent. No further analysis is recommended.

5.3.3 Section 411.00–416.00 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 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 using a pressure difference of 200 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 27 mL/min at start of the CHi phase to 17 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 shows an upward slope in middle times nearly reaching a horizontal stabilization at late times, indicating radial flow. A two shell composite radial flow model with decreasing transmissivity away from the borehole was used for the analysis of the CHi phase. The response of the CHir phase shows a short time of horizontal stabilization at middle times followed by an upward trend at late times, indicating the transition to a zone of lower transmissivity or a change in flow dimension at some distance to the borehole. A two shell composite model with wellbore storage, skin and a decreasing transmissivity was chosen for the analysis of the CHir phase. The analysis is presented in Appendix 2-39.

Selected representative parameters

The recommended transmissivity of $3.9 \cdot 10^{-8}$ m²/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization and the better derivative quality. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-9}$ m²/s to $5.0 \cdot 10^{-8}$ m²/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 3,500.9 kPa.

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

5.3.4 Section 416.00–421.00 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 slow recovery of the pulse test indicated a very low formation transmissivity. To confirm a flow below the measurement limit a constant head injection was performed subsequently. The pulse injection test was analysed.

During the brief injection phase of the pulse injection a total volume of about 3.8 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 221 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.7 \cdot 10^{-11}$ m³/Pa. During the CHi phase the flow rate dropped quickly below 1 mL/min and the test was stopped.

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 a horizontal stabilization at middle and late times, indicating radial flow. The PI phase was analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-40.

Selected representative parameters

The recommended transmissivity of $3.2 \cdot 10^{-10}$ m²/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-10}$ to $6.0 \cdot 10^{-10}$ m²/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

5.3.5 Section 421.00–426.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 72 kPa in 30 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$m²/s). None of the test phases is analysable.

The measured data is presented in Appendix 2-41.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.6 Section 426.00–431.00 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 analysed.

During the brief injection phase of the pulse injection a total volume of about 3.2 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 $1.4 \cdot 10^{-11}$ m^3/Pa.

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 a horizontal stabilization at middle and late times, indicating radial flow. The PI phase was analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-42.

Selected representative parameters

The recommended transmissivity of $2.3 \cdot 10^{-11}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-12}$ to $6.0 \cdot 10^{-11}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

5.3.7 Section 431.00–436.00 m, test no. 1, injection

Comments to test

The test design consisted of a preliminary pulse injection test with the goal of deriving a first estimate of the formation transmissivity. Due to packer compliance the pressure in the interval during the PSR increased 50 kPa in 12 min first and decreased 2 kPa afterwards. Therefore it was decided to skip the pulse injection and to conduct a sequence consisting of a constant pressure injection phase (CHi) and a recovery phase (CHir) directly. The CHi and CHir phases were analysed quantitatively.

The CHi phase was conducted using a pressure difference of 180 kPa. No hydraulic connection to the adjacent zones was observed. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 backpressure. The injection rate decreased from 2.5 mL/min at start of the CHi phase to 1 mL/min at the end, indicating a low interval transmissivity. Due to the low flow rate the recorded data of the flow rate is noisy and the results of the CHi phase should be regarded carefully. The CHir shows no problems and is 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. Data and derivative of the CHi phase are noisy due to the small flow rate. The derivative does not show horizontal stabilization clearly. Radial flow was assumed. The CHi phase was analysed using an infinite acting homogeneous flow model. The response of the CHir phase doesn't exceed the wellbore storage area. Similar to the CHi phase a homogeneous flow model was chosen for the analysis. The analysis is presented in Appendix 2-43.

Selected representative parameters

The recommended transmissivity of $1.6 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHi phase, which is close to show a horizontal stabilization. The result is uncertain due to low transmissivity and the short test time causing a noisy pressure response and derivative data. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-11}$ m^2/s to $8.0 \cdot 10^{-10}$ m^2/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 3,640.3 kPa.

The analyses of the CHi and CHir phases show consistency. Due to the low transmissivity the derived values for Transmissivity and static pressure are uncertain. No further analysis is recommended.

5.3.8 Section 436.00–441.00 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. To confirm a flow below the measurement limit a constant head injection test was performed subsequently. The pulse injection test was analysed.

During the brief injection phase of the pulse injection a total volume of about 2.4 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 219 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.1 \cdot 10^{-11}$ m^3/Pa. During the CHi phase the flow rate dropped quickly below 1 mL/min therefore the test was stopped.

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 a horizontal stabilization at middle time, indicating radial flow. The PI phase was analysed using a radial homogeneous flow model. The analysis is presented in Appendix 2-44.

Selected representative parameters

The recommended transmissivity of $1.8 \cdot 10^{-10}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-11}$ to $6.0 \cdot 10^{-10}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

5.3.9 Section 441.00–446.00 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 moderate 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 using a pressure difference of 206 kPa. No hydraulic connection to the adjacent zones was observed. Due to the regulation unit needing some time to adjust the pressure properly the early time pressure data of the CHi phase is very noisy. The injection rate decreased from 30 mL/min at start of the CHi phase to 23 mL/min at the end, indicating a moderate interval transmissivity (consistent with the pulse recovery). The late time data of the CHi and the CHir phase are of good quality and 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 no clear horizontal stabilization at middle and late times due to the disturbances of the early time data. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The response of the CHir phase shows a continuous downward slope at middle and late times, indicating a change in transmissivity or flow dimension at some distance to the borehole. A two shell composite flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-45.

Selected representative parameters

The recommended transmissivity of $2.9 \cdot 10^{-8}$ m^2/s was derived from the analysis of the CHi phase, which horizontal part is less sensitive to the derivative smoothing factor. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-8}$ m^2/s to $8.0 \cdot 10^{-8}$ m^2/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 3,745.9 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities. Inconsistencies concerning the flow model can be attributed to the poor data quality of the CHi phase. No further analysis is recommended.

5.3.10 Section 446.00–451.00 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 using a pressure difference of 200 kPa. Due to a slight hydraulic connection the pressure in the zone below the interval increased 5.5 kPa during injection. No hydraulic connection to the zone above the interval was observed. The injection rate decreased from 0.49 L/min at start of the CHi phase to 0.31L/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 a bit noisy but shows horizontal stabilization at middle time followed by a downward slope at late time. The derivative of the CHir phase shows a similar behaviour. Both phases were analysed using a two shell composite radial flow model with increasing transmissivity at some distance from the borehole. The analysis is presented in Appendix 2-46.

Selected representative parameters

The recommended transmissivity of $3.2 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase (inner zone), which shows horizontal stabilization and a better derivative quality than the CHir phase. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m^2/s to $8.0 \cdot 10^{-7}$ m^2/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 3,786.3 kPa.

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

5.3.11 Section 551.00–556.00 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 slow 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 using a pressure difference of 285 kPa. No hydraulic connection to the adjacent zones was observed. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 backpressure. The injection rate decreased from 3.4 mL/min at start of the CHi phase to 2.5 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 a bit noisy due to the small flow rate but shows horizontal stabilization at middle and late times. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The pressure response of the CHir phase doesn’t reach horizontal stabilization due to the given test time. The derivative shows the transition from wellbore storage and skin dominated flow to pure formation flow. Similar to the CHi phase a homogeneous radial flow model was chosen for the analysis. The analysis is presented in Appendix 2-47.

Selected representative parameters

The recommended transmissivity of $1.4 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although the derivative data is a bit noisy. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-10}$ m^2/s to $6.0 \cdot 10^{-9}$ m^2/s. The analyses were conducted using a flow dimension of 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 4,609.5 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.12 Section 556.00–561.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 18 kPa in 10 minutes. Anyhow the pulse test was started and after closing the valve the pressure kept rising due to packer compliance. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). None of the test phases are analysable.

The measured data is presented in Appendix 2-48.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.13 Section 561.00–566.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 295 kPa in 10 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). None of the test phases is analysable.

The measured data is presented in Appendix 2-49.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.14 Section 566.00–571.00 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 analysed.

During the brief injection phase of the pulse injection a total volume of about 3.7 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 225 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.6 \cdot 10^{-11}$ m^3/Pa.

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 is noisy at early times and shows a linear upward slope at middle and late times. This is indicative for a flow dimension less than 2 or for the transition to a zone with lower transmissivity at some distance to the borehole. The PI phase was therefore analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-50.

Selected representative parameters

The recommended transmissivity of $2.0\cdot10^{-10}$ m^2/s was derived from the analysis of the Pi phase (inner zone). The confidence range for the interval transmissivity is estimated to be $5.0\cdot10^{-11}$ to $5.0\cdot10^{-10}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

No further analysis is recommended.

5.3.15 Section 631.00–636.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 33 kPa in 10 minutes. Anyhow the pulse test was started and the pressure stabilized at constantly high values. After a while the pressure started to decrease slowly. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0\cdot10^{-11}$ m^2/s). Due to the overlapping of pressure response and packer compliance the test was skipped. The test phase is not analysable.

The measured data is presented in Appendix 2-51.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0\cdot10^{-11}$ m^2/s.

No further analysis recommended.

5.3.16 Section 636.00–641.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. After inflating the packers and closing the test valve, the pressure kept rising by approx. 20 kPa in 10 minutes. Anyhow the pulse test was started and at first the pressure stabilized at constantly high values and started to increase slowly later on. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). Due to covering of the pressure response by the packer compliance the test was skipped. The test phase is not analysable.

The measured data is presented in Appendix 2-52.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m²/s.

No further analysis recommended.

5.3.17 Section 641.00–646.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. After inflating the packers and closing the test valve, the pressure kept rising by approx. 17 kPa in 10 minutes. Anyhow the pulse test was started and at first the pressure stabilized at constantly high values and started to increase slowly later on. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m²/s). Due to covering of the pressure response by the packer compliance the test was skipped. The test phase is not analysable.

The measured data is presented in Appendix 2-53.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m²/s.

No further analysis recommended.

5.3.18 Section 646.00–651.00 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 slow 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 using a pressure difference of 238 kPa. No hydraulic connection to the adjacent zones was observed. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 back-pressure. The injection rate decreased from 9.8 mL/min at start of the CHi phase to 4.6 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 a bit noisy due to the small flow rate and shows an upward slope at middle time tending to horizontal stabilization at late time. A two shell composite radial flow model with decreasing transmissivity at some distance from the borehole was used for the analysis of the CHi phase. The pressure response of the CHir phase tends to horizontal stabilization at middle time and shows an upward trend at late time without reaching a final horizontal stabilization. The CHir phase was analysed with a two shell composite flow model similar to the CHi phase. The analysis is presented in Appendix 2-54.

Selected representative parameters

The recommended transmissivity of $2.0 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-9}$ m^2/s to $5.0 \cdot 10^{-9}$ m^2/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 5,388.8 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.19 Section 651.00–656.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). After inflating the packers and closing the test valve, the pressure kept rising by approx. 15 kPa in 10 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). However, a pulse injection test was started and showed a very slow recovery, indicating a very small transmissivity. To confirm a flow below 1 mL/min a manual injection without using the regulation unit was performed. After start of the injection, the flow rate dropped very quickly below the measurement limit of 1 mL/min and the test was stopped. None of the test phases are analysable.

The measured data is presented in Appendix 2-55.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.20 Section 656.00–661.00 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.

After start of the injection, the regulation unit did not react. Therefore the test was continued manually with backpressure from the vessel. The pressure difference was 234 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 38 mL/min at start of the CHi phase to 5 mL/min at the end, indicating a moderate to low interval transmissivity (consistent with the pulse recovery). Due to the time needed by the system to get stable pressure conditions the data quality of the CHi phase is quite poor. The CHir phase shows slow recovery. The CHir and the late time data of the CHi phase are sufficient 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 and shows an upward trend at late time. Early and middle time data are not available. The CHi phase was analysed using a two shell composite radial flow model. The response of the CHir phase shows an upward trend at middle and late times with a slope of 1, which is characteristic for a closed system. A composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-56.

Selected representative parameters

The recommended transmissivity of $6.5 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHi phase (outer zone). The inner zones of both phases are interpreted as skin zones. The confidence range for the interval transmissivity is estimated to be $3.0 \cdot 10^{-10}$ m^2/s to $3.0 \cdot 10^{-9}$ m^2/s. A flow dimension of 2 was assumed. 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 5,623.5 kPa. Due to the low transmissivity and the short test time, the derived head is not representative for the formation.

The analyses of the CHi and CHir phases show some inconsistencies due to poor data quality and too short test duration. No further analysis is recommended.

5.3.21 Section 661.00–666.00 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 slow recovery of the pulse test indicated a 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.

During the brief injection phase of the pulse injection a total volume of about 37.1 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 222 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.4 \cdot 10^{-10}$ m^3/Pa. 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.

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 response shows a linear upward slope at early and middle times followed by a horizontal stabilization. The downward trend at late times is due to uncertainties regarding the static pressure. This is indicative for the transition to a zone with lower transmissivity at some distance to the borehole. The PI phase was analysed using a two shell composite flow model with wellbore storage and skin. The analysis is presented in Appendix 2-57.

Selected representative parameters

The recommended transmissivity of $4.0 \cdot 10^{-10}$ m^2/s was derived from the analysis of the Pi phase (outer zone). The inner zone is interpreted as skin. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-10}$ to $8.0 \cdot 10^{-10}$ m^2/s. The flow dimension was assumed to be 2. The static pressure could not be extrapolated due to the low transmissivity.

No further analysis is recommended.

5.3.22 Section 666.00–671.00 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 using a pressure difference of 198 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 200 mL/min at start of the CHi phase to 60 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

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 a horizontal stabilization at early times followed by a continuous upward trend at middle time. The late time data tends to horizontal stabilization without reaching it during test time. Similar to the CHi phase the response of the CHir phase shows a trend to horizontal stabilization at early time with a subsequent upward slope at middle and late time, indicating a decrease in transmissivity at some distance from the borehole. The slope of 1 is indicative for a closed system. A two shell composite radial flow model was chosen for the analyses of both test phases. The analyses are presented in Appendix 2-58.

Selected representative parameters

The recommended transmissivity of $3.1 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows horizontal stabilization in a segment of the derivative. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-08}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/s. The flow dimension displayed during the test is 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 5,617.0 kPa. Due to the short test duration and the low transmissivity, the derived head is not representative for the formation.

The analyses of the CHi and CHir phases show consistency in the range of the resulting transmissivities and in the flow models. No further analysis is recommended.

5.3.23 Section 671.00–676.00 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 analysed.

During the brief injection phase of the pulse injection a total volume of about 4.2 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 229 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.8 \cdot 10^{-11}$ m^3/Pa.

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 response shows a linear upward slope at early time followed by a downward slope at middle time with a slight change of inclination at late time. The PI phase was therefore analysed using a two shell composite flow model with wellbore storage and skin and an increasing transmissivity at some distance to the borehole. The analysis is presented in Appendix 2-59.

Selected representative parameters

The recommended transmissivity of $3.7·10^{–11}$ m^2/s was derived from the analysis of the Pi phase (outer zone). The confidence range for the interval transmissivity is estimated to be $8.0·10^{–12}$ to $5.0·10^{–11}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

No further analysis is recommended.

5.3.24 Section 676.00–681.00 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 slow 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 using a pressure difference of 215 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 3.5 mL/min at start of the CHi phase to 2.6 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Due to the flow rate the CHi phase is very noisy but still amenable for quantitative analysis. The CHir phase shows no problems for the 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 noisy due to the small flow rate and shows horizontal stabilization throughout test time, indicating radial flow. An infinite acting homogeneous radial flow model was used for the analysis of the CHi phase. The pressure response of the CHir phase shows a downward slope at middle to late times without reaching horizontal stabilization. This is indicative for the transition from wellbore storage and skin dominated flow to pure formation flow. The CHir phase was analysed with a homogeneous flow model similar to the CHi phase. The analysis is presented in Appendix 2-60.

Selected representative parameters

The recommended transmissivity of $2.4·10^{–9}$ m^2/s was derived from the analysis of the CHi phase, which shows a continuous horizontal stabilization although the derivative is noisy. The confidence range for the interval transmissivity is estimated to be $8.0·10^{–10}$ m^2/s to $6.0·10^{–9}$ m^2/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 5,652.7 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.25 Section 681.00–686.00 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 using a pressure difference of 232 kPa. A hydraulic connection to the zone below the interval was observed. After the start of the injection the pressure increased by 30 kPa, indicating crossflow through fractures. No hydraulic connection to the zone above the interval was observed. The injection rate decreased from 1.8 L/min at start of the CHi phase to 0.4 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 due to the small flow rate. Although being noisy, the derivative shows horizontal stabilization at middle and late times, indicating radial flow. The pressure response of the CHir phase is noisy at early time and doesn't show horizontal stabilization at middle or late times. Both phases were analysed with an infinite acting homogeneous flow model. The analysis is presented in Appendix 2-61.

Selected representative parameters

The recommended transmissivity of $2.5 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows a continuous horizontal stabilization. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/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 5,697.2 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.26 Section 686.00–691.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. The pulse test was started but reached only a pressure difference of 82 kPa due to wrong settings for the injection pressure. After 2 minutes the injection was repeated with correct settings, but the interval pressure stabilized at constantly high values without any significant recovery. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than 1E–11 m^2/s). Due to covering of the pressure response by the packer compliance the test was skipped. The test phase is not analysable.

The measured data is presented in Appendix 2-62.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.27 Section 691.00–696.00 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 using a pressure difference of 214 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 100 mL/min at start of the CHi phase to 37 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

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 the trend shows downward at late times. The CHi phase was analysed using a two shell composite radial flow model. The response of the CHir phase shows a horizontal stabilisation at middle times followed by a downward slope at late times indicating an increasing transmissivity at some distance from the borehole. A two shell composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-63.

Selected representative parameters

The recommended transmissivity of $8.6 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHir phase (inner zone), which shows horizontal stabilization. The confidence range for the interval transmissivity is estimated to be $7.0 \cdot 10^{-9}$ m^2/s to $5.0 \cdot 10^{-8}$ m^2/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 5,781.8 kPa.

The analyses of the CHi and CHir phases show consistency in the range of the resulting transmissivities and flow models. No further analysis is recommended.

5.3.28 Section 696.00–701.00 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 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 using a pressure difference of 205 kPa. No hydraulic connection to the adjacent zones was observed. The injection rate decreased from 190 mL/min at start of the CHi phase to 92 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

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 bit noisy and shows an upward slope at middle times tending to horizontal stabilization at final late times. A two shell composite radial flow model with decreasing transmissivity at some distance from the borehole was used for the analysis of the CHi phase. The pressure response of the CHir phase tends to horizontal stabilization at middle time and shows an upward trend at late time without reaching a final horizontal stabilization. The CHir phase was analysed with a two shell composite flow model similar to the CHi phase. The analysis is presented in Appendix 2-64.

Selected representative parameters

The recommended transmissivity of $1.5 \cdot 10^{-7}$ m²/s was derived from the analysis of the CHir phase (inner zone), which shows a short sequence of horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m²/s to $3.0 \cdot 10^{-7}$ m²/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 5,819.5 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.29 Section 701.00–706.00 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 using a pressure difference of 210 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 77 mL/min at start of the CHi phase to 17 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 shows a downward trend at middle times, probably caused by the time needed to get stable conditions during the injection. At late times the derivative shows horizontal stabilization, indicating radial flow. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The response of the CHir phase shows an upward slope at middle times and the beginning of a horizontal stabilization at late times. This is characteristic for the transition to a zone of lower transmissivity at some distance from the borehole. Horizontal stabilisation was not reached during test time. A two shell composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-65.

Selected representative parameters

The recommended transmissivity of $7.8 \cdot 10^{-9}$ m²/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be $3.0 \cdot 10^{-9}$ m²/s to $3.0 \cdot 10^{-8}$ m²/s. The flow dimension displayed during the test is 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 5,845.9 kPa.

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

5.3.30 Section 706.00–711.00 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 using a pressure difference of 196 kPa. No hydraulic connection to the adjacent zones has been observed. The automatic regulation unit worked improperly. Constant pressure could not be kept up during injection and therefore the flow rate fluctuated between values from 4.0 to 6.0 mL/min roughly. As a general trend, the injection rate decreased from 5.4 mL/min at start of the CHi phase to 4.9 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The data quality of the CHi phase is poor and the recovery of the CHir phase is relatively fast. Both phases are still amenable for qualitative and quantitative analyses, but the results should be regarded with respect to the above mentioned 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 derivative of the CHi phase is very noisy. Radial flow was assumed. The pressure response of the CHir phase is less noisy but very sensitive to the smoothing factor. The fast recovery and the derivative are indicative for turbulent flow close to the borehole wall. Both phases were analysed with an infinite acting homogeneous flow model. The analysis is presented in Appendix 2-66.

Selected representative parameters

The recommended transmissivity of $3.8 \cdot 10^{-9}$ m^2/s was derived from the analysis of the CHi phase. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-9}$ m^2/s to $8.0 \cdot 10^{-9}$ m^2/s. A flow dimension of 2 was assumed. 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 5,914.6 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.31 Section 731.00–736.00 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 using a pressure difference of 196 kPa. The lower section (bottom zone) showed a pressure increase by 4 kPa during the injection and decrease by 4 kPa during the recovery. No hydraulic connection to the zone above the interval has been observed. The injection rate decreased from 92 mL/min at start of the CHi phase to 81 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

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 horizontal stabilization at middle and late times, indicating radial flow. The pressure response of the CHir shows horizontal stabilization at middle and late times. Both phases were analysed with an infinite acting homogeneous flow model. The analysis is presented in Appendix 2-67.

Selected representative parameters

The recommended transmissivity of $1.4 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHir phase, which shows a clear horizontal stabilization. The confidence range for the interval transmissivity is estimated to be $7.0 \cdot 10^{-8}$ m^2/s to $3.0 \cdot 10^{-7}$ m^2/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 6,115.3 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.32 Section 736.00–741.00 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 analysed.

The upper section showed a pressure increase by 10 kPa within 10 min prior the pulse injection. No hydraulic connection to the adjacent zones has been observed. During the brief injection phase of the pulse injection a total volume of about 3.4 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 208 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $1.8 \cdot 10^{-11}$ m^3/Pa.

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 response shows a linear upward slope at early time followed by a horizontal stabilization at middle and late times. The PI phase was therefore analysed using a homogeneous flow model. The analysis is presented in Appendix 2-68.

Selected representative parameters

The recommended transmissivity of $6.2 \cdot 10^{-11}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $3.0 \cdot 10^{-11}$ to $8.0 \cdot 10^{-11}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

No further analysis is recommended.

5.3.33 Section 741.00–746.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 360 kPa in 10 minutes. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). The test was skipped. None of the test phases is analysable.

The measured data is presented in Appendix 2-69.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.34 Section 746.00–751.00 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 using a pressure difference of 210 kPa. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 backpressure. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 2.3 mL/min at start of the CHi phase to 1.4 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Due to the small flow rate the data of the CHi phase is very noisy. The CHir phase shows no problems. Although the CHi phase being noisy, both phases 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 the trend shows horizontal stabilization at middle and late times. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The derivative of the CHir phase shows the transition from wellbore storage and skin dominated flow to pure formation flow. Horizontal stabilisation was not reached during test time. A two shell composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-70.

Selected representative parameters

The recommended transmissivity of $8.4 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be $6.0 \cdot 10^{-10}$ m^2/s to $3.0 \cdot 10^{-9}$ m^2/s. The flow dimension displayed during the test is 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 6,239.3 kPa.

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

5.3.35 Section 751.00–756.00 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 using a pressure difference of 210 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 5.0 mL/min at start of the CHi phase to 1.8 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). Due to the small flow rate, the data of the CHi phase is noisy. The CHir phase shows no problems. However, both phases 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 the trend shows horizontal stabilization at late times. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The response of the CHir phase shows an upward slope with a slight change of inclination at middle times which indicates an increasing transmissivity at some distance from the borehole. At late time horizontal stabilization seems to be reached. A two shell composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-71.

Selected representative parameters

The recommended transmissivity of $6.8 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be $4.0 \cdot 10^{-11}$ m^2/s to $2.0 \cdot 10^{-9}$ m^2/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 6,278.0 kPa.

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

5.3.36 Section 756.00–761.00 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 slow 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 using a pressure difference of 238 kPa. No hydraulic connection to the adjacent zones was observed. Due to the expected small injection rate, the CHi phase was conducted without the automatic regulation, directly from the injection vessel with N_2 back-pressure. The injection rate decreased from 4.8 mL/min at start of the CHi phase to 1.8 mL/min at the end, indicating a low interval transmissivity (consistent with the pulse recovery). The CHi phase is very noisy due to the low flow rate. However both phases 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 due to the small flow rate. Assuming a flow dimension of 2, the derivative shows a downward slope at middle time without reaching a horizontal stabilization at late time. A two shell composite radial flow model with increasing transmissivity at some distance from the borehole was used for the analysis of the CHi phase. The CHir phase shows the transisition to pure formation flow with reaching a horizontal stabilisation. The CHir phase was analysed with an infinite acting homogenous radial flow model. The analysis is presented in Appendix 2-72.

Selected representative parameters

The recommended transmissivity of $3.8 \cdot 10^{-10}$ m^2/s was derived from the analysis of the CHir phase, which shows a horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-10}$ m^2/s to $8.0 \cdot 10^{-10}$ m^2/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 6,310.8 kPa.

The analyses of the CHi and CHir phases show consistency in the resulting transmissivities and flow models. No further analysis is recommended.

5.3.37 Section 761.00–766.00 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 analysed.

The test section showed a pressure increase by 9 kPa within in 12 min prior the pulse injection. No hydraulic connection to the adjacent zones has been observed. During the brief injection phase of the pulse injection a total volume of about 4.7 mL was injected (derived from the flow meter readings). This injected volume produced a pressure increase of 228 kPa. Using a dV/dP approach, the wellbore storage coefficient relevant for the subsequent pressure recovery can be calculated to $2.1 \cdot 10^{-11}$ m^3/Pa.

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 response shows a linear upward slope at early time followed by a horizontal stabilization at middle and late times. The PI phase was therefore analysed using a homogeneous flow model. The analysis is presented in Appendix 2-73.

Selected representative parameters

The recommended transmissivity of $2.5 \cdot 10^{-11}$ m^2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-12}$ to $6.0 \cdot 10^{-11}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

No further analysis is recommended.

5.3.38 Section 766.00–771.00 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 slow 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 using a pressure difference of 211 kPa. The lower zone showed a pressure increase by 58 kPa during the injection and a pressure decrease by 32 kPa during the recovery, indicating hydraulic connection through fractures. No hydraulic connection to the zone above was observed. The injection rate decreased from 3.5 L/min at start of the CHi phase to 1.1 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

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 an upward slope at middle time and a horizontal stabilization at late time. This is indicative for the transition to a zone of lower transmissivity or a change in flow dimension. A two shell composite radial flow model with decreasing transmissivity at some distance from the borehole was used for the analysis of the CHi phase. The pressure response of the CHir phase tends to horizontal stabilization at middle time and shows an upward trend at late time without reaching a final horizontal stabilization. The CHir phase was analysed with a two shell composite flow model similar to the CHi phase. The analysis is presented in Appendix 2-72.

Selected representative parameters

The recommended transmissivity of $4.1 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase (outer zone), which shows a horizontal stabilization and a good data quality. Due to the hydraulic communication with the bottom zone, the derived value for T should be regarded as the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be $8.0 \cdot 10^{-8}$ m^2/s to $5.0 \cdot 10^{-7}$ m^2/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 6,397.2 kPa.

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

5.3.39 Section 771.00–776.00 m, test no. 1, injection

Comments to test

The intention was to conduct the test as a constant pressure injection test phase (CHi), followed by a pressure recovery phase (CHir). A preliminary pulse injection test should have shown a first estimate of the formation transmissivity. However, after inflating the packers and closing the test valve, the pressure kept rising by approx. 28 kPa in 10 minutes. Anyhow the pulse test was started and after closing the valve the pressure kept rising due to packer compliance. This phenomenon is caused by prolonged packer expansion in a very tight section (T probably smaller than $1.0 \cdot 10^{-11}$ m^2/s). None of the test phases is analysable.

The measured data is presented in Appendix 2-75.

Selected representative parameters

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than $1.0 \cdot 10^{-11}$ m^2/s.

No further analysis recommended.

5.3.40 Section 776.00–781.00 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 using a pressure difference of 197 kPa. The lower section shows an increasing pressure throughout the test from 6,522 kPa to 7,428 kPa. No hydraulic connection to the adjacent zones has been observed. The injection rate decreased from 1.7 L/min at start of the CHi phase to 0.3 L/min at the end, indicating a medium interval transmissivity (consistent with the pulse recovery). Although the regulation unit did not work properly at the beginning and at the end of the CHi phase, the data quality is still amenable for quantitative analysis. The CHir phase shows no problems and is 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 the trend shows horizontal stabilization at middle times. The CHi phase was analysed using an infinite acting homogeneous radial flow model. The response of the CHir phase shows a flat part at early and middle times followed by an upward slope and a final horizontal stabilisation at late times. This is characteristic for a change in flow dimension or change in transmissivity. A two shell composite radial flow model with wellbore storage and skin was chosen for the analysis. The analysis is presented in Appendix 2-76.

Selected representative parameters

The recommended transmissivity of $2.1 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be $9.0 \cdot 10^{-8}$ m^2/s to $4.0 \cdot 10^{-7}$ m^2/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 6,468.9 kPa.

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

5.4 Single-hole pump tests

In the following, the pump tests conducted in borehole KLX19A are presented and analysed.

5.4.1 Section 495.00–515.00 m, test no. 1, pumping

Comments to test

The test was conducted as a constant rate pump test phase with a flow rate of 2.1 L/min, followed by a pressure recovery phase. The maximum drawdown just before stop of flowing was about 120 kPa. All pressures are influenced by natural phenomena (e.g. tidal effects). A hydraulic connection between the test interval and the bottom zone was observed. The flow rate during the pumping phase of about 2.1 L/min and the resulting drawdown of about 120 kPa indicate a relatively moderate o high interval transmissivity. After approximate 786 hours of pumping, a water sample was taken. The CRw phase is noisy and unstable and therefore not analysable. The CRwR phase is very short compared to the perturbation phase. However, the recovery is of good quality and amenable 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 CRwr phase shows a relatively long transition period from Wellbore storage and skin dominated flow to pure formation flow. This is probably caused by the hydraulic communication to the bottom section. At late middle times and late times the derivative is flat, which is indicative for radial flow (flow dimension of 2). A radial composite flow model with increasing transmissivity at some distance to the borehole was chosen for the analysis of the CRwr phase. The analysis is presented in Appendix 2-78.

Selected representative parameters

The recommended transmissivity of $5.8 \cdot 10^{-6}$ m^2/s was derived from the analysis of the CRwr phase. Due to the hydraulic communication to the bottom zone, the derived value should be regarded as at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be $1.0 \cdot 10^{-6}$ to $6.0 \cdot 10^{-6}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CRwr phase using type curve extrapolation in the Horner plot to a value of 4,331.2 kPa. Due to the short duration of the recovery compared to the pumping time, this value is slightly uncertain.

5.4.2 Section 764.00–769.00 m, test no. 1, pumping

Comments to test

The test was conducted as a constant rate pump test phase with a flow rate of 0.8 L/min, followed by a pressure recovery phase. The maximum drawdown just before stop of flowing was about 235 kPa. A hydraulic connection between the test interval and the bottom zone was observed. Between approximately 14 and 20.5 hours elapsed time, the flow rate and the pressure in the test section became very noisy. The reason for this is unknown. The flow rate during the pumping phase of about 0.8 L/min and the resulting drawdown of about 235 kPa indicate a relatively moderate to low interval transmissivity. Due to malfunction of the bottom transducer, the reaction in the bottom zone could not be observed earlier. After approximate 160 hours of pumping, a water sample was taken. The CRw phase is very noisy and unstable and not analysable. The CRwR phase is relatively short compared to the perturbation phase. However, the recovery is of good quality and amenable 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 CRwr phase shows a gently inclined derivative at middle times, followed by a downward trend at late times, indicating either a change in flow dimension or in transmissivity. A radial composite flow model with increasing transmissivity at some distance to the borehole was chosen for the analysis of the CRwr phase. The analysis is presented in Appendix 2-77.

Selected representative parameters

The recommended transmissivity of $2.9 \cdot 10^{-7}$ m^2/s was derived from the analysis of the CRwr phase. Due to the hydraulic communication to the bottom zone, the derived value should be regarded as at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be $5.0 \cdot 10^{-8}$ to $3.0 \cdot 10^{-7}$ m^2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CRwr phase using type curve extrapolation in the Horner plot to a value of 6,404.6 kPa. Due to the short duration of the recovery compared to the pumping time, this value is slightly uncertain.

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 KLX19A (for nomenclature see Appendix 4 and below).

Borehole Sec up [m bToC]	Borehole Sec low [m bToC]	Date and time for test ttart YYMMDD hh:mm	Date and time for test stop YYMMDD hh:mm	Q_p (m^3/s)	Q_m (m^3/s)	t_p (s)	t_F (s)	p_0 (kPa)	p_i (kPa)	p_p (kPa)	p_F (kPa)	te_w (°C)	Test phases measured, Analysed test phases marked bold
111.00	211.00	070111 08:17	070111 10:39	7.77E–04	7.85E–04	1,800	1,800	1,801	1,804	2,004	1,806	9.5	**CHi / CHir**
211.00	311.00	070112 09:13	070112 14:01	4.50E–04	4.76E–04	1,800	1,800	2,632	2,630	2,834	2,637	10.8	**CHi / CHir**
211.00	311.00	070112 14:03	070112 15:20	6.43E–04	6.62E–04	1,800	1,800	2,637	2,636	2,989	2,643	10.8	**CHi / CHir**
311.00	411.00	070112 16:54	070112 18:28	#NV	#NV	#NV	#NV	3,459	#NV	#NV	#NV	12.0	–
411.00	511.00	070113 09:30	070113 11:44	2.68E–05	2.92E–05	1,800	1,800	4,275	4,275	4,479	4,281	13.2	**CHi / CHir**
411.00	511.00	070113 11:46	070113 12:57	5.00E–05	5.53E–05	1,800	1,800	4,280	4,280	4,723	4,288	13.2	**CHi / CHir**
511.00	611.00	070113 14:17	070113 16:33	5.85E–05	6.20E–05	1,800	1,800	5,102	5,102	5,304	5,110	14.6	**CHi / CHir**
511.00	611.00	070113 16:35	070113 17:43	1.01E–04	1.07E–04	1,800	1,800	5,110	5,110	5,561	5,118	14.6	**CHi / CHir**
611.00	711.00	070114 08:48	070114 11:01	7.67E–06	9.00E–06	1,800	2,700	5,926	5,911	6,112	5,938	16.0	**CHi / CHir**
611.00	711.00	070114 11:03	070114 12:42	1.55E–05	2.00E–05	1,800	1,800	5,926	5,915	6,365	5,986	16.0	**CHi / CHir**
694.00	794.00	070115 15:33	070115 17:24	1.93E–05	2.63E–05	1,800	1,800	6,596	6,578	6,783	6,619	17.0	**CHi / CHir**
694.00	794.00	070115 17:27	070115 21:48	3.80E–05	4.95E–05	1,800	1,800	6,598	6,594	7,047	6,598	17.0	**CHi / CHir**
111.00	131.00	070117 11:33	070117 13:30	7.50E–04	7.64E–04	1,200	1,200	1,142	1,143	1,348	1,146	8.5	**CHi / CHir**
131.00	151.00	070117 14:04	070117 15:56	1.33E–07	2.33E–07	1,200	1,200	1,312	1,317	1,517	1,381	8.8	**CHi / CHir**
151.00	171.00	070117 16:30	070117 17:52	3.17E–05	3.28E–05	1,200	1,200	1,479	1,479	1,679	1,481	9.0	**CHi / CHir**
171.00	191.00	070117 18:23	070118 08:17	#NV	#NV	10	18,000	1,646	1,651	1,870	1,716	9.2	**Pi**
191.00	211.00	070118 08:17	070118 10:20	2.00E–08	3.17E–08	1,200	1,200	1,808	1,819	2,024	1,861	9.5	**CHi / CHir**
211.00	231.00	070118 10:53	070118 12:18	1.33E–06	1.57E–06	1,200	1,200	1,972	1,973	2,172	2,002	9.7	**CHi / CHir**
231.00	251.00	070118 13:06	070118 14:00	#NV	#NV	#NV	#NV	2,137	#NV	#NV	#NV	9.9	–
251.00	271.00	070118 14:30	070118 15:53	#NV	#NV	10	2,700	2,301	2,306	2,526	2,468	10.2	**Pi**
271.00	291.00	070118 16:24	070118 17:13	#NV	#NV	#NV	#NV	2,468	#NV	#NV	#NV	10.4	–
291.00	311.00	070118 17:44	070118 19:04	4.60E–04	4.98E–04	1,200	1,200	2,632	2,629	2,834	2,636	10.7	**CHi / CHir**
411.00	431.00	070119 09:23	070119 10:47	2.33E–07	2.83E–07	1,200	1,200	3,621	3,622	3,822	3,639	12.2	**CHi / CHir**
431.00	451.00	070119 11:20	070119 12:40	5.50E–06	5.82E–06	1,200	1,200	3,785	3,783	3,983	3,783	12.5	**CHi / CHir**
451.00	471.00	070119 13:38	070119 14:58	2.50E–05	2.73E–05	1,200	1,200	3,951	3,950	4,151	3,954	12.8	**CHi / CHir**
471.00	491.00	070119 15:30	070119 16:52	4.67E–06	4.83E–06	1,200	1,200	4,117	4,114	4,314	4,114	13.0	**CHi / CHir**

Borehole Sec up [m bToC]	Borehole Sec low [m bToC]	Date and time for test ttart YYMMDD hh:mm	Date and time for test stop YYMMDD hh:mm	Q_p (m^3/s)	Q_m (m^3/s)	t_p (s)	t_F (s)	p_0 (kPa)	p_i (kPa)	p_p (kPa)	p_F (kPa)	te_w (°C)	Test phases measured, Analysed test phases marked bold
491.00	511.00	070119 17:26	070119 18:46	3.17E–06	3.33E–06	1,200	1,200	4,281	4,277	4,477	4,278	13.3	**CHi / CHir**
511.00	531.00	070120 08:21	070120 09:42	6.13E–05	6.47E–05	1,200	1,200	4,446	4,444	4,644	4,449	13.5	**CHi / CHir**
530.00	550.00	070120 10:18	070120 11:14	#NV	#NV	#NV	#NV	4,600	#NV	#NV	#NV	13.8	–
550.00	570.00	070120 11:45	070120 13:02	5.00E–08	5.00E–08	1,200	1,200	4,764	4,730	4,981	4,733	14.0	**CHi / CHir**
571.00	591.00	070120 13:39	070120 15:40	#NV	#NV	10	4,560	4,938	4,942	5,180	5,026	14.3	**Pi**
591.00	611.00	070120 16:19	070120 17:09	#NV	#NV	#NV	#NV	5,103	#NV	#NV	#NV	14.6	–
611.00	631.00	070120 17:41	070120 18:38	#NV	#NV	#NV	#NV	5,268	#NV	#NV	#NV	14.9	–
631.00	651.00	070121 08:29	070121 10:11	4.67E–08	5.33E–08	1,200	1,200	5,435	5,441	5,646	5,459	15.2	**CHi / CHir**
651.00	671.00	070121 13:18	070121 14:22	1.00E–06	1.70E–06	1,200	1,200	5,592	5,588	5,788	5,673	15.4	**CHi / CHir**
671.00	691.00	070121 14:52	070121 16:23	6.30E–06	6.95E–06	1,200	1,200	5,756	5,743	5,955	5,761	15.7	**CHi / CHir**
691.00	711.00	070121 16:56	070121 19:26	2.17E–06	2.67E–06	1,200	3,600	5,924	5,920	6,121	5,915	16.0	**CHi / CHir**
711.00	731.00	070122 08:46	070122 09:58	#NV	#NV	#NV	#NV	6,085	#NV	#NV	#NV	16.2	–
731.00	751.00	070122 10:50	070122 12:17	1.33E–06	1.38E–06	1,200	1,200	6,245	6,235	6,435	6,238	16.5	**CHi / CHir**
751.00	771.00	070122 13:36	070122 15:00	1.83E–05	2.35E–05	1,200	1,200	6,414	6,405	6,608	6,434	16.7	**CHi / CHir**
771.00	791.00	070122 15:43	070122 17:52	5.83E–06	6.57E–06	1,200	1,200	6,578	6,571	6,776	6,588	17.0	**CHi / CHir**
104.00	109.00	070124 09:08	070124 10:32	6.52E–04	6.69E–04	1,200	1,200	964	964	1,164	965	8.8	**CHi / CHir**
109.00	114.00	070124 10:57	070124 13:05	6.98E–04	7.04E–04	1,200	1,200	1,007	1,006	1,204	1,007	8.8	**CHi / CHir**
411.00	416.00	070124 17:05	070124 18:29	2.83E–07	3.17E–07	1,200	1,200	3,497	3,500	3,700	3,513	12.0	**CHi / CHir**
416.00	421.00	070125 08:23	070125 09:40	#NV	#NV	10	1,680	3,548	3,553	3,774	3,554	12.1	**Pi**
421.00	426.00	070125 10:04	070125 10:52	#NV	#NV	#NV	#NV	6,085	#NV	#NV	#NV	12.2	–
426.00	431.00	070125 11:16	070125 12:55	#NV	#NV	10	3,600	3,629	3,636	3,867	3,712	12.3	**Pi**
431.00	436.00	070125 13:20	070125 14:43	1.67E–08	1.83E–08	1,200	1,200	3,671	3,722	3,902	3,793	12.3	**CHi / CHir**
436.00	441.00	070125 15:07	070125 16:20	#NV	#NV	10	1,620	3,712	3,725	3,944	3,722	12.4	**Pi**
441.00	446.00	070125 16:48	070125 18:12	4.00E–07	4.17E–07	1,200	1,200	3,752	3,749	3,955	3,749	12.5	**CHi / CHir**
446.00	451.00	070125 18:36	070125 19:58	5.17E–06	5.50E–06	1,200	1,200	3,792	3,789	3,989	3,789	12.5	**CHi / CHir**
551.00	556.00	070126 09:34	070126 11:08	4.17E–08	4.50E–08	1,200	1,200	4,650	4,613	4,898	4,612	13.9	**CHi / CHir**
556.00	561.00	070126 11:34	070126 13:12	#NV	#NV	#NV	#NV	4,694	#NV	#NV	#NV	14.0	–
561.00	566.00	070126 13:58	070126 14:36	#NV	#NV	#NV	#NV	4,738	#NV	#NV	#NV	14.0	–
566.00	571.00	070126 14:59	070126 16:39	#NV	#NV	10	3,600	4,779	4,797	5,022	4,862	14.1	**Pi**

Borehole Sec up [m bToC]	**Borehole Sec low [m bToC]**	**Date and time for test ttart YYMMDD hh:mm**	**Date and time for test stop YYMMDD hh:mm**	**Q_p (m^3/s)**	**Q_m (m^3/s)**	**t_p (s)**	**t_F (s)**	**p_0 (kPa)**	**p_i (kPa)**	**p_p (kPa)**	**p_F (kPa)**	**te_w (°C)**	**Test phases measured, Analysed test phases marked bold**
631.00	636.00	070126 17:42	070126 19:21	#NV	#NV	#NV	#NV	5,309	#NV	#NV	#NV	15.0	–
636.00	641.00	070127 08:26	070127 09:20	#NV	#NV	#NV	#NV	5,353	#NV	#NV	#NV	15.0	–
641.00	646.00	070127 09:47	070127 10:37	#NV	#NV	#NV	#NV	5,393	#NV	#NV	#NV	15.1	–
646.00	651.00	070127 11:03	070127 12:37	7.67E–08	8.83E–08	1,200	1,200	5,434	5,418	5,656	5,443	15.2	**CHi / CHir**
651.00	656.00	070127 13:03	070127 13:58	#NV	#NV	#NV	#NV	5,475	#NV	#NV	#NV	15.2	–
656.00	661.00	070127 14:22	070127 16:11	8.33E–08	1.67E–07	1,200	1,200	5,516	5,536	5,770	5,686	15.3	**CHi / CHir**
661.00	666.00	070127 17:13	070127 19:22	#NV	#NV	10	5,400	5,557	5,560	5,782	5,557	15.4	**Pi**
666.00	671.00	070128 08:17	070128 09:42	1.00E–06	1.55E–06	1,200	1,200	5,598	5,595	5,793	5,671	15.4	**CHi / CHir**
671.00	676.00	070128 10:07	070128 11:55	#NV	#NV	10	3,600	5,638	5,642	5,871	5,695	15.5	**Pi**
676.00	681.00	070128 12:22	070128 13:51	4.33E–08	4.33E–08	1,200	1,200	5,679	5,664	5,879	5,661	15.6	**CHi / CHir**
681.00	686.00	070128 14:19	070128 15:44	6.95E–06	7.57E–06	1,200	1,200	5,720	5,706	5,938	5,724	15.6	**CHi / CHir**
686.00	691.00	070128 16:10	070128 17:06	#NV	#NV	#NV	#NV	5,761	#NV	#NV	#NV	15.7	–
691.00	696.00	070128 17:33	070128 18:59	6.17E–07	6.83E–07	1,200	1,200	5,802	5,792	6,006	5,792	15.8	**CHi / CHir**
696.00	701.00	070129 08:23	070129 09:47	1.55E–06	1.78E–06	1,200	1,200	5,846	5,838	6,043	5,852	15.8	**CHi / CHir**
701.00	706.00	070129 10:16	070129 11:59	2.67E–07	4.17E–07	1,200	1,200	5,885	5,886	6,095	5,993	15.9	**CHi / CHir**
706.00	711.00	070129 12:42	070129 14:12	8.33E–08	6.83E–08	1,200	1,200	5,927	5,923	6,118	5,916	16.0	**CHi / CHir**
731.00	736.00	070129 14:49	070129 16:18	1.33E–06	1.40E–06	1,200	1,200	6,131	6,118	6,321	6,118	16.3	**CHi / CHir**
736.00	741.00	070129 16:43	070129 18:22	#NV	#NV	10	3,600	6,171	6,183	6,396	6,211	16.3	**Pi**
741.00	746.00	070129 18:54	070129 19:33	#NV	#NV	#NV	#NV	6,212	#NV	#NV	#NV	16.4	–
746.00	751.00	070130 08:14	070130 09:54	1.67E–08	2.33E–08	1,200	1,200	6,256	6,262	6,483	6,273	16.5	**CHi / CHir**
751.00	756.00	070130 10:20	070130 12:02	2.67E–08	3.67E–08	1,200	1,200	6,296	6,307	6,527	6,340	16.6	**CHi / CHir**
756.00	761.00	070130 12:47	070130 14:29	2.83E–08	3.00E–08	1,200	1,200	6,338	6,347	6,568	6,365	16.6	**CHi / CHir**
761.00	766.00	070130 14:54	070130 16:35	#NV	#NV	10	3,600	6,377	6,388	6,616	6,468	16.7	**Pi**
766.00	771.00	070130 17:00	070130 18:21	1.91E–05	2.48E–05	1,200	1,200	6,417	6,409	6,620	6,441	16.8	**CHi / CHir**
771.00	776.00	070131 08:08	070131 09:01	#NV	#NV	#NV	#NV	6,460	#NV	#NV	#NV	16.8	–
776.00	781.00	070131 09:28	070131 11:02	5.67E–06	6.45E–06	1,200	1,200	6,500	6,492	6,691	6,508	16.9	**CHi / CHir**
495.00	515.00	20061128 19:53	20061205 15:52	3.50E–07	3.57E–07	2,827,044	12,780	4,316	4,311	4,186	4,306	13.3	CRw **/ CRwr**
764.00	769.00	20061207 15:07	20070109 12:28	1.33E–05	1.33E–05	578,490	9,588	6,404	6,391	6,150	6,347	16.8	CRw **/ CRwr**

Nomenclature	
Q_p	Flow in test section immediately before stop of flow [m³/s]
Q_m	Arithmetical mean flow during perturbation phase [m³/s]
t_p	Duration of perturbation phase [s]
t_f	Duration of recovery phase [s]
p_0	Pressure in borehole before packer inflation [kPa]
p_i	Pressure in test section before start of flowing [kPa]
p_p	Pressure in test section before stop of flowing [kPa]
p_F	Pressure in test section at the end of the recovery [kPa]
Te_w	Temperature in test section
Test phases	CHi Constant Head injection phase
	CHir: Recovery phase following the constant head injection phase
	CRw: Constant rate withdrawal
	CRwr: Recovery phase following the constanrt rate phase
	Pi: Pulse injection phase
#NV	not analysed/no values

Table 6-2. Results from analysis of hydraulic tests in KLX19A (for nomenclature see Appendix 4 and below).

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up m btoc	low m btoc	Q/s m^2/s	T_M m^2/s	Perturb. phase	Recovery phase	T_{f1} m^2/s	T_{f2} m^2/s	T_{s1} m^2/s	T_{s2} m^2/s	T_T m^2/s	T_{TMIN} m^2/s	T_{TMAX} m^2/s	C m^3/Pa	ξ –	dt_1 min	dt_2 min	p* kPa	h_{wif} m.a.s.l.
111.00	211.00	3.8E–05	5.0E–05	22	WBS2	1.2E–04	3.0E–04	2.4E–04	#NV	3.0E–04	7.0E–05	5.0E–04	4.4E–09	30.3	0.4	16.7	1,806.1	13.39
211.00	311.00	2.2E–05	2.8E–05	22	WBS22	1.9E–05	4.9E–05	1.1E–05	3.6E–05	1.1E–05	9.0E–06	5.0E–05	1.7E–08	–4.9	0.9	2.7	2,630.9	13.61
211.00	311.00	1.8E–05	2.3E–05	2	WBS22	4.9E–05	#NV	9.7E–06	3.2E–05	9.7E–06	8.0E–06	5.0E–05	1.0E–08	–4.6	1.0	3.2	2,633.0	13.82
311.00	411.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–10	1.0E–12	1.0E–10	#NV	#NV	#NV	#NV	#NV	#NV
411.00	511.00	1.3E–06	1.7E–06	22	WBS22	6.8E–07	1.7E–06	2.8E–07	9.5E–07	9.5E–07	6.0E–07	3.0E–06	4.7E–10	–4.9	#NV	#NV	4,274.7	13.97
411.00	511.00	1.1E–06	1.4E–06	22	WBS22	6.1E–07	1.5E–06	3.9E–07	2.4E–06	6.1E–07	4.0E–07	2.0E–06	2.3E–10	–3.5	0.5	5.5	4,275.4	14.04
511.00	611.00	2.8E–06	3.7E–06	22	WBS22	2.2E–06	5.4E–06	1.2E–06	5.5E–06	5.5E–06	3.0E–06	8.0E–06	1.1E–09	–4.1	8.9	25.9	5,105.8	15.39
511.00	611.00	2.2E–06	2.9E–06	22	WBS22	1.5E–06	4.8E–06	1.9E–06	6.2E–06	6.2E–06	2.0E–06	8.0E–06	4.6E–09	–2.0	9.9	27.1	5,108.4	15.66
611.00	711.00	3.7E–07	4.9E–07	22	WBS2	8.2E–07	2.3E–07	1.2E–07	#NV	1.2E–07	8.0E–08	4.0E–07	1.3E–09	–4.8	#NV	#NV	5,902.9	13.47
611.00	711.00	3.4E–07	4.4E–07	2	WBS22	1.8E–07	#NV	1.5E–07	1.0E–07	1.8E–07	8.0E–08	4.0E–07	4.1E–09	–3.6	1.6	20.2	5,889.9	12.15
694.00	794.00	9.3E–07	1.2E–06	22	WBS22	2.3E–06	4.6E–07	5.2E–07	2.6E–07	4.6E–07	9.0E–08	6.0E–07	1.1E–09	–4.0	7.8	23.6	6,578.9	13.45
694.00	794.00	8.2E–07	1.1E–06	22	WBS22	1.4E–06	4.1E–07	1.3E–06	3.3E–07	4.1E–07	9.0E–08	6.0E–07	1.4E–09	–0.9	8.8	24.9	6,580.7	13.63
111.00	131.00	3.6E–05	3.8E–05	2	WBS2	3.0E–05	3.0E–04	1.6E–04	#NV	3.0E–04	6.0E–05	4.0E–04	3.7E–09	0.0	0.4	18.5	1,145.8	13.39
131.00	151.00	6.5E–09	6.8E–09	22	WBS22	6.8E–09	1.7E–09	2.7E–08	1.3E–09	1.7E–09	9.0E–10	7.0E–09	1.1E–10	–1.9	#NV	#NV	1,297.7	12.00
151.00	171.00	1.6E–06	1.6E–06	2	WBS2	4.3E–06	#NV	4.1E–06	#NV	4.1E–06	1.0E–06	6.0E–06	5.4E–10	8.3	1.0	15.9	1,477.0	13.45
171.00	191.00	#NV	#NV	#NV	22	#NV	#NV	1.1E–11	4.2E–12	4.2E–12	1.0E–12	8.0E–12	3.2E–11	–1.1	#NV	#NV	#NV	#NV
191.00	211.00	9.6E–10	1.0E–09	#NV	WBS2	#NV	#NV	3.8E–10	#NV	3.8E–10	8.0E–11	8.0E–10	6.2E–11	–1.0	#NV	#NV	1,791.3	11.88
211.00	231.00	6.6E–08	6.9E–08	22	WBS22	1.2E–07	4.1E–08	2.0E–07	8.1E–08	2.0E–07	6.0E–08	4.0E–07	8.6E–11	7.3	1.3	4.5	1,995.2	15.88
231.00	251.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
251.00	271.00	#NV	#NV	#NV	22	#NV	#NV	4.9E–11	1.2E–11	1.2E–11	5.0E–12	5.0E–11	5.4E–11	–0.3	#NV	#NV	#NV	#NV
271.00	291.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
291.00	311.00	2.2E–05	2.3E–05	22	WBS22	2.3E–05	4.5E–05	1.1E–05	3.8E–05	1.1E–05	9.0E–06	5.0E–05	1.5E–08	–4.8	0.8	6.0	2,628.8	13.40
411.00	431.00	1.1E–08	1.2E–08	22	WBS22	1.1E–08	4.4E–09	3.2E–08	1.1E–08	3.2E–08	9.0E–09	5.0E–08	5.7E–11	7.5	3.2	6.0	3,623.9	14.39
431.00	451.00	2.7E–07	2.8E–07	2	WBS2	3.0E–07	#NV	6.4E–07	#NV	3.0E–07	2.0E–07	7.0E–07	6.1E–11	0.4	0.6	11.5	3,782.2	13.84
451.00	471.00	1.2E–06	1.3E–06	22	WBS22	8.1E–07	1.4E–06	4.6E–07	1.5E–06	1.5E–06	7.0E–07	4.0E–06	1.1E–09	–4.1	#NV	#NV	3,944.1	13.66
471.00	491.00	2.3E–07	2.4E–07	2	WBS2	4.8E–07	#NV	1.5E–06	#NV	4.8E–07	2.0E–07	8.0E–07	8.3E–11	6.5	0.7	16.8	4,114.6	14.34
491.00	511.00	1.6E–07	1.6E–07	2	WBS2	4.1E–07	#NV	5.4E–07	#NV	4.1E–07	1.0E–07	8.0E–07	9.1E–11	9.2	0.5	16.2	4,277.7	14.28

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up m btoc	low m btoc	Q/s m^2/s	T_M m^2/s	Perturb. phase	Recovery phase	T_{f1} m^2/s	T_{f2} m^2/s	T_{s1} m^2/s	T_{s2} m^2/s	T_T m^2/s	T_{TMIN} m^2/s	T_{TMAX} m^2/s	C m^3/Pa	ξ –	dt_1 min	dt_2 min	p* kPa	h_{wif} m.a.s.l.
511.00	531.00	3.0E–06	3.2E–06	22	WBS22	2.5E–06	4.9E–06	1.2E–06	6.2E–06	4.9E–06	1.0E–06	8.0E–06	2.7E–09	–2.0	4.4	18.8	4,444.2	14.56
530.00	550.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–10	1.0E–13	1.0E–10	#NV	#NV	#NV	#NV	#NV	#NV
550.00	570.00	2.0E–09	2.0E–09	2	WBS2	2.0E–09	#NV	1.1E–08	#NV	2.0E–09	8.0E–10	5.0E–09	6.3E–11	2.5	0.3	13.9	4,715.0	9.68
571.00	591.00	#NV	#NV	#NV	22	#NV	#NV	6.5E–10	1.1E–10	1.1E–10	5.0E–11	5.0E–10	5.9E–11	2.14	21.4	69.8	#NV	#NV
591.00	611.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
611.00	631.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–10	#NV	#NV	#NV	#NV	#NV	#NV
631.00	651.00	2.2E–09	2.3E–09	2	WBS22	1.2E–09	#NV	2.7E–09	6.9E–10	1.2E–09	8.0E–10	3.0E–09	5.4E–11	–0.4	1.9	12.7	5,397.2	11.83
651.00	671.00	4.9E–08	5.1E–08	22	WBS22	5.0E–08	8.3E–09	5.4E–08	1.8E–08	5.4E–08	1.0E–08	7.0E–08	1.9E–10	–3.3	0.5	2.9	5,612.5	17.15
671.00	691.00	2.9E–07	3.1E–07	22	WBS22	5.0E–07	2.5E–07	2.3E–07	#NV	2.3E–07	9.0E–08	6.0E–07	4.5E–09	1.9	#NV	#NV	5,743.3	13.85
691.00	711.00	1.1E–07	1.1E–07	22	WBS22	5.4E–08	#NV	4.6E–08	3.8E–08	5.4E–08	1.0E–08	8.0E–08	4.6E–11	–2.8	0.7	17.1	5,906.2	13.81
711.00	731.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
731.00	751.00	6.5E–08	6.8E–08	2	WBS2	1.9E–07	#NV	2.3E–07	#NV	2.3E–07	8.0E–08	5.0E–07	5.5E–11	3.7	1.7	15.8	6,235	14.11
751.00	771.00	8.9E–07	9.3E–07	22	WBS22	9.0E–07	3.6E–07	4.5E–07	2.5E–07	3.6E–07	7.0E–08	4.0E–07	3.4E–10	–2.6	7.3	16.9	6,398	14.06
771.00	791.00	2.8E–07	2.9E–07	2	WBS22	1.8E–07	#NV	2.0E–06	1.1E–07	1.8E–07	7.0E–08	4.0E–07	4.9E–10	–2.4	1.2	10.8	6,546.2	12.59
104.00	109.00	3.2E–05	2.6E–05	2	WBS2	6.8E–05	#NV	7.7E–05	#NV	6.8E–05	3.0E–05	8.0E–05	5.0E–09	4.2	1.1	16.8	965.3	13.57
109.00	114.00	3.5E–05	2.9E–05	22	WBS2	9.9E–05	4.9E–04	2.2E–04	#NV	4.9E–04	8.0E–05	5.0E–04	3.6E–09	10.4	0.6	14.8	1,007.1	13.62
411.00	416.00	1.4E–08	1.2E–08	22	WBS22	3.2E–08	1.1E–08	3.9E–08	1.4E–08	3.9E–08	8.0E–09	5.0E–08	1.9E–11	8.1	1.0	2.3	3,500.9	14.38
416.00	421.00	#NV	#NV	#NV	2	#NV	#NV	3.2E–10	#NV	3.2E–10	1.0E–10	6.0E–10	1.7E–11	1.0	0.2	20.8	#NV	#NV
421.00	426.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
426.00	431.00	#NV	#NV	#NV	2	#NV	#NV	2.3E–11	#NV	2.3E–11	9.0E–12	6.0E–11	1.4E–11	1.1	3.3	57.8	#NV	#NV
431.00	436.00	9.1E–10	7.5E–10	2	WBS2	1.6E–10	#NV	2.0E–11	#NV	1.6E–10	8.0E–11	8.0E–10	4.1E–11	–1.5	#NV	#NV	3,640.3	11.90
436.00	441.00	#NV	#NV	#NV	2	#NV	#NV	1.8E–10	#NV	1.8E–10	8.0E–11	6.0E–10	1.1E–11	1.3	0.2	7.3	#NV	#NV
441.00	446.00	1.9E–08	1.6E–08	2	WBS22	2.9E–08	#NV	2.4E–08	4.4E–08	2.9E–08	1.0E–08	8.0E–08	1.4E–11	4.5	2.0	13.5	3,745.9	14.31
446.00	451.00	2.5E–07	2.1E–07	22	WBS22	3.2E–07	6.1E–07	6.9E–07	1.2E–06	3.2E–07	8.0E–08	8.0E–07	3.9E–11	1.4	0.6	4.7	3,786.3	14.25
551.00	556.00	1.4E–09	1.2E–09	2	WBS2	1.4E–09	#NV	6.3E–09	#NV	1.4E–09	8.0E–10	6.0E–09	2.0E–11	2.0	0.7	16.6	4,609.5	10.59
556.00	561.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
561.00	566.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
566.00	571.00	#NV	#NV	#NV	22	#NV	#NV	2.0E–10	1.22E–11	2.0E–10	5.0E–11	5.0E–10	1.6E–11	0.6	0.3	14.1	#NV	#NV

Interval position		Stationary flow parameters		Transient analysis														
				Flow regime		Formation parameters											Static conditions	
up m btoc	low m btoc	Q/s m²/s	T_M m²/s	Perturb. phase	Recovery phase	T_{f1} m²/s	T_{f2} m²/s	T_{s1} m²/s	T_{s2} m²/s	T_T m²/s	T_{TMIN} m²/s	T_{TMAX} m²/s	C m³/Pa	ξ –	dt_1 min	dt_2 min	p* kPa	h_{wif} m.a.s.l.
631.00	636.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
636.00	641.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
641.00	646.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
646.00	651.00	3.2E–09	2.6E–09	22	WBS22	3.5E–09	1.8E–09	2.0E–09	8.08E–10	2.0E–09	9.0E–09	5.0E–09	2.6E–11	–1.1	1.0	2.6	5,388.8	10.97
651.00	656.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
656.00	661.00	3.5E–09	2.9E–09	22	WBS22	3.9E–09	6.5E–10	3.4E–08	5.30E–10	6.5E–10	3.0E–10	3.0E–09	1.4E–10	–0.8	#NV	#NV	5,623.5	26.59
661.00	666.00	#NV	#NV	#NV	22	#NV	#NV	1.6E–09	4.00E–10	4.0E–10	1.0E–10	8.0E–10	1.4E–10	–3.1	#NV	#NV	#NV	#NV
666.00	671.00	5.0E–08	4.1E–08	22	WBS22	8.0E–08	1.15E–08	3.1E–07	2.1E–08	3.1E–07	8.0E–08	4.0E–07	6.4E–11	4.8	0.4	1.0	5,617.0	17.61
671.00	676.00	#NV	#NV	#NV	22	#NV	#NV	9.3E–12	3.70E–11	3.7E–11	8.0E–12	5.0E–11	1.8E–11	–0.9	#NV	#NV	#NV	#NV
676.00	681.00	2.0E–09	1.6E–09	2	WBS2	2.4E–09	#NV	4.3E–09	#NV	2.4E–09	8.0E–10	6.0E–09	2.3E–11	4.2	0.6	11.7	5,652.7	12.93
681.00	686.00	2.9E–07	2.4E–07	2	WBS2	2.5E–07	#NV	2.2E–07	#NV	2.5E–07	9.0E–08	4.0E–07	3.9E–09	–1.2	1.1	16.9	5,697.2	13.31
686.00	691.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
691.00	696.00	2.8E–08	2.3E–08	2	WBS22	1.9E–08	4.8E–08	8.6E–09	3.4E–08	8.6E–09	7.0E–09	5.0E–08	4.7E–11	–2.6	#NV	#NV	5,781.8	13.61
696.00	701.00	7.4E–08	6.1E–08	22	WBS22	1.5E–07	4.9E–08	1.5E–07	3.4E–08	1.5E–07	8.0E–08	3.0E–07	6.5E–11	2.5	0.5	1.2	5,819.5	13.30
701.00	706.00	1.3E–08	1.0E–08	2	WBS22	7.8E–09	#NV	8.3E–08	4.3E–09	7.8E–09	3.0E–09	3.0E–08	1.9E–11	–1.0	6.5	16.5	5,845.9	11.83
706.00	711.00	4.2E–09	3.5E–09	2	WBS2	3.8E–09	#NV	7.2E–09	#NV	3.8E–09	1.0E–09	8.0E–09	1.2E–11	2.5	0.9	12.5	5,914.6	14.66
731.00	736.00	6.4E–08	5.3E–08	2	WBS2	1.7E–07	#NV	1.4E–07	#NV	1.4E–07	7.0E–08	3.0E–07	2.6E–11	7.9	0.6	3.8	6,115.3	14.34
736.00	741.00	#NV	#NV	#NV	2	#NV	#NV	6.2E–11	#NV	6.2E–11	1.0E–11	7.0E–11	1.8E–11	0.6	1.3	37.8	#NV	#NV
741.00	746.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
746.00	751.00	7.4E–10	6.1E–10	2	WBS2	8.4E–10	#NV	7.1E–10	#NV	8.4E–10	6.0E–10	3.0E–09	3.1E–11	1.6	1.0	14.5	6,239.3	14.51
751.00	756.00	1.2E–09	9.8E–10	2	WBS22	6.8E–10	#NV	2.0E–09	4.5E–10	6.8E–10	4.0E–10	2.0E–09	1.8E–11	0.2	3.7	17.1	6,278.0	14.30
756.00	761.00	1.3E–09	1.0E–09	22	WBS22	4.3E–10	1.4E–09	3.8E–10	#NV	3.8E–10	9.0E–11	9.0E–09	2.4E–11	–1.1	10.0	14.0	6,311	13.50
761.00	766.00	#NV	#NV	#NV	2	#NV	#NV	2.5E–11	#NV	2.5E–11	8.0E–12	6.0E–11	2.1E–11	0.4	2.5	36.3	#NV	#NV
766.00	771.00	8.9E–07	7.3E–07	22	WBS22	8.3E–07	4.1E–07	4.7E–07	2.4E–07	4.13E–07	8.0E–08	5.0E–07	3.1E–10	–3.0	#NV	#NV	6,397	14.00
771.00	776.00	#NV	#NV	#NV	#NV	#NV	#NV	#NV	#NV	1.0E–11	1.0E–13	1.0E–11	#NV	#NV	#NV	#NV	#NV	#NV
776.00	781.00	2.8E–07	2.3E–07	2	WBS22	2.1E–07	#NV	3.0E–06	1.2E–07	2.1E–07	9.0E–08	4.0E–07	6.8E–10	–1.8	2.1	13.0	6,469	13.02
495.00	515.00	2.70E–06	2.90E–06	#NV	WBS22	#NV	#NV	2.6E–06	5.8E–06	5.8E–06	1.0E–06	6.0E–06	6.8E–09	–2.2	11.4	95.5	4,331	16.38
764.00	769.00	5.40E–07	4.50E–07	#NV	WBS22	#NV	#NV	2.9E–07	7.2E–07	2.9E–07	5.0E–08	3.0E–07	9.7E–10	–4.6	0.6	23.3	6,405	16.37

Nomenclature	
Q/s	Specific capacity.
T_M	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_f	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.
T_s	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_T	Recommended transmissivity.
T_{TMIN}	Confidence range lower limit.
T_{TMAX}	Confidence range upper limit.
C	Wellbore storage coefficient.
ξ	Skin factor (calculated based on a storativity of $1 \cdot 10^{-6}$).
dt_1	Estimated start time of evaluation.
dt_2	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_{wif}	Fresh-water head (based on transducer depth and p*).
#NV	Not analysed/no values.

Table 6-3. Results from the ri-index calculation of hydraulic tests in KLX19A (see Section 4.5.5 for details and nomenclature).

Borehole secup [m b ToC]	Borehole seclow [m b ToC]	Recommended transmissivity Tt [m²/s]	ri-index [–]	Time t_2 for radius of influence calculation [s]	Radius of Influence ri [m]
111.00	211.00	3.0E–04	0	1,800	398.03
211.00	311.00	1.1E–05	–1	159	51.76
211.00	311.00	9.7E–06	–1	192	55.24
311.00	411.00	1.0E–10	#NV	#NV	#NV
411.00	511.00	9.5E–07	–1	1,800	94.54
411.00	511.00	6.1E–07	–1	332.4	36.43
511.00	611.00	5.5E–06	0	1,800	147.00
511.00	611.00	6.2E–06	0	1,800	151.23
611.00	711.00	1.2E–07	0	2,700	69.51
611.00	711.00	1.8E–07	0	1,800	62.16
694.00	794.00	4.6E–07	1	1,800	79.01
694.00	794.00	4.1E–07	1	1,800	76.76
111.00	131.00	3.0E–04	0	1,200	325.95
131.00	151.00	1.7E–09	1	#NV	#NV
151.00	171.00	4.1E–06	0	1,200	111.15
171.00	191.00	4.2E–12	1	#NV	#NV
191.00	211.00	3.8E–10	0	1,200	10.93
211.00	231.00	2.0E–07	1	271.8	25.00
231.00	251.00	1.0E–11	#NV	#NV	#NV
251.00	271.00	1.2E–11	1	#NV	#NV
271.00	291.00	1.0E–11	#NV	#NV	#NV
291.00	311.00	1.1E–05	–1	357	78.26
411.00	431.00	3.2E–08	1	357	18.00
431.00	451.00	3.0E–07	0	1,200	57.72
451.00	471.00	1.5E–06	0	#NV	#NV
471.00	491.00	4.8E–07	0	1,200	86.17
491.00	511.00	4.1E–07	0	1,200	62.73
511.00	531.00	4.9E–06	0	1,200	116.43
530.00	550.00	1.0E–10	#NV	#NV	#NV
550.00	570.00	2.0E–09	0	1,200	16.44
571.00	591.00	1.1E–10	#NV	#NV	#NV
591.00	611.00	1.0E–11	#NV	#NV	#NV
611.00	631.00	1.0E–11	#NV	#NV	#NV
631.00	651.00	1.2E–09	0	1,200	14.65
651.00	671.00	5.4E–08	1	175.8	14.41
671.00	691.00	2.3E–07	0	1,200	54.19
691.00	711.00	5.4E–08	0	1,200	37.65
711.00	731.00	1.0E–11	#NV	#NV	#NV
731.00	751.00	2.3E–07	0	1,200	54.07
751.00	771.00	3.6E–07	1	1,015.8	55.73
771.00	791.00	1.8E–07	0	1,200	50.97
104.00	109.00	6.8E–05	0	1,200	224.63
109.00	114.00	4.9E–04	0	888	257.77
411.00	416.00	3.9E–08	1	135.6	11.09

Borehole secup [m b ToC]	Borehole seclow [m b ToC]	Recommended transmissivity Tt [m²/s]	ri-index [–]	Time t_2 for radius of influence calculation [s]	Radius of Influence ri [m]
416.00	421.00	3.2E–10	0	1,680	12.41
421.00	426.00	1.0E–11	#NV	#NV	#NV
426.00	431.00	2.3E–11	0	3,600	9.39
431.00	436.00	1.6E–10	0	1,200	8.75
436.00	441.00	1.8E–10	0	1,620	10.56
441.00	446.00	2.9E–08	0	1,200	32.38
446.00	451.00	3.2E–07	0	1,200	58.86
551.00	556.00	1.4E–09	0	1,200	15.00
556.00	561.00	1.0E–11	#NV	#NV	#NV
561.00	566.00	1.0E–11	#NV	#NV	#NV
566.00	571.00	2.0E–10	1	846	7.76
631.00	636.00	1.0E–11	#NV	#NV	#NV
636.00	641.00	1.0E–11	#NV	#NV	#NV
641.00	646.00	1.0E–11	#NV	#NV	#NV
646.00	651.00	2.0E–09	1	153	5.92
651.00	656.00	1.0E–11	#NV	#NV	#NV
656.00	661.00	6.5E–10	1	#NV	#NV
661.00	666.00	4.0E–10	1	#NV	#NV
666.00	671.00	3.1E–07	1	57.6	12.80
671.00	676.00	3.7E–11	0	3,600	10.57
676.00	681.00	2.4E–09	0	1,200	17.39
681.00	686.00	2.5E–07	0	1,200	55.28
686.00	691.00	1.0E–11	#NV	#NV	#NV
691.00	696.00	8.6E–09	0	1,200	23.83
696.00	701.00	1.5E–07	1	70.8	11.87
701.00	706.00	7.8E–09	1	1,200	23.23
706.00	711.00	3.8E–09	0	1,200	19.43
731.00	736.00	1.4E–07	0	1,200	48.21
736.00	741.00	6.2E–11	0	3,600	12.03
741.00	746.00	1.0E–11	#NV	#NV	#NV
746.00	751.00	8.4E–10	0	1,200	13.33
751.00	756.00	6.8E–10	0	1,200	12.64
756.00	761.00	3.8E–10	0	1,200	10.94
761.00	766.00	2.5E–11	0	3,600	9.60
766.00	771.00	4.1E–07	1	1,200	62.73
771.00	776.00	1.0E–11	#NV	#NV	#NV
776.00	781.00	2.1E–07	0	1,200	53.10
495.00	515.00	5.8E–06	–1	1,398	61.82
764.00	769.00	2.9E–07	0	12,780	397.07

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

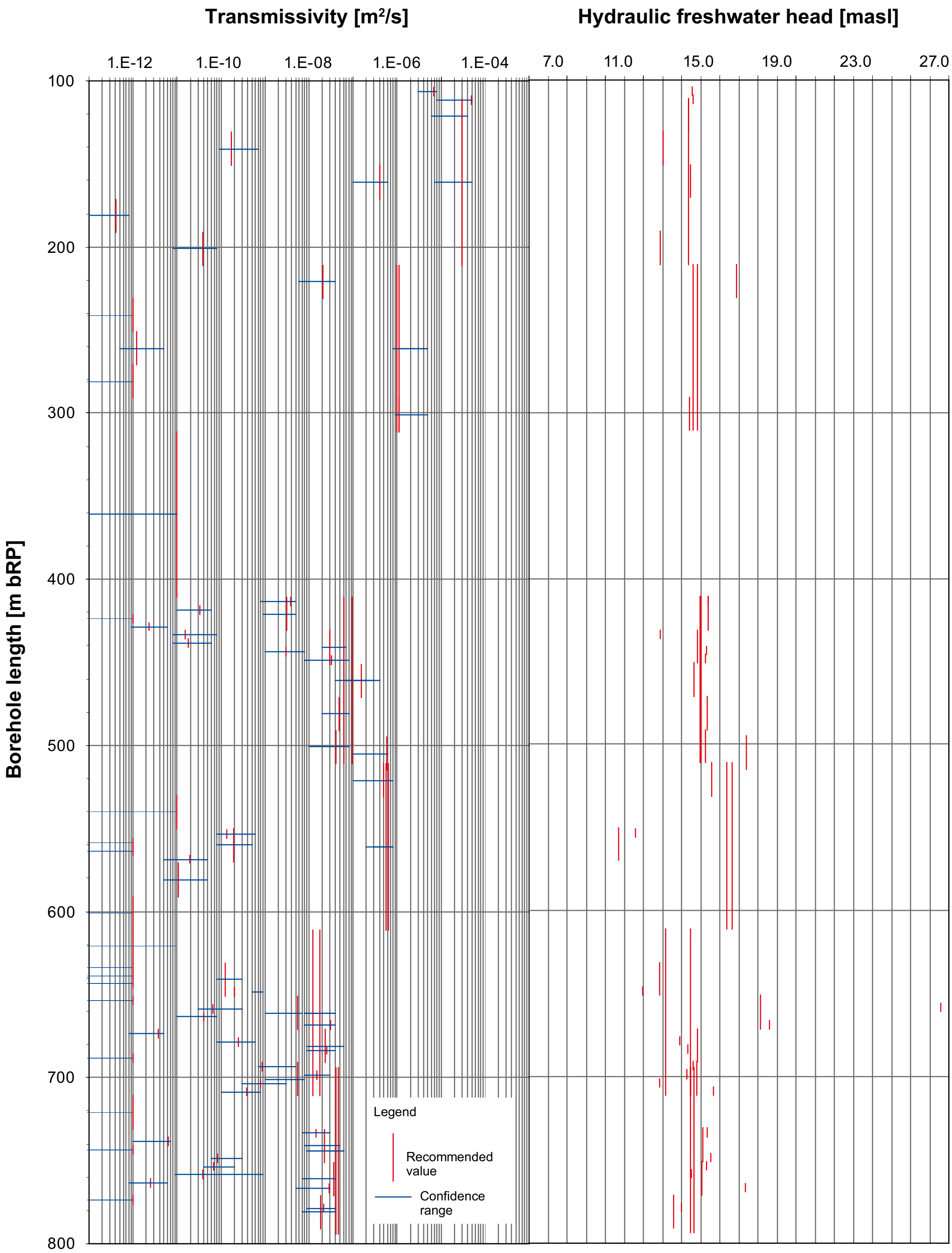


Figure 6-1. Results summary – profiles of transmissivity and equivalent freshwater head extrapolated.

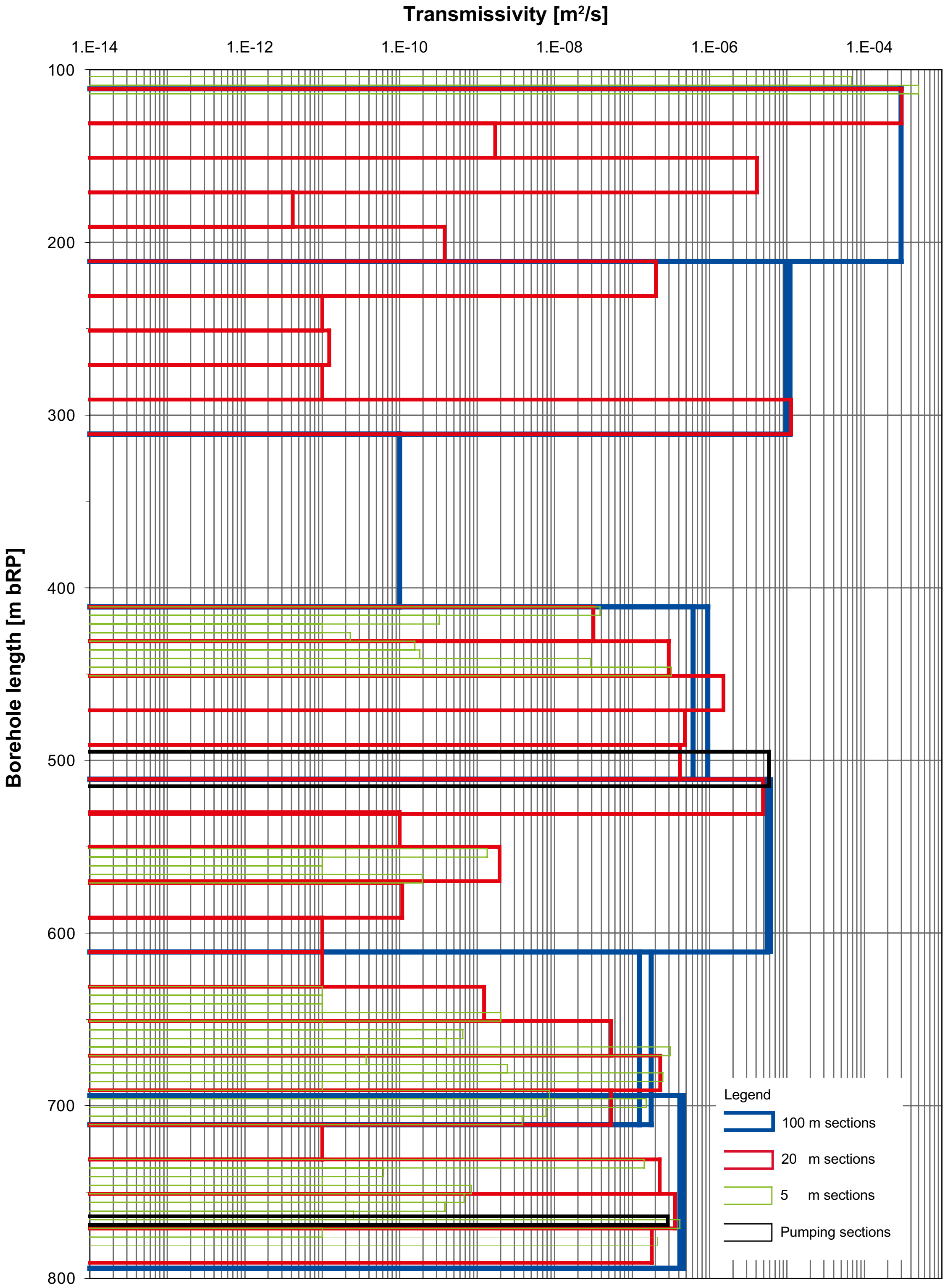


Figure 6-2. *Results summary – profile of transmissivity.*

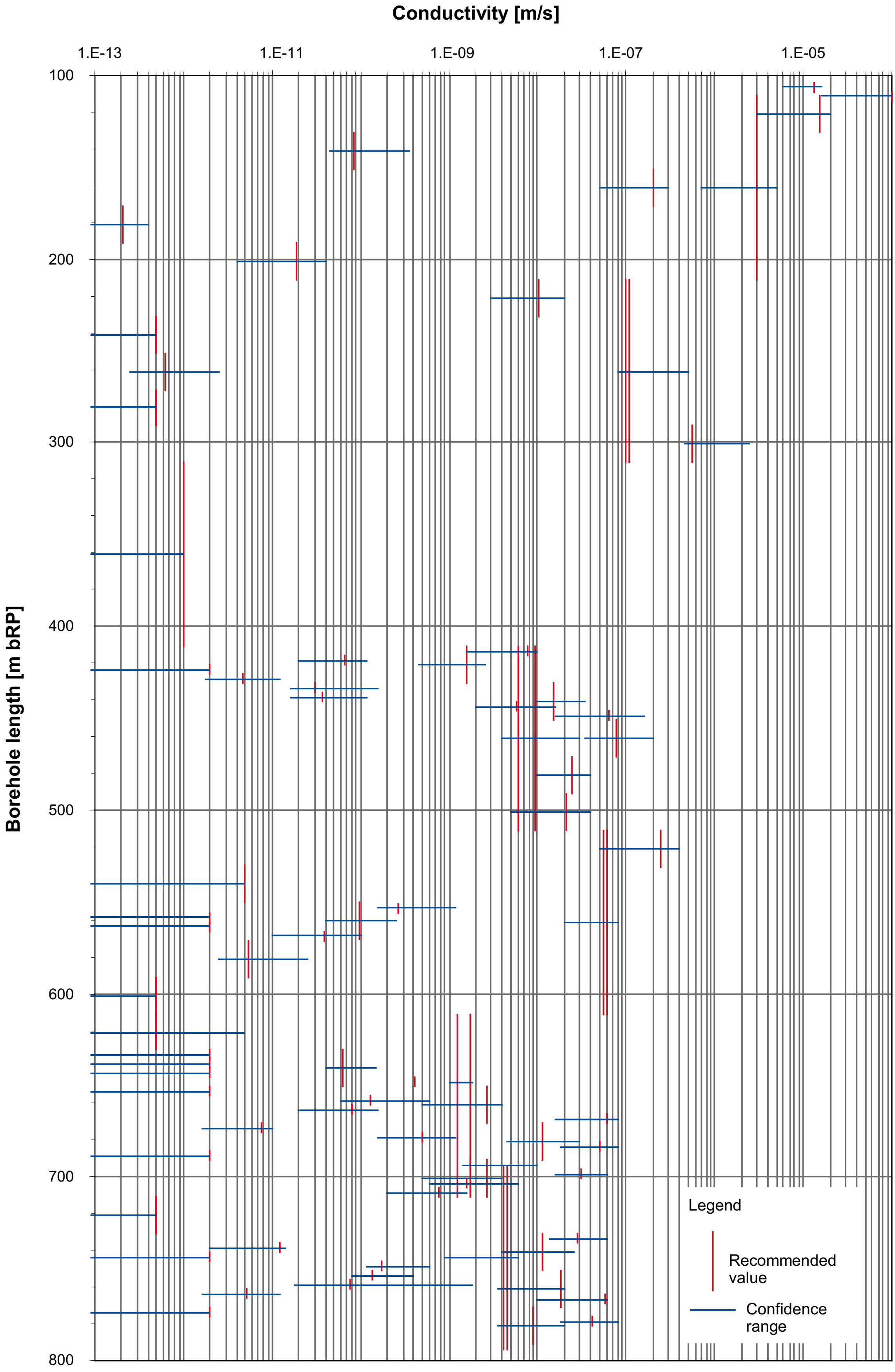


***Figure 6-3.** Results summary – profile of hydraulic conductivity.*

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 Figure 6-4).

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.

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.

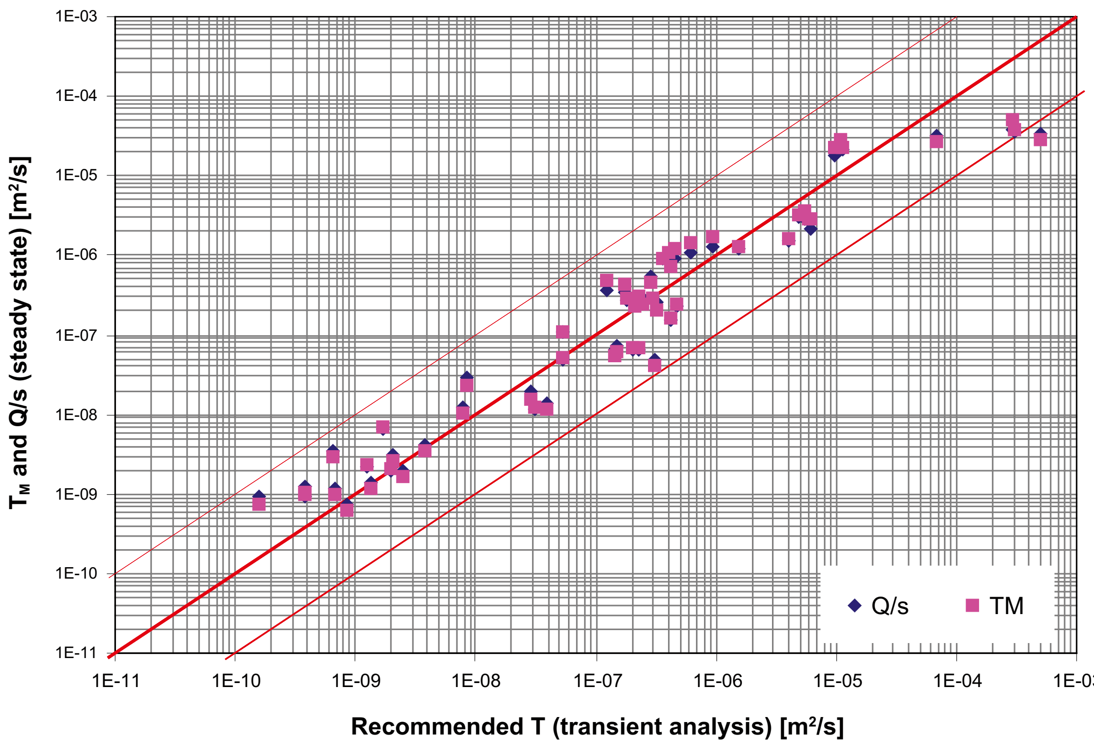


Figure 6-4. Correlation analysis of transmissivities derived by steady state and transient methods.

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:

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

ΔV Volume change of 2 Packers (The volume change was estimated at $7 \cdot 10^{-7}$ m³/100 kPa based on the results of laboratory tests conducted by GEOSIGMA) [m³]

Δp Pressure change in test section (usually $2 \cdot 10^{5}$ Pa) [Pa]

V Volume in test section [m³]

Table 6-4 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.

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.

Figure 6-5 presents a cross-plot of the matched and theoretical wellbore storage coefficients.

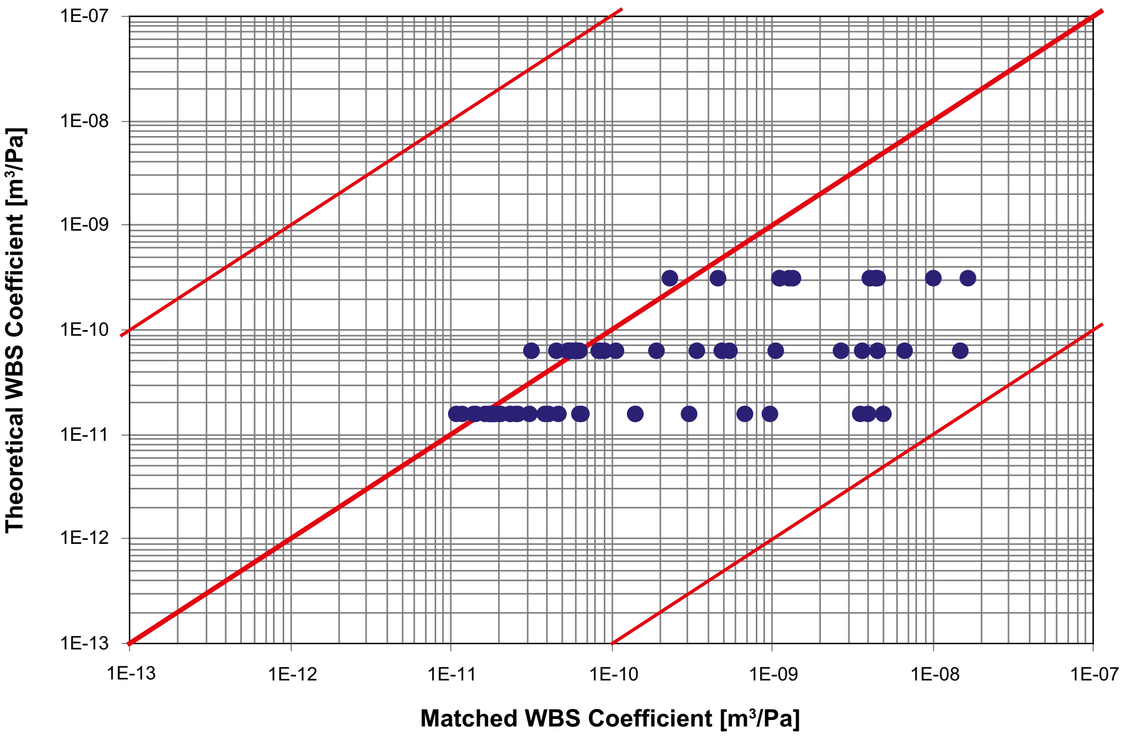


Figure 6-5. *Correlation analysis of theoretical and matched wellbore storage coefficients.*

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

Length of test section [m]	Volume in test section [m³]	Compressibility [1/Pa]
5	0.023	$3 \cdot 10^{-10}$
20	0.091	$8 \cdot 10^{-11}$
100	0.454	$2 \cdot 10^{-11}$
Average compressibility:		$1 \cdot 10^{-10}$

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.

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.

In few cases the tests were not analysable because the compliance phase following the packer inflation was to long or because the conducted preliminary pulse did not recover. Both responses are indicative for a very low interval transmissivity and a transmissivity value of $1 \cdot 10^{-11}$ m²/s was recommended (regarded as the upper limit of the confidence range).

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 of the 20 m sections, the preliminary pulse was prolonged and the recommended transmissivities range between $4.2 \cdot 10^{-12}$ m²/s and $1.1 \cdot 10^{-10}$ m²/s, respectively. Testing the 5 m sections, the pulse test was prolonged and analysed in eight cases. The derived transmissivities range from $2.3 \cdot 10^{-11}$ m²/s to $4.0 \cdot 10^{-10}$ m²/s

The recommended transmissivities derived from the conducted injection tests (CHi and CHir) range from $1.2 \cdot 10^{-7}$ m²/s to $3.0 \cdot 10^{-4}$ m²/s (100 m tests), $3.8 \cdot 10^{-10}$ m²/s to $3.0 \cdot 10^{-4}$ m²/s and $2.0 \cdot 10^{-10}$ m²/s to $5.0 \cdot 10^{-4}$ m²/s, respectively.

A few 5 and 20 m sections show larger transmissivities than the appropriate longer interval. The most of the differences are relatively small and are covered by the confidence range. Additionally, this can be explained by crossflow and connections to the adjacent zones.

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 the freshwater head ranges from 10.6 m to 17.2 m. The highest freshwater heads are measured between 500 m and 600 m. Test section 565.00–561.00 m shows a unrealistic high freshwater head (26.6 m asl).This value is a result of the very low transmissivity of this section ($6.5 \cdot 10^{-10}$ m²/s), the relatively short test duration and uncertainties concerning packer compliance.

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 $1 \cdot 10^{-8}$ m^2/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

Ramey H J Jr, Agarwal R G, Martin R G I, 1975. Analysis of "Slug Test" or DST flow Period data. J. Can. Pet. Tec., September 1975.

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

Rhen I, Forsmark T, Forssman I, Zetterlund M, 2006. Evaluation of hydrogeological propoerties for hydraulic conductor domains (HCD) and hydraulic rock domains (HRD). SKB R-06-22, Svensk Kärnbränslehantering AB.

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 AB.

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

APPENDIX 1

File Description Table

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX19A				
TEST- AND FILEPROTOCOL					**Testorder dated : 2006-11-27**				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted	Sign.
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
2007-01-11	08:17	111.00	211.00	__KLX19A_0111.00_200701110817.ht2	KLX19A_111.00-211.00_070111_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-11	
2007-01-11	12:03	211.00	311.00	__KLX19A_0211.00_200701111203.ht2	KLX19A_211.00-311.00_070111_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-11	
2007-01-12	09:13	211.00	311.00	__KLX19A_0211.00_200701120913.ht2	KLX19A_211.00-311.00_070112_2_CHir_Q_r.csv	Chir	2007-02-01	2007-01-12	
2007-01-12	14:03	211.00	311.00	__KLX19A_0211.00_200701121403.ht2	KLX19A_211.00-311.00_070112_3_CHir_Q_r.csv	Chir	2007-02-01	2007-01-12	
2007-01-12	16:54	311.00	411.00	__KLX19A_0311.00_200701121654.ht2	KLX19A_311.00-411.00_070112_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-13	
2007-01-13	09:30	411.00	511.00	__KLX19A_0411.00_200701130930.ht2	KLX19A_411.00-511.00_070113_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-13	
2007-01-13	11:46	411.00	511.00	__KLX19A_0411.00_200701131146.ht2	KLX19A_411.00-511.00_070113_2_CHir_Q_r.csv	Chir	2007-02-01	2007-01-13	
2007-01-13	14:17	511.00	611.00	__KLX19A_0511.00_200701131417.ht2	KLX19A_511.00-611.00_070113_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-13	
2007-01-13	16:35	511.00	611.00	__KLX19A_0511.00_200701131635.ht2	KLX19A_511.00-611.00_070113_2_CHir_Q_r.csv	Chir	2007-02-01	2007-01-13	
2007-01-14	08:48	611.00	711.00	__KLX19A_0611.00_200701140848.ht2	KLX19A_611.00-711.00_070114_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-14	
2007-01-14	11:03	611.00	711.00	__KLX19A_0611.00_200701141103.ht2	KLX19A_611.00-711.00_070114_2_CHir_Q_r.csv	Chir	2007-02-01	2007-01-14	
2007-01-15	15:33	694.00	794.00	__KLX19A_0694.00_200701151533.ht2	KLX19A_694.00-794.00_070115_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-15	
2007-01-15	17:27	694.00	794.00	__KLX19A_0694.00_200701151727.ht2	KLX19A_694.00-794.00_070115_2_CHir_Q_r.csv	Chir	2007-02-01	2007-01-16	
2007-01-17	11:33	111.00	131.00	__KLX19A_0111.00_200701171133.ht2	KLX19A_111.00-131.00_070117_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-17	
2007-01-17	14:04	131.00	151.00	__KLX19A_0131.00_200701171404.ht2	KLX19A_131.00-151.00_070117_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-17	
2007-01-17	16:30	151.00	171.00	__KLX19A_0151.00_200701171630.ht2	KLX19A_151.00-171.00_070117_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-17	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX19A				
TEST- AND FILEPROTOCOL					**Testorder dated : 2006-11-27**				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted	Sign.
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
2007-01-17	18:23	171.00	191.00	__KLX19A_0171.00_200701171823.ht2	KLX19A_171.00-191.00_070117_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-18	
2007-01-18	08:17	191.00	211.00	__KLX19A_0191.00_200701180817.ht2	KLX19A_191.00-211.00_070118_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-18	
2007-01-18	10:53	211.00	231.00	__KLX19A_0211.00_200701181053.ht2	KLX19A_211.00-231.00_070118_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-18	
2007-01-18	13:06	231.00	251.00	__KLX19A_0231.00_200701181306.ht2	KLX19A_231.00-251.00_070118_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-18	
2007-01-18	14:30	251.00	271.00	__KLX19A_0251.00_200701181430.ht2	KLX19A_251.00-271.00_070118_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-18	
2007-01-18	16:24	271.00	291.00	__KLX19A_0271.00_200701181624.ht2	KLX19A_271.00-291.00_070118_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-18	
2007-01-18	17:44	291.00	311.00	__KLX19A_0291.00_200701181744.ht2	KLX19A_291.00-311.00_070118_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-19	
2007-01-19	09:23	411.00	431.00	__KLX19A_0411.00_200701190923.ht2	KLX19A_411.00-431.00_070119_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-19	
2007-01-19	11:20	431.00	451.00	__KLX19A_0431.00_200701191120.ht2	KLX19A_431.00-451.00_070119_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-19	
2007-01-19	13:38	451.00	471.00	__KLX19A_0451.00_200701191338.ht2	KLX19A_451.00-471.00_070119_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-19	
2007-01-19	15:30	471.00	491.00	__KLX19A_0471.00_200701191530.ht2	KLX19A_471.00-491.00_070119_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-19	
2007-01-19	17:26	491.00	511.00	__KLX19A_0491.00_200701191726.ht2	KLX19A_491.00-511.00_070119_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-20	
2007-01-20	08:21	511.00	531.00	__KLX19A_0511.00_200701200821.ht2	KLX19A_511.00-531.00_070120_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-20	
2007-01-20	10:18	530.00	550.00	__KLX19A_0530.00_200701201018.ht2	KLX19A_530.00-550.00_070120_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-20	
2007-01-20	11:45	550.00	570.00	__KLX19A_0550.00_200701201145.ht2	KLX19A_550.00-570.00_070120_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-20	
2007-01-20	13:39	571.00	591.00	__KLX19A_0571.00_200701201339.ht2	KLX19A_571.00-591.00_070120_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-20	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX19A				
TEST- AND FILEPROTOCOL					Testorder dated : 2006-11-27				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted	Sign.
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
2007-01-20	16:19	591.00	611.00	__KLX19A_0591.00_200701201619.ht2	KLX19A_591.00-611.00_070120_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-20	
2007-01-20	17:41	611.00	631.00	__KLX19A_0611.00_200701201741.ht2	KLX19A_611.00-631.00_070120_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-21	
2007-01-21	08:29	631.00	651.00	__KLX19A_0631.00_200701210829.ht2	KLX19A_631.00-651.00_070121_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-21	
2007-01-21	10:45	651.00	671.00	__KLX19A_0651.00_200701211045.ht2	KLX19A_651.00-671.00_070121_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-21	
2007-01-21	13:18	651.00	671.00	__KLX19A_0651.00_200701211318.ht2	KLX19A_651.00-671.00_070121_2_CHir_Q_r.csv	CHir	2007-02-01	2007-01-21	
2007-01-21	14:52	671.00	691.00	__KLX19A_0671.00_200701211452.ht2	KLX19A_671.00-691.00_070121_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-21	
2007-01-21	16:56	691.00	711.00	__KLX19A_0691.00_200701211656.ht2	KLX19A_691.00-711.00_070121_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-22	
2007-01-22	08:46	711.00	731.00	__KLX19A_0711.00_200701220846.ht2	KLX19A_711.00-731.00_070122_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-22	
2007-01-22	10:50	731.00	751.00	__KLX19A_0731.00_200701221050.ht2	KLX19A_731.00-751.00_070122_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-22	
2007-01-22	13:36	751.00	771.00	__KLX19A_0751.00_200701221336.ht2	KLX19A_751.00-771.00_070122_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-22	
2007-01-22	15:43	771.00	791.00	__KLX19A_0771.00_200701221543.ht2	KLX19A_771.00-791.00_070122_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-22	
2007-01-24	09:08	104.00	109.00	__KLX19A_0104.00_200701240908.ht2	KLX19A_104.00-109.00_070124_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-24	
2007-01-24	10:57	109.00	114.00	__KLX19A_0109.00_200701241057.ht2	KLX19A_109.00-114.00_070124_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-24	
2007-01-24	17:05	411.00	416.00	__KLX19A_0411.00_200701241705.ht2	KLX19A_411.00-416.00_070124_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-25	
2007-01-25	08:23	416.00	421.00	__KLX19A_0416.00_200701250823.ht2	KLX19A_416.00-421.00_070125_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-25	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX19A				
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2007-01-25	11:16	426.00	431.00	__KLX19A_0426.00_200701251116.ht2	KLX19A_426.00-431.00_070125_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-25	
2007-01-25	13:20	431.00	436.00	__KLX19A_0431.00_200701251320.ht2	KLX19A_431.00-436.00_070125_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-25	
2007-01-25	15:07	436.00	441.00	__KLX19A_0436.00_200701251507.ht2	KLX19A_436.00-441.00_070125_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-25	
2007-01-25	16:48	441.00	446.00	__KLX19A_0441.00_200701251648.ht2	KLX19A_441.00-446.00_070125_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-25	
2007-01-25	18:36	446.00	451.00	__KLX19A_0446.00_200701251836.ht2	KLX19A_446.00-451.00_070125_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-26	
2007-01-26	09:34	551.00	556.00	__KLX19A_0551.00_200701260934.ht2	KLX19A_551.00-556.00_070126_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-26	
2007-01-26	11:34	556.00	561.00	__KLX19A_0556.00_200701261134.ht2	KLX19A_556.00-561.00_070126_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-26	
2007-01-26	13:58	561.00	566.00	__KLX19A_0561.00_200701261358.ht2	KLX19A_561.00-566.00_070126_1_CHir_Q_r.csv	CHir	2007-02-01	2007-01-26	
2007-01-26	15:02	566.00	571.00	__KLX19A_0566.00_200701261459.ht2	KLX19A_566.00-571.00_070126_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-26	
2007-01-26	17:42	631.00	636.00	__KLX19A_0631.00_200701261742.ht2	KLX19A_631.00-636.00_070126_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-27	
2007-01-27	08:26	636.00	641.00	__KLX19A_0636.00_200701270826.ht2	KLX19A_636.00-641.00_070127_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-27	
2007-01-27	09:47	641.00	646.00	__KLX19A_0641.00_200701270947.ht2	KLX19A_641.00-646.00_070127_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-27	
2007-01-27	11:03	646.00	651.00	__KLX19A_0646.00_200701271103.ht2	KLX19A_646.00-651.00_070127_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-27	
2007-01-27	13:03	651.00	656.00	__KLX19A_0651.00_200701271303.ht2	KLX19A_651.00-656.00_070127_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-27	

HYDROTESTING WITH PSS					**DRILLHOLE IDENTIFICATION NO.: KLX19A**				
TEST- AND FILEPROTOCOL					**Testorder dated : 2006-11-27**				
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Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
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2007-01-27	17:13	661.00	666.00	__KLX19A_0661.00_200701271713.ht2	KLX19A_661.00-666.00_070127_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-28	
2007-01-28	08:17	666.00	671.00	__KLX19A_0666.00_200701280817.ht2	KLX19A_666.00-671.00_070128_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-28	
2007-01-28	10:07	671.00	676.00	__KLX19A_0671.00_200701281007.ht2	KLX19A_671.00-676.00_070128_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-28	
2007-01-28	12:22	676.00	681.00	__KLX19A_0676.00_200701281222.ht2	KLX19A_676.00-681.00_070128_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-28	
2007-01-28	14:19	681.00	686.00	__KLX19A_0681.00_200701281419.ht2	KLX19A_681.00-686.00_070128_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-28	
2007-01-28	16:10	686.00	691.00	__KLX19A_0686.00_200701281610.ht2	KLX19A_686.00-691.00_070128_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-28	
2007-01-28	17:33	691.00	696.00	__KLX19A_0691.00_200701281733.ht2	KLX19A_691.00-696.00_070128_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-29	
2007-01-29	08:23	696.00	701.00	__KLX19A_0696.00_200701290823.ht2	KLX19A_696.00-701.00_070129_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-29	
2007-01-29	10:16	701.00	706.00	__KLX19A_0701.00_200701291016.ht2	KLX19A_701.00-706.00_070129_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-29	
2007-01-29	12:42	706.00	711.00	__KLX19A_0706.00_200701291242.ht2	KLX19A_706.00-711.00_070129_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-29	
2007-01-29	14:49	731.00	736.00	__KLX19A_0731.00_200701291449.ht2	KLX19A_731.00-736.00_070129_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-29	
2007-01-29	16:43	736.00	741.00	__KLX19A_0736.00_200701291643.ht2	KLX19A_736.00-741.00_070129_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-29	
2007-01-29	18:54	741.00	746.00	__KLX19A_0741.00_200701301854.ht2	KLX19A_741.00-746.00_070130_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-30	
2007-01-30	08:14	746.00	751.00	__KLX19A_0746.00_200701300814.ht2	KLX19A_746.00-751.00_070130_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-30	

HYDROTESTING WITH PSS					DRILLHOLE IDENTIFICATION NO.: KLX19A				
TEST- AND FILEPROTOCOL					**Testorder dated : 2006-11-27**				
Teststart		Interval boundaries		Name of Datafiles		Testtype	Copied to	Plotted	Sign.
Date	Time	Upper	Lower	(*.HT2-file)	(*.CSV-file)		disk/CD	(date)	
2007-01-30	10:20	751.00	756.00	__KLX19A_0751.00_200701301020.ht2	KLX19A_751.00-756.00_070130_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-30	
2007-01-30	12:48	756.00	761.00	__KLX19A_0756.00_200701301248.ht2	KLX19A_756.00-761.00_070130_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-30	
2007-01-30	14:54	761.00	766.00	__KLX19A_0761.00_200701301454.ht2	KLX19A_761.00-766.00_070130_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-30	
2007-01-30	17:00	766.00	771.00	__KLX19A_0766.00_200701301700.ht2	KLX19A_766.00-771.00_070130_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-31	
2007-01-31	08:08	771.00	776.00	__KLX19A_0771.00_200701310808.ht2	KLX19A_771.00-776.00_070131_1_Pi_Q_r.csv	Pi	2007-02-01	2007-01-31	
2007-01-31	09:28	776.00	781.00	__KLX19A_0776.00_200701310928.ht2	KLX19A_776.00-781.00_070131_1_CHir_Q_r.csv	Chir	2007-02-01	2007-01-31	

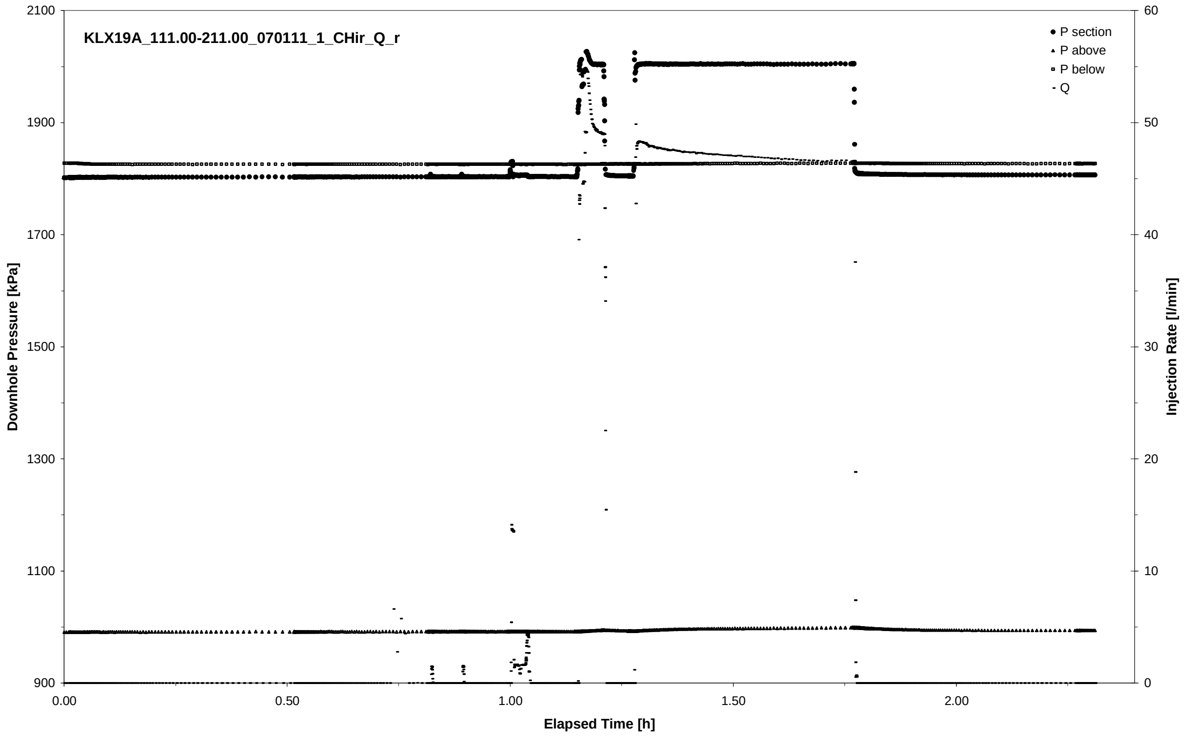
APPENDIX 2

Analysis diagrams

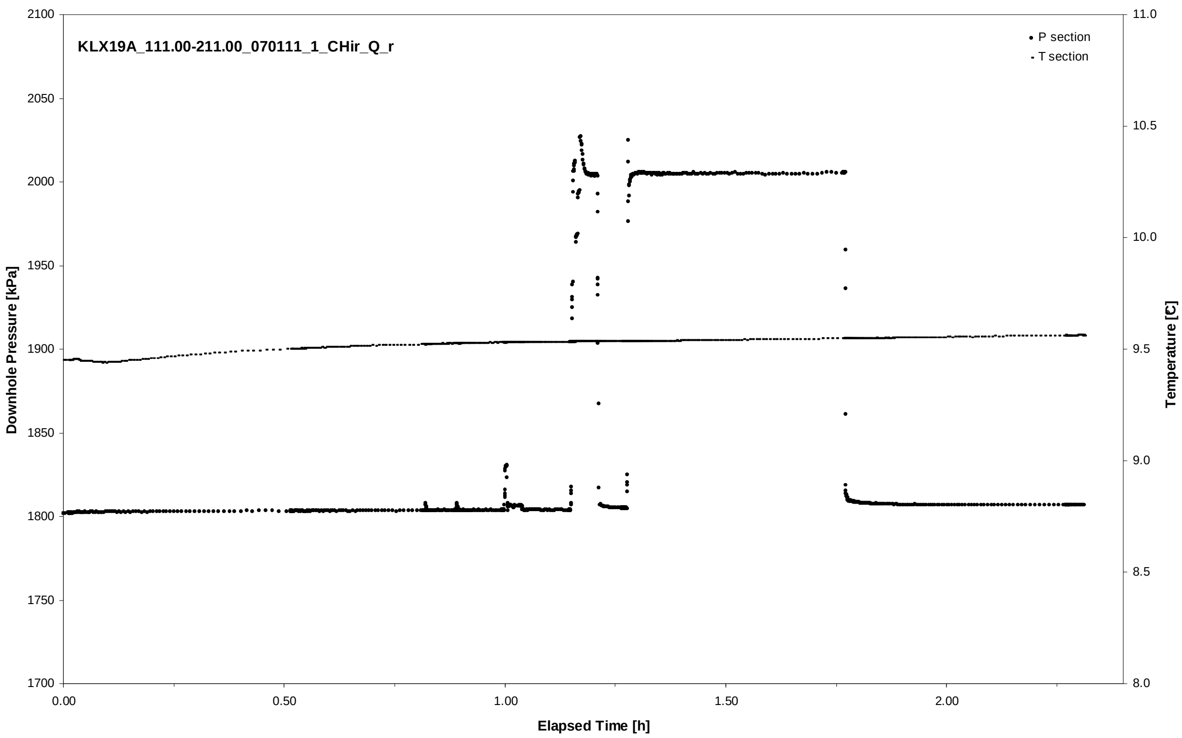
APPENDIX 2-1

Test 111.00 – 211.00 m

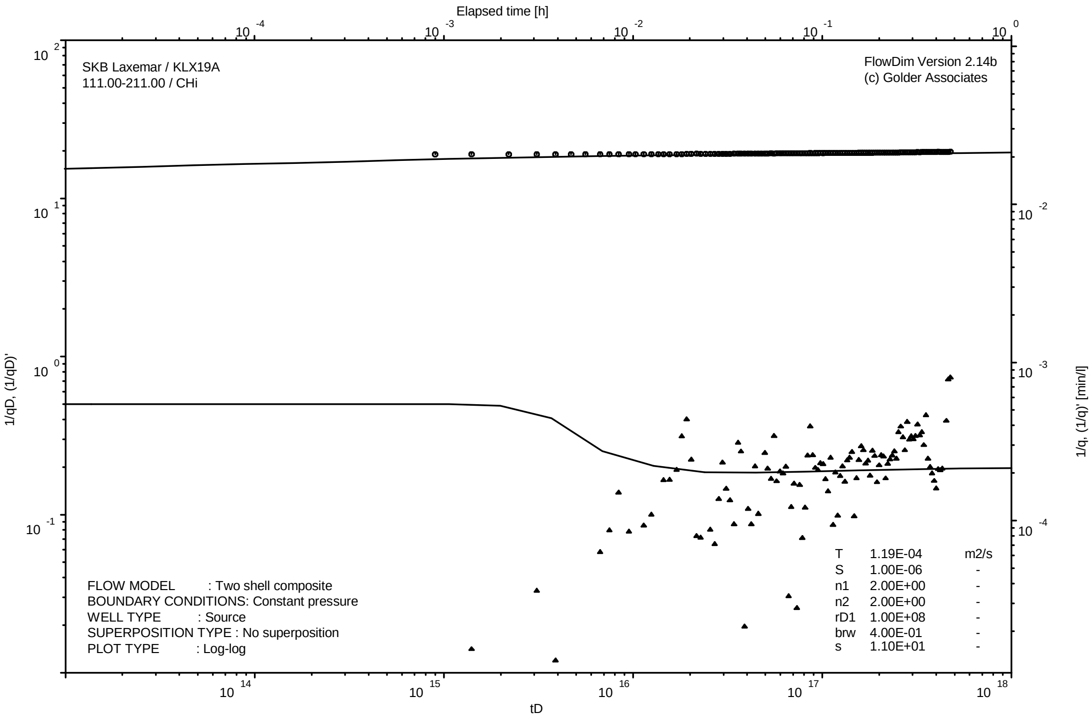
Analysis diagrams



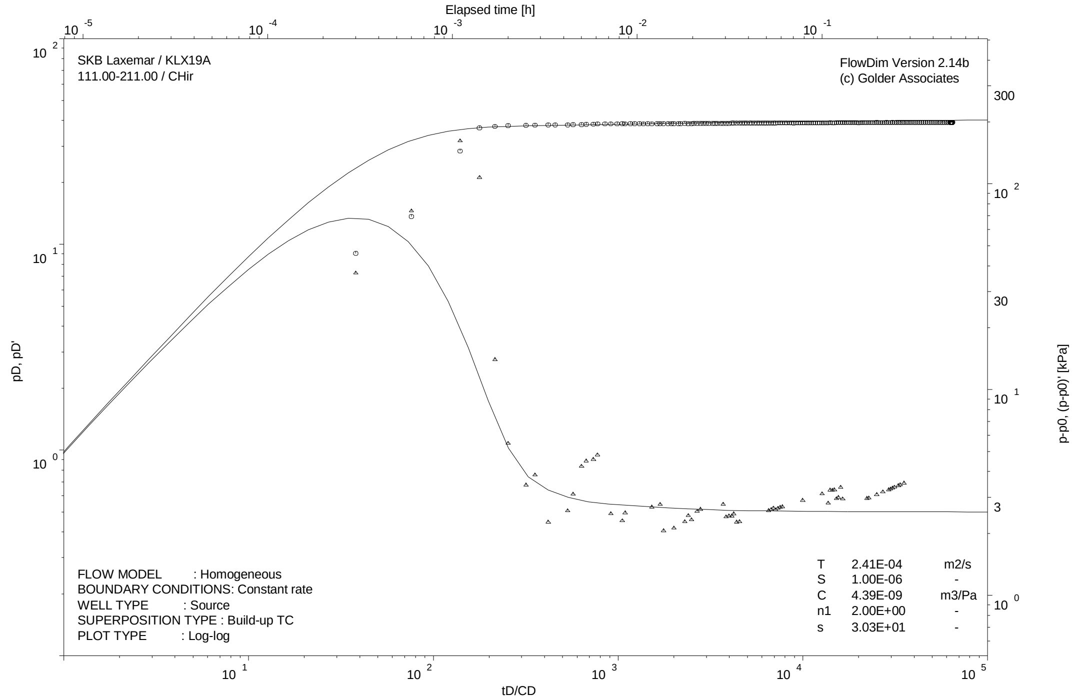
Pressure and flow rate vs. time; cartesian plot



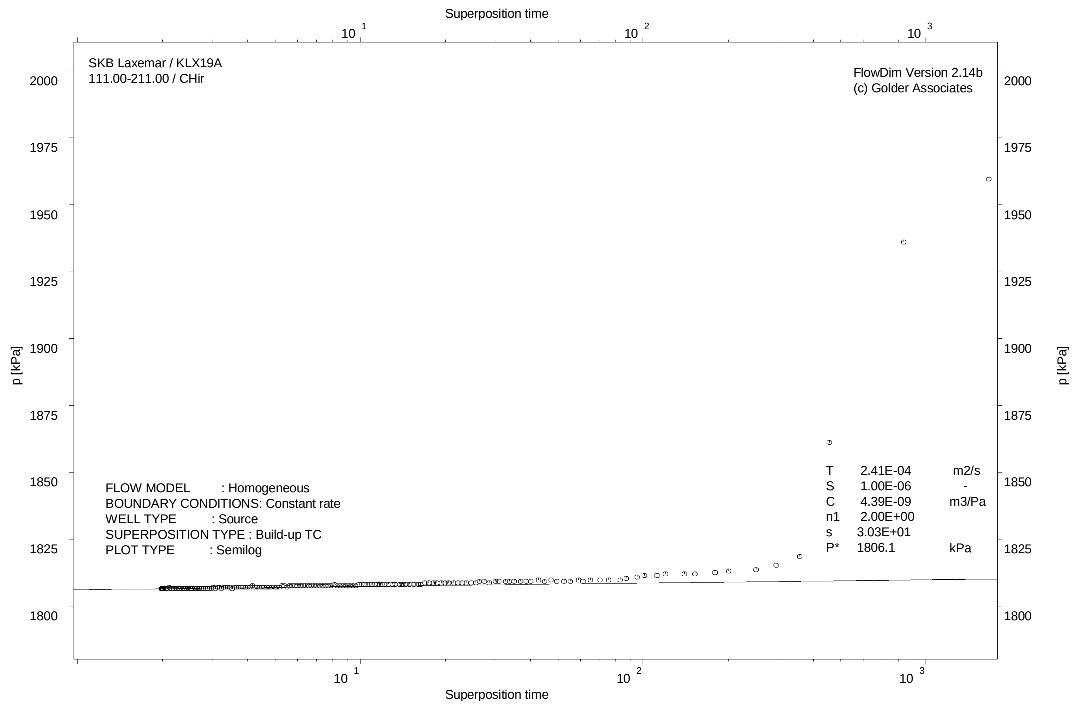
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

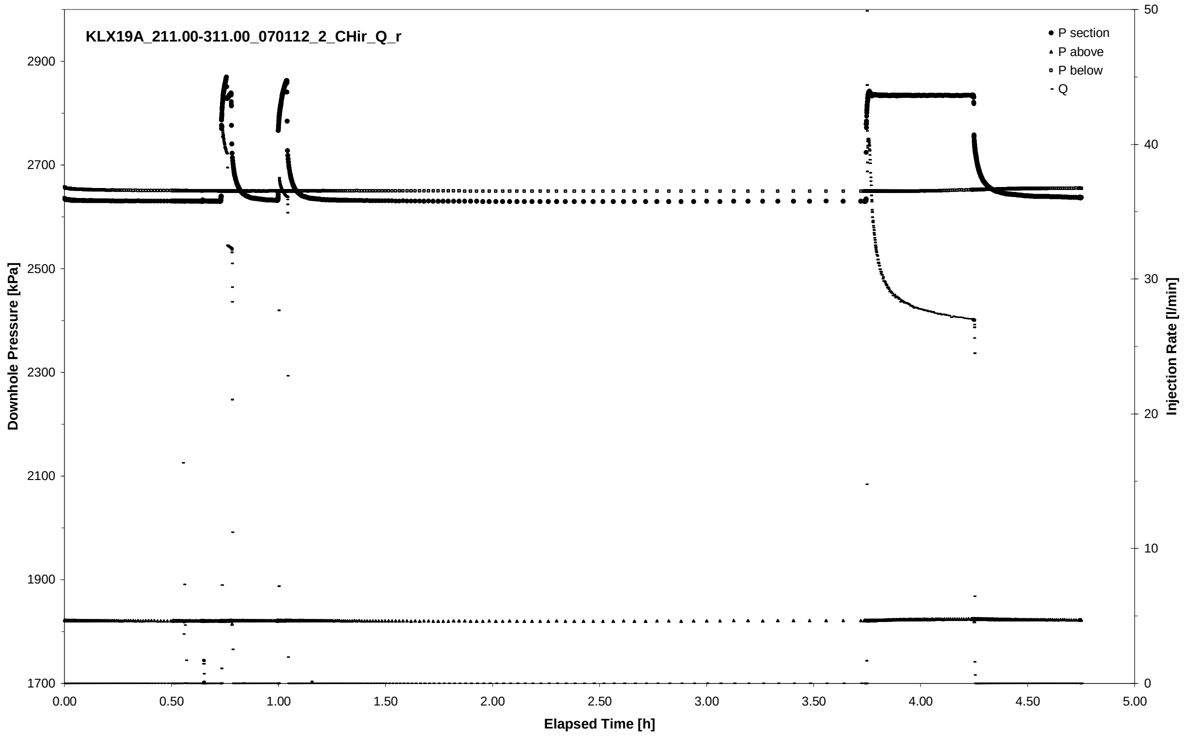


CHIR phase; HORNER match

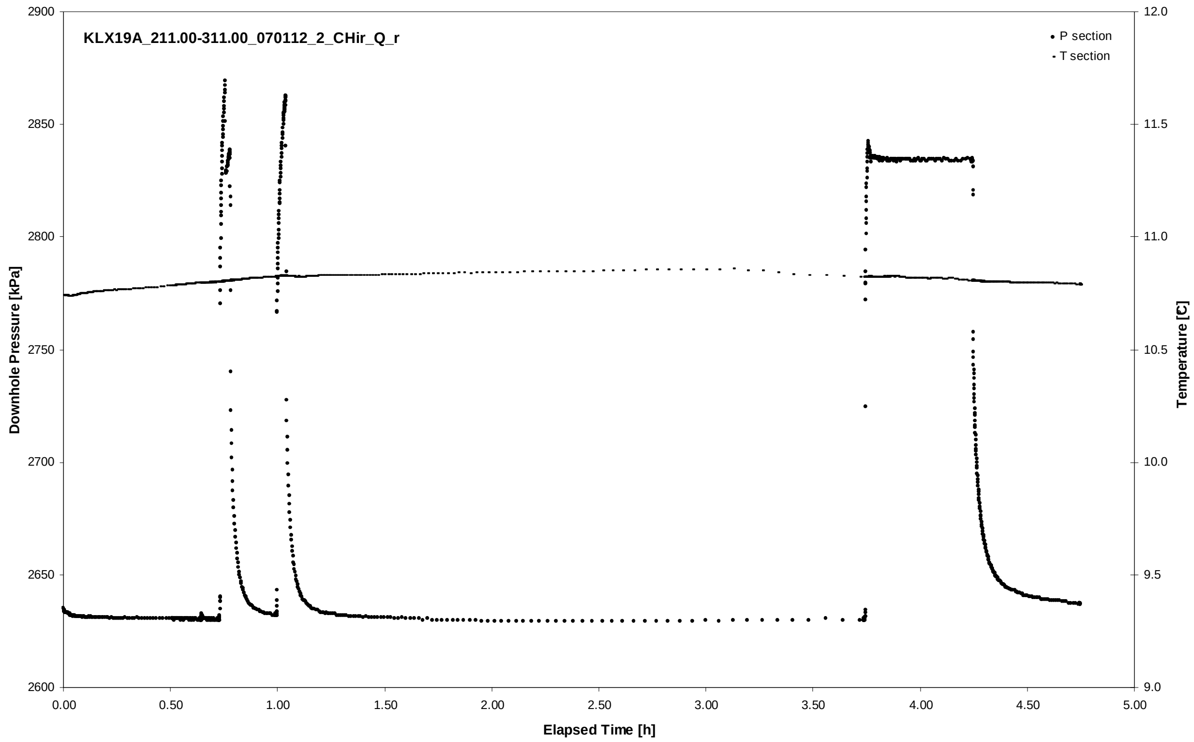
APPENDIX 2-2

Test 211.00 – 311.00 m

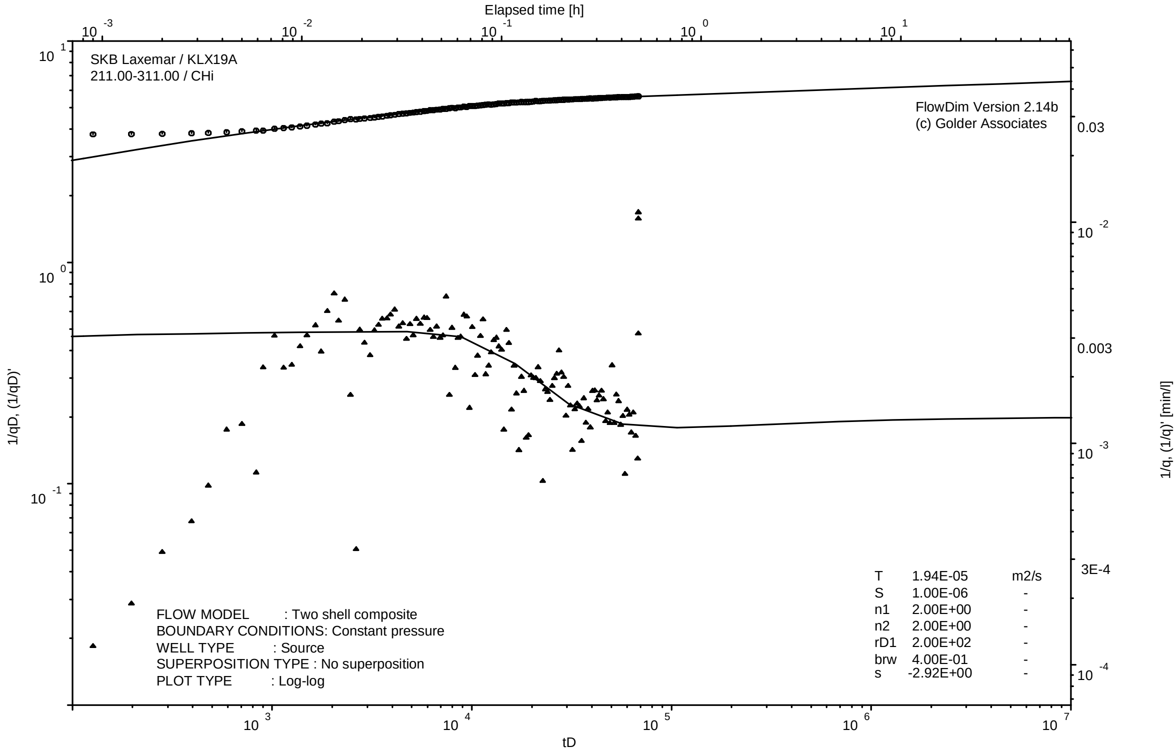
Analysis diagrams



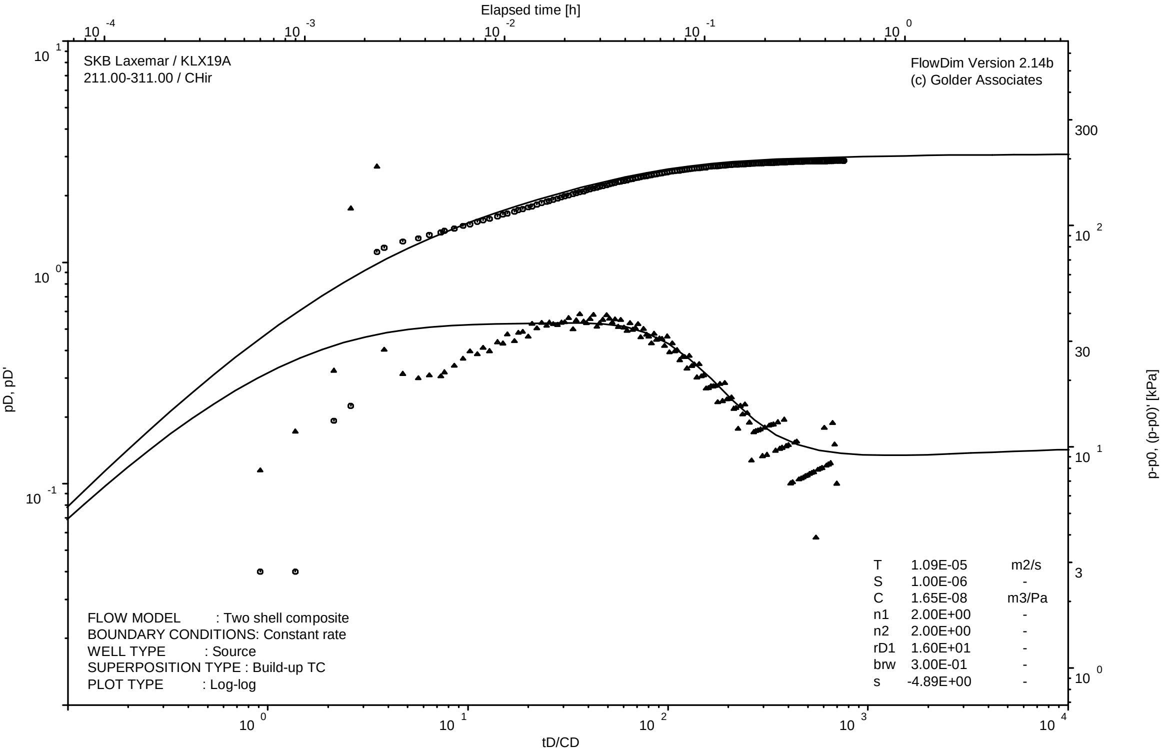
Pressure and flow rate vs. time; cartesian plot



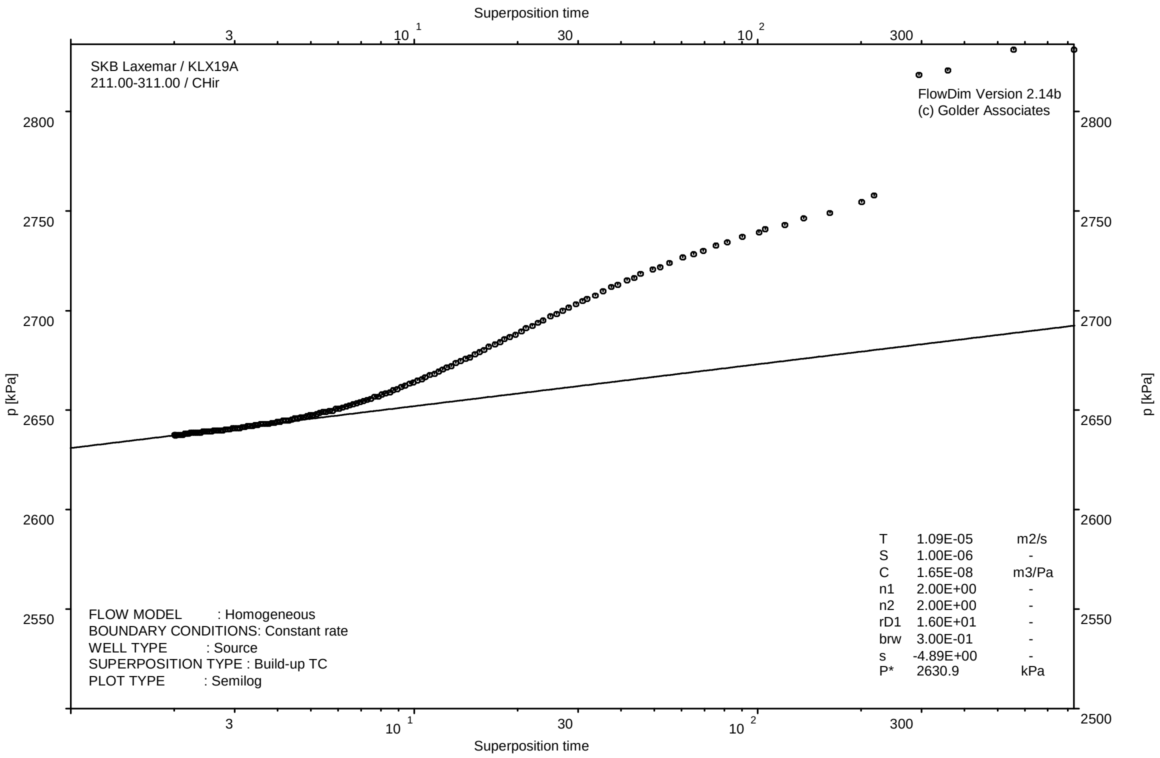
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

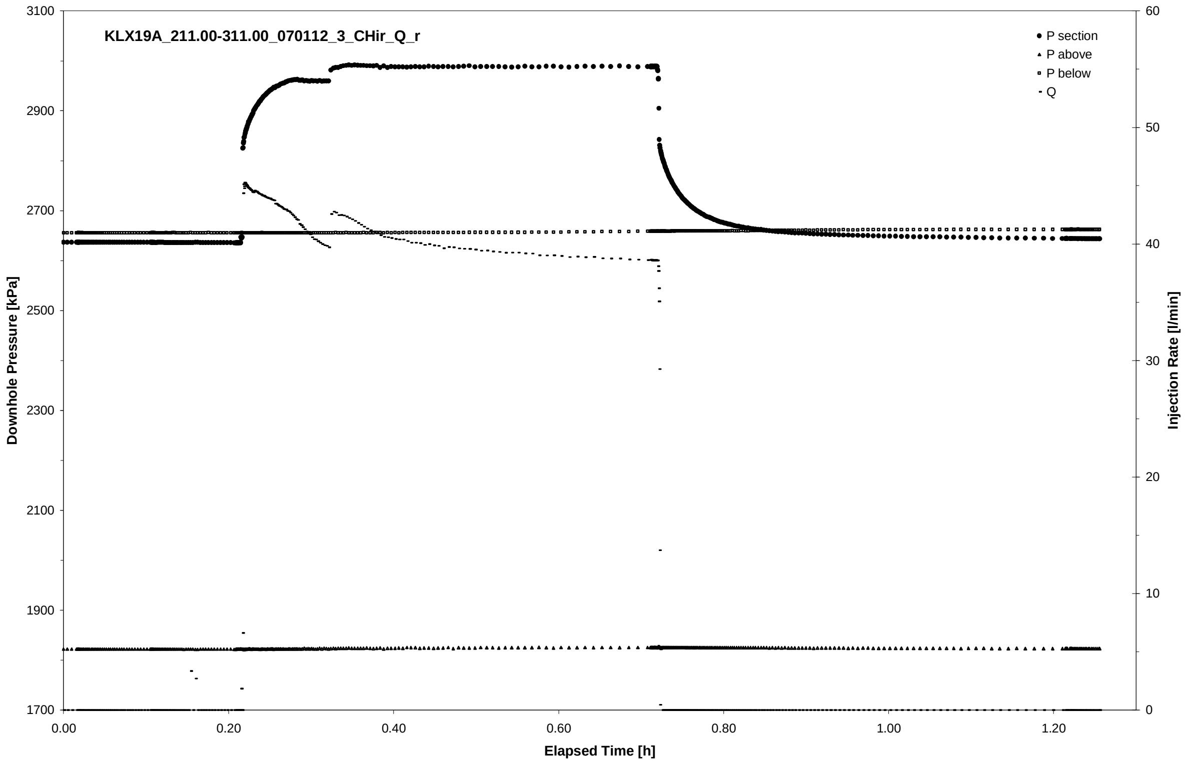


CHIR phase; HORNER match

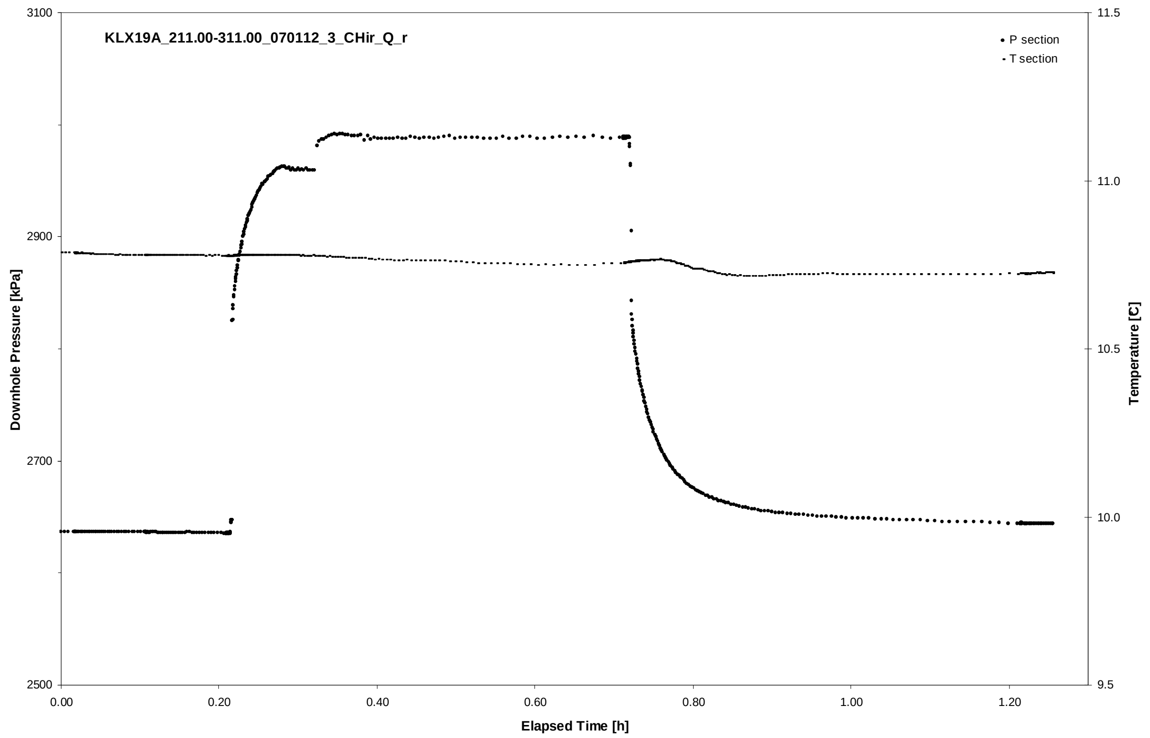
APPENDIX 2-2a

Test 211.00 – 311.00 m

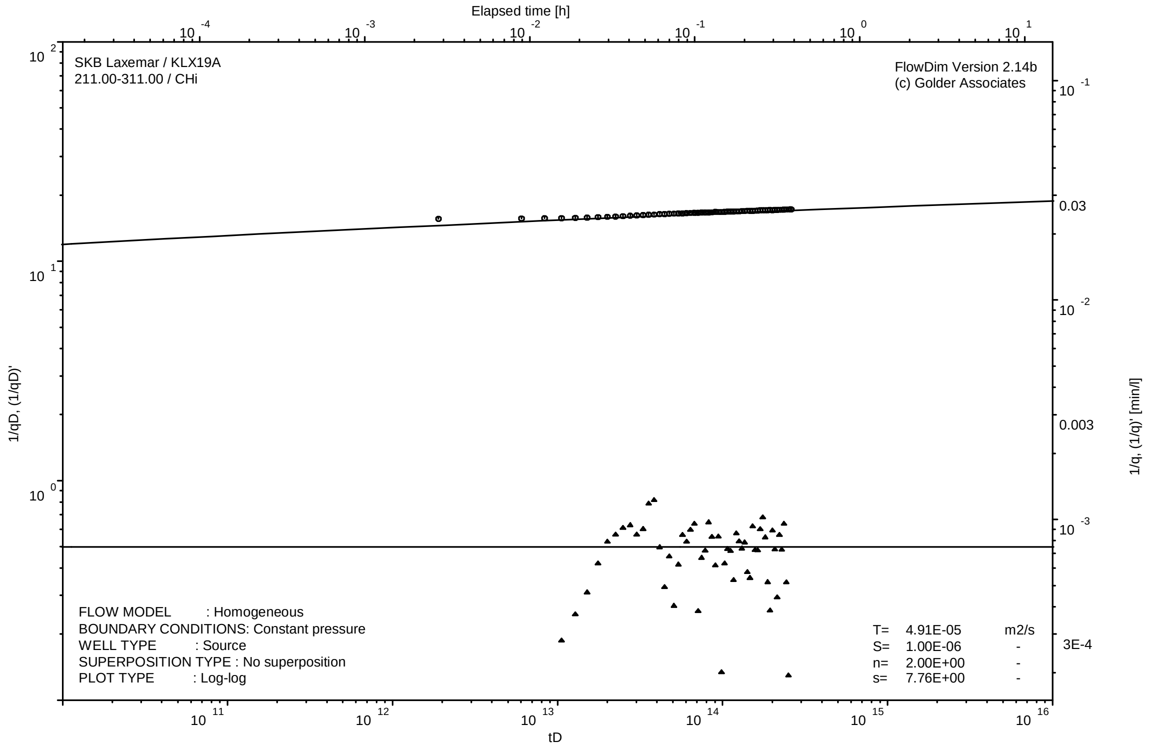
Analysis diagrams



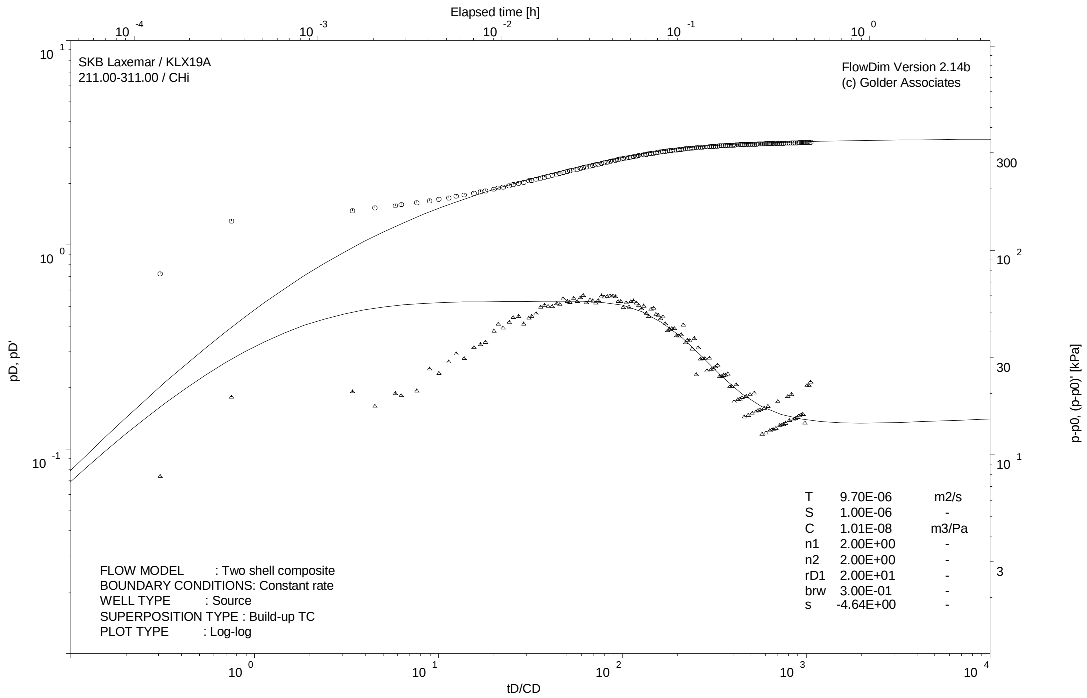
Pressure and flow rate vs. time; cartesian plot



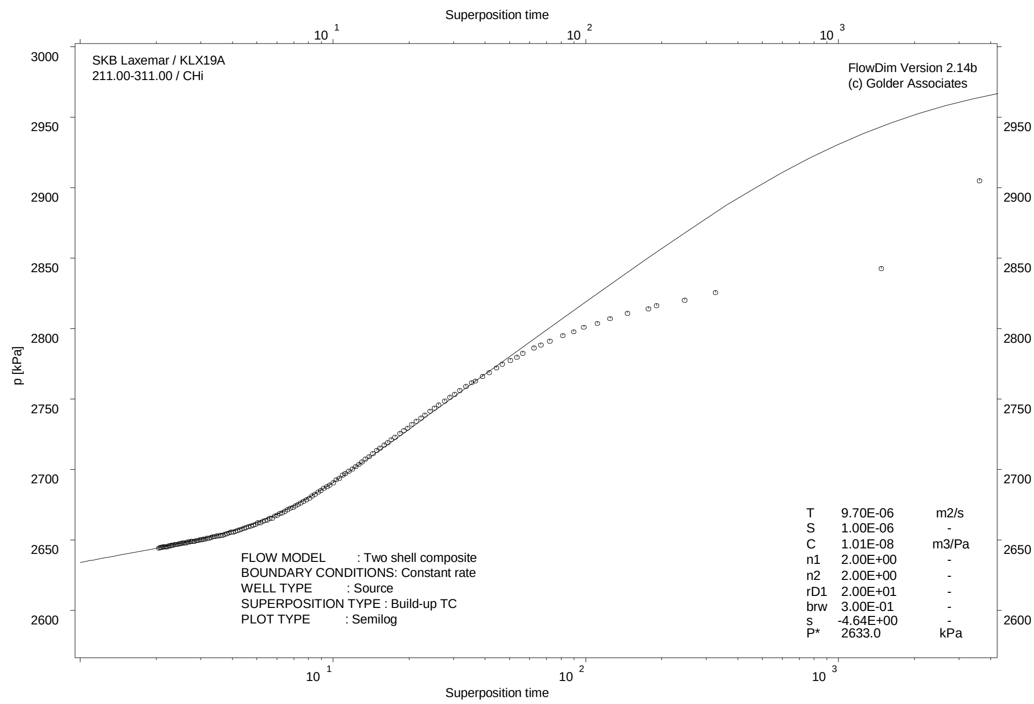
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

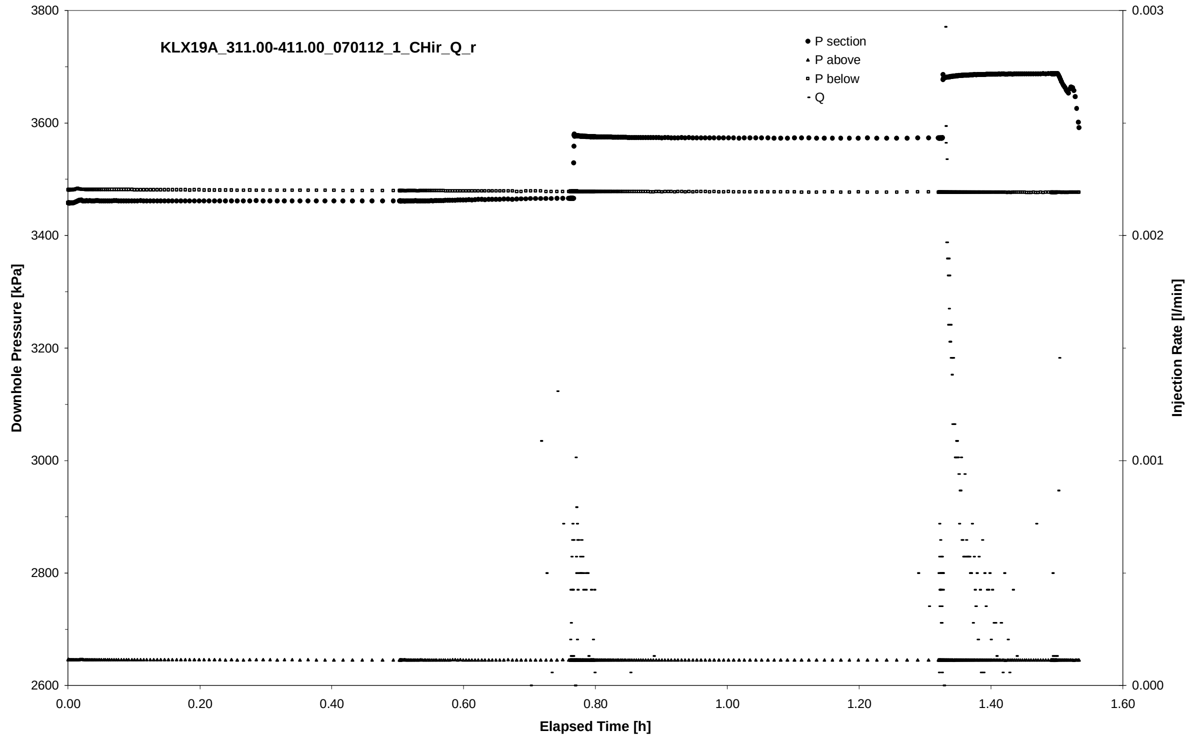


CHIR phase; HORNER match

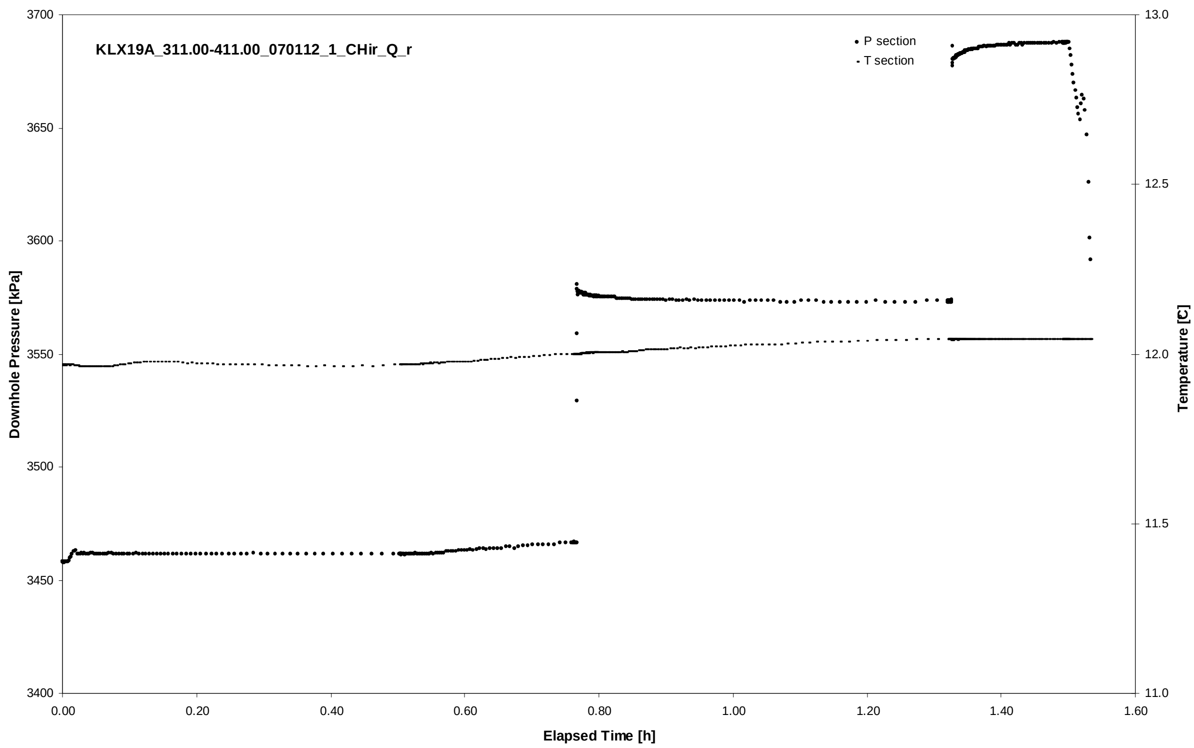
APPENDIX 2-3

Test 311.00 – 411.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

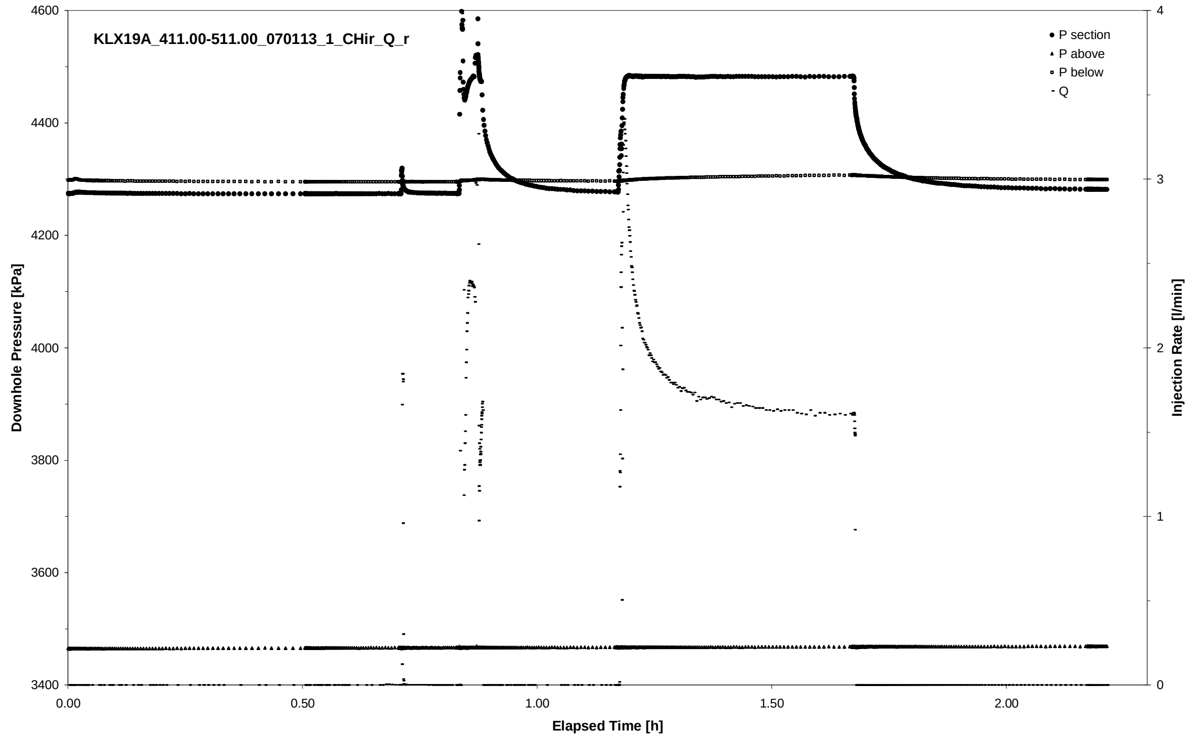
Not Analysed

CHIR phase; HORNER match

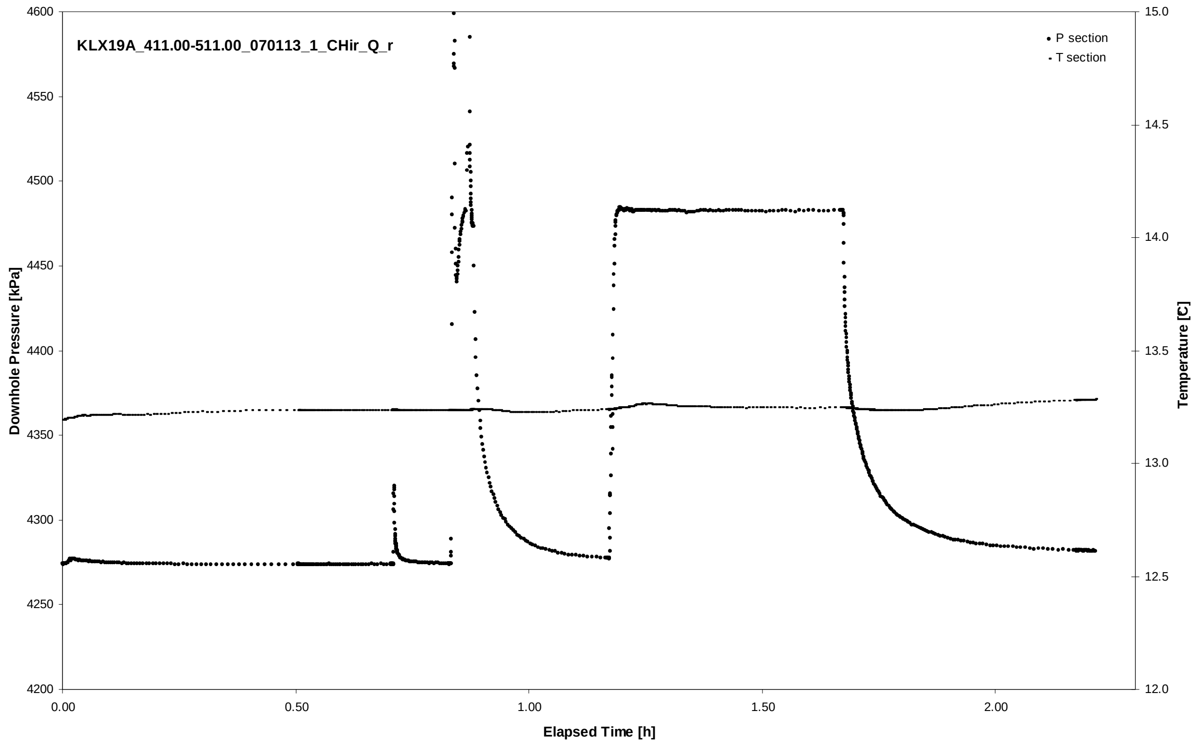
APPENDIX 2-4

Test 411.00 – 511.00 m

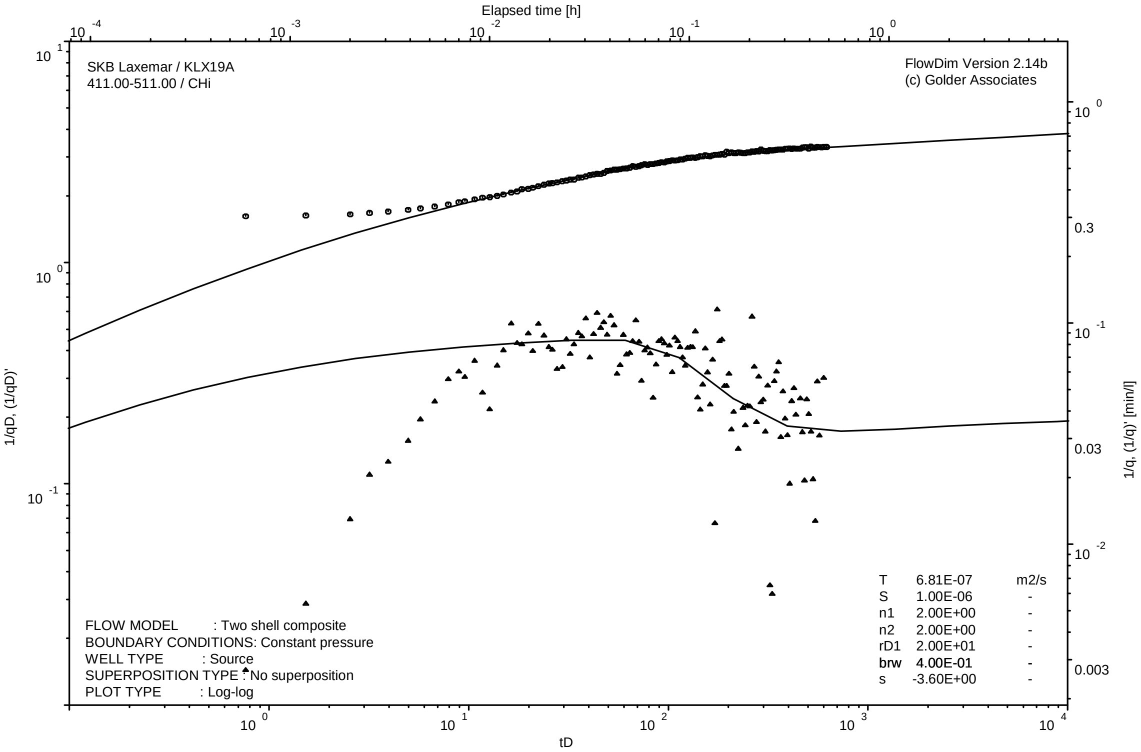
Analysis diagrams



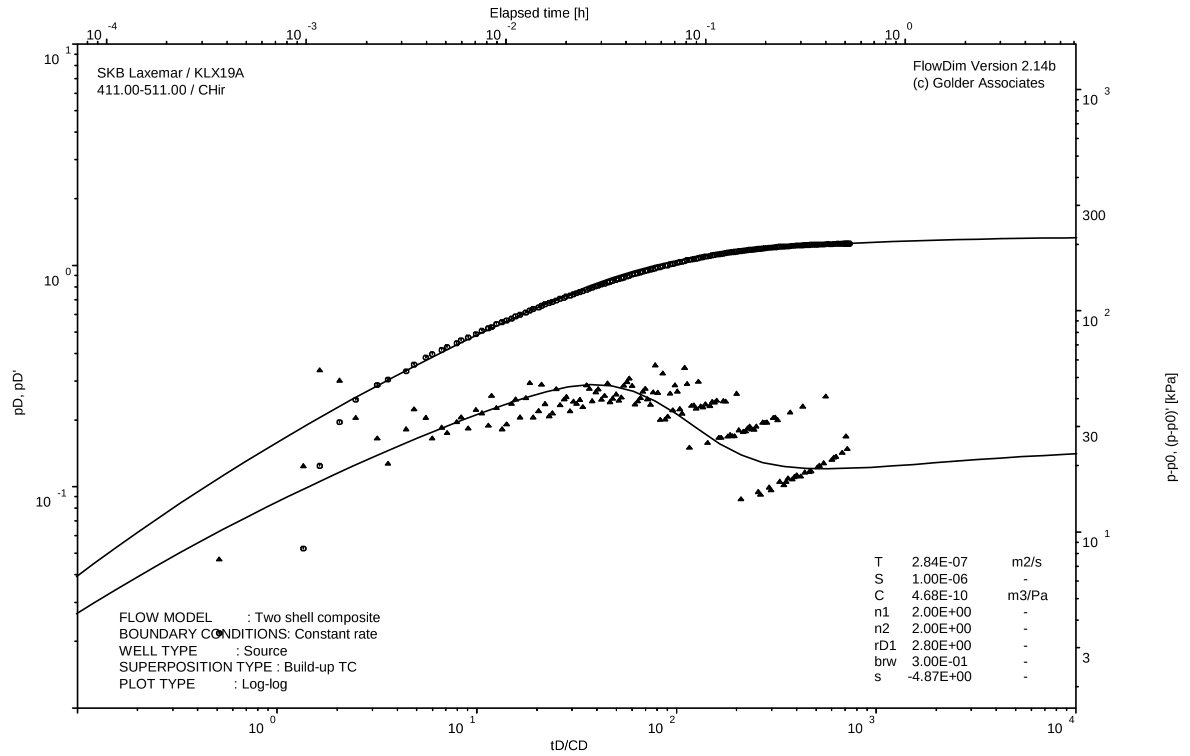
Pressure and flow rate vs. time; cartesian plot



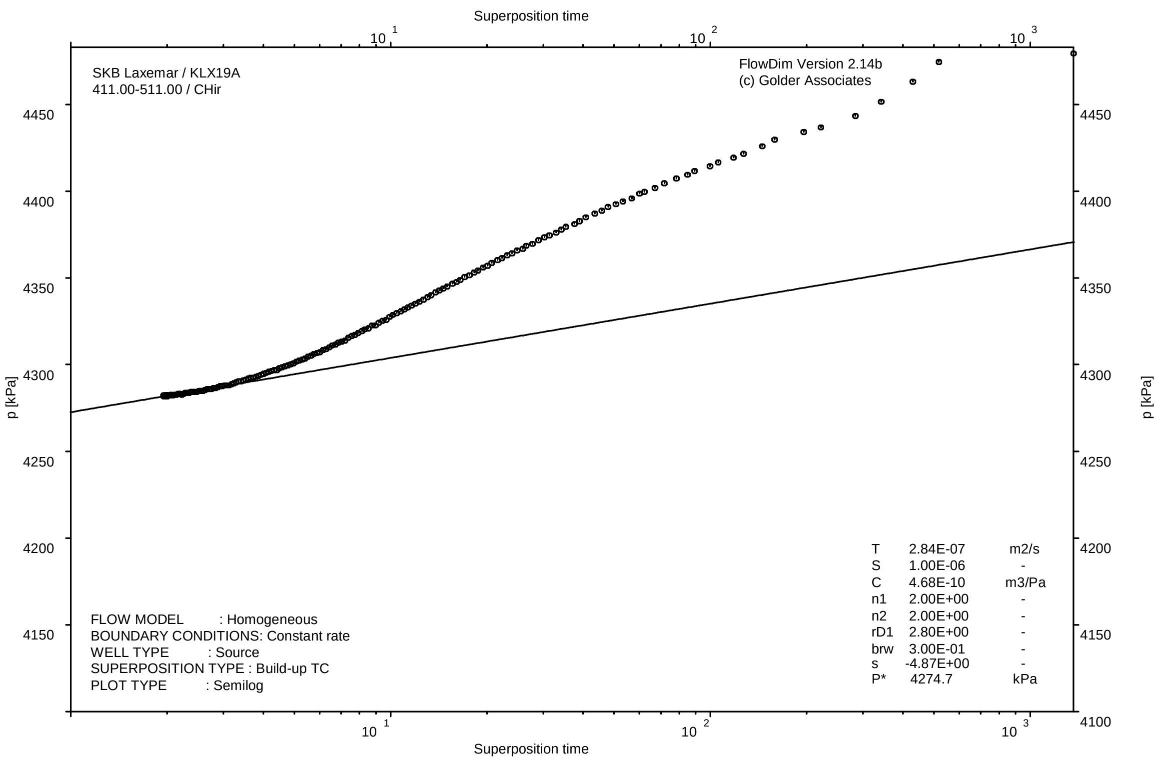
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

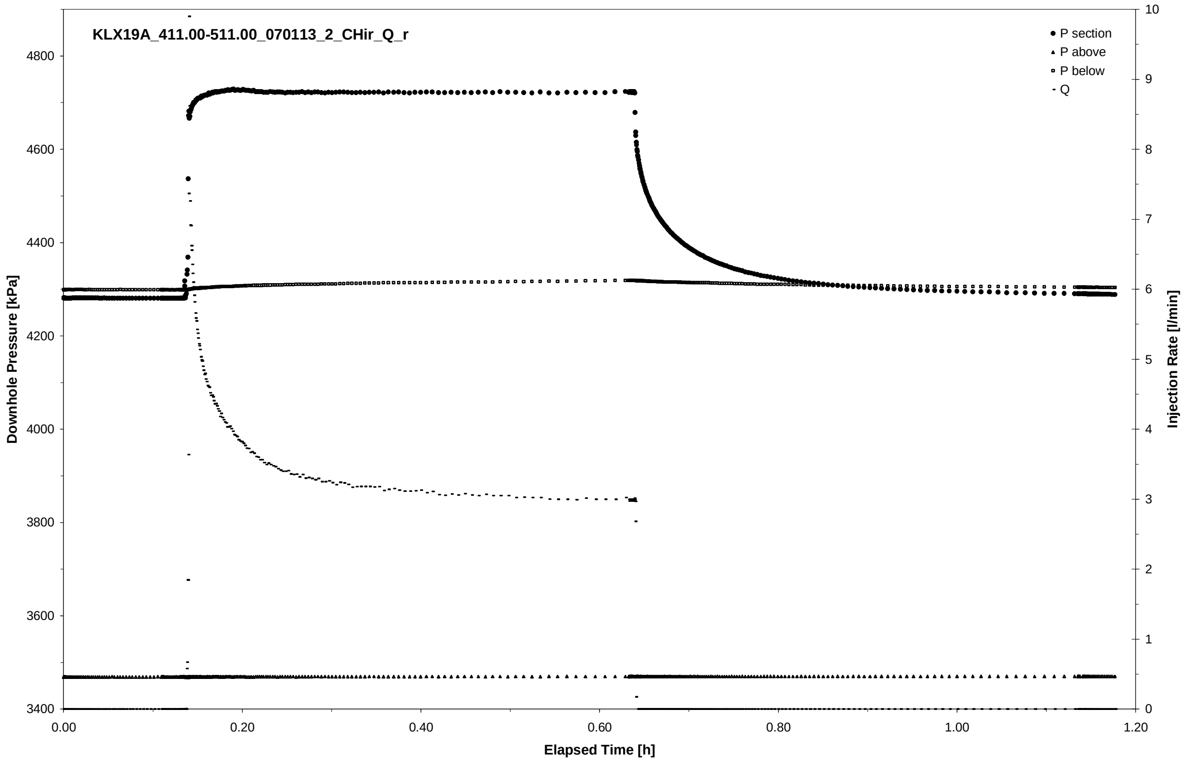


CHIR phase; HORNER match

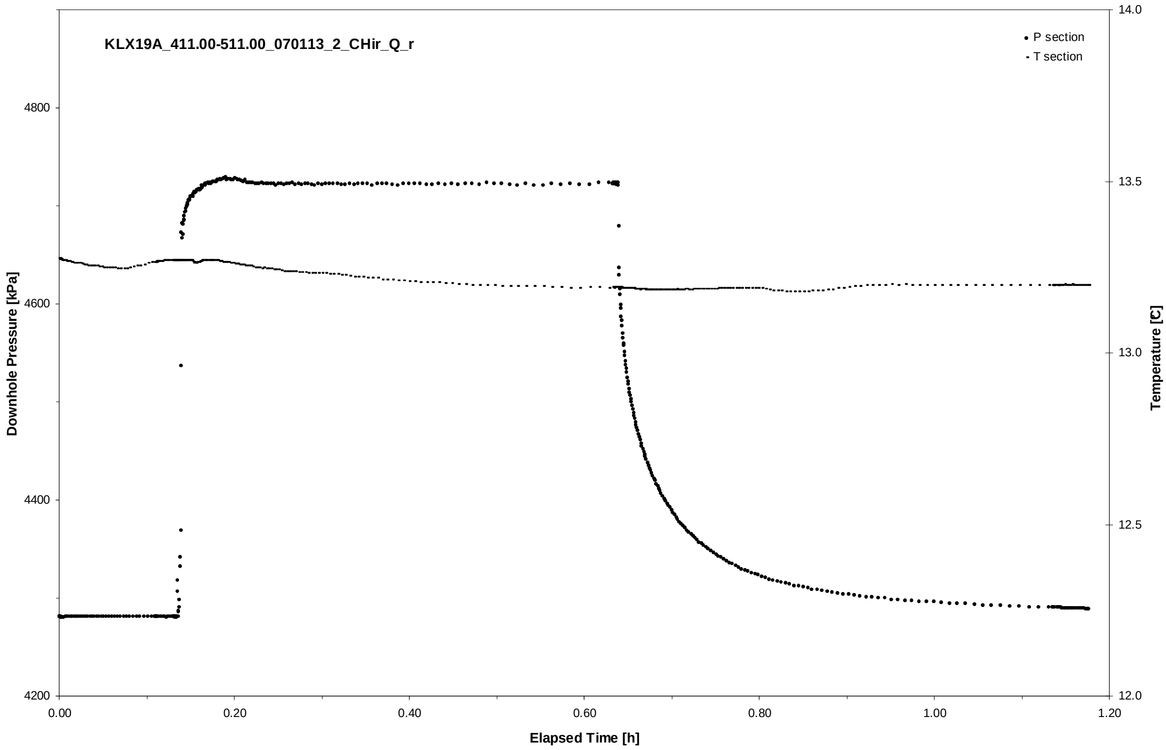
APPENDIX 2-4a

Test 411.00 – 511.00 m

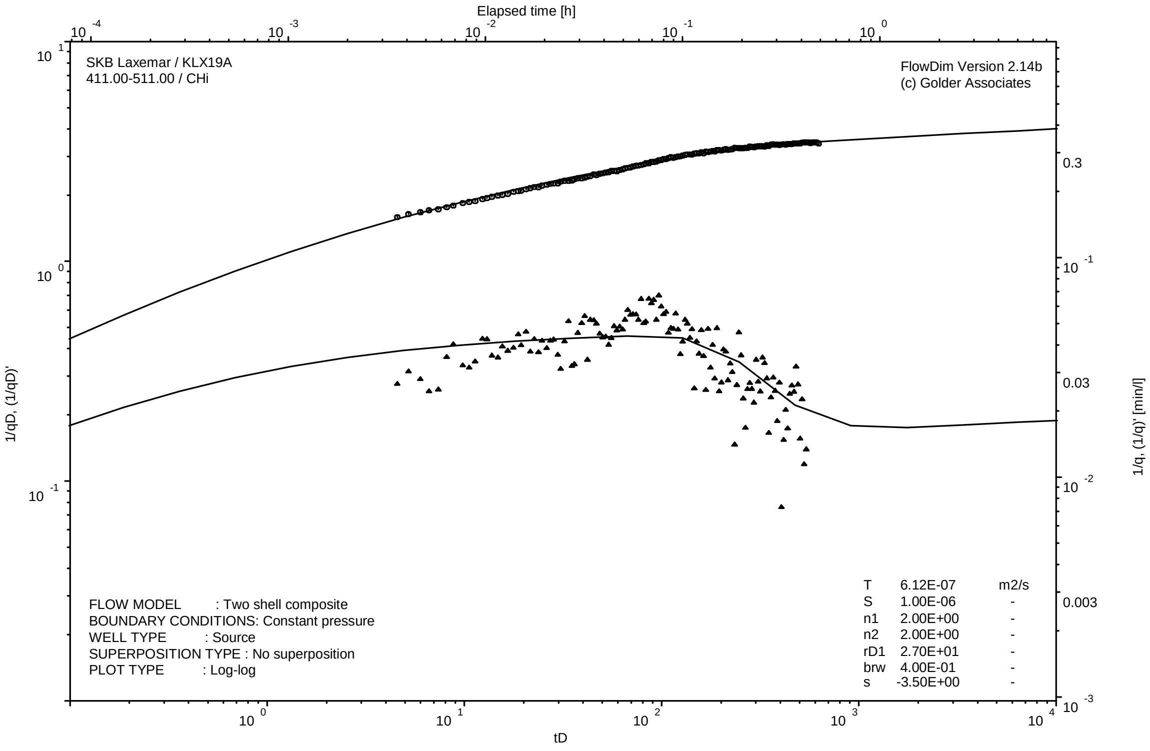
Analysis diagrams



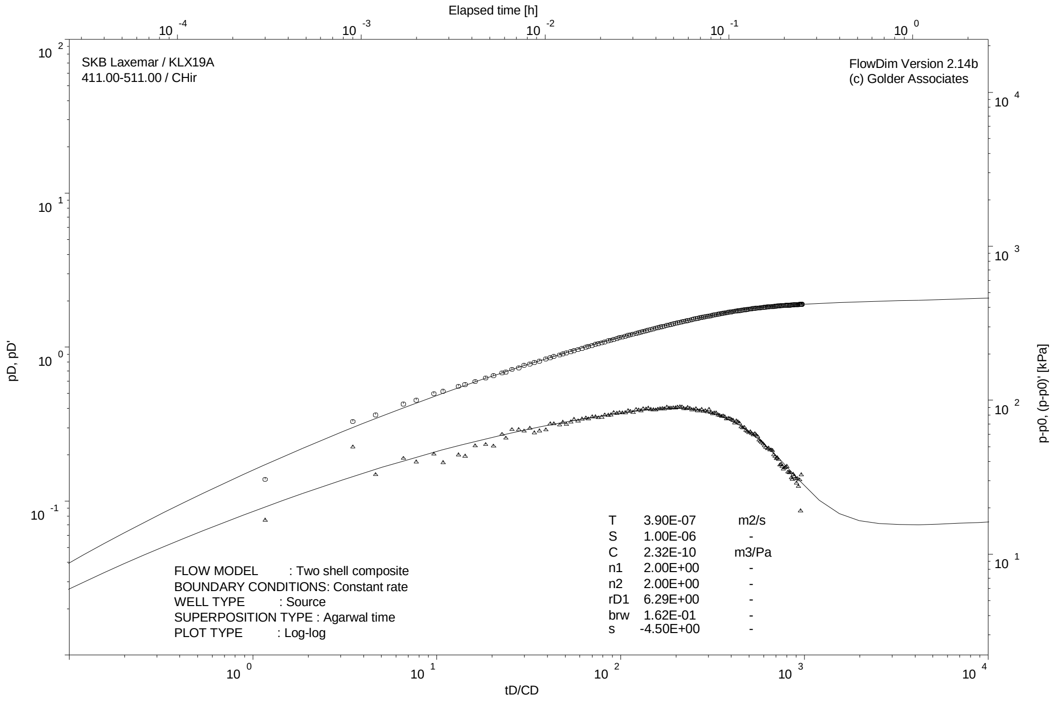
Pressure and flow rate vs. time; cartesian plot



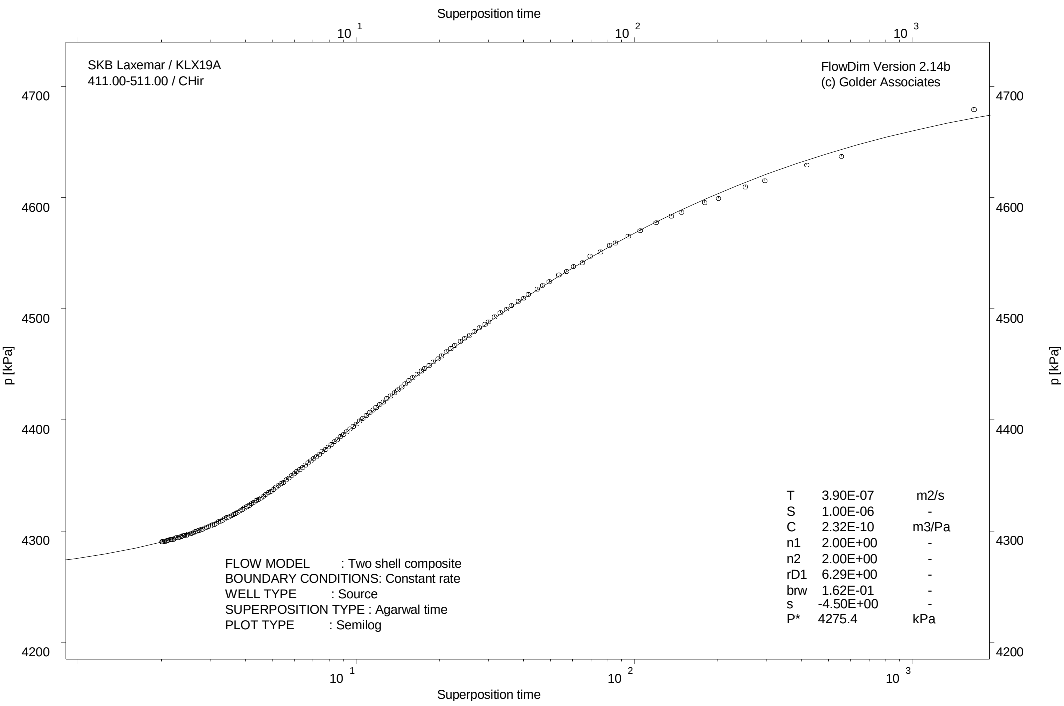
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

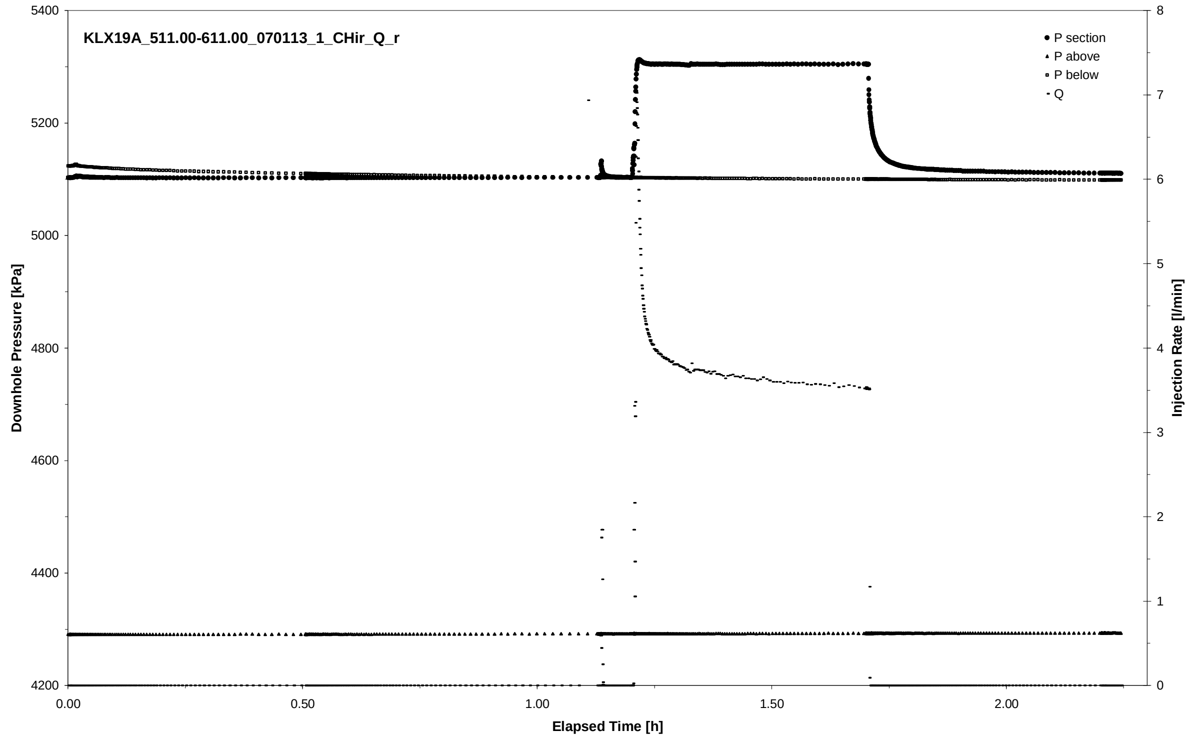


CHIR phase; HORNER match

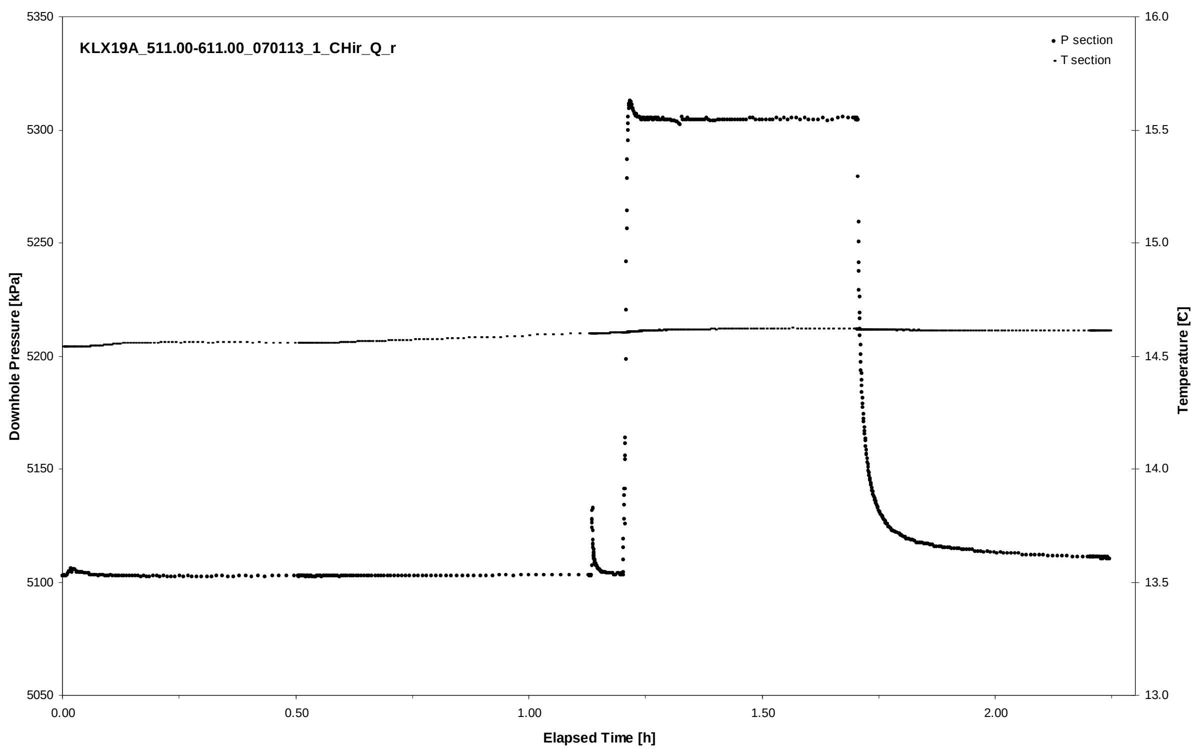
APPENDIX 2-5

Test 511.00 – 611.00 m

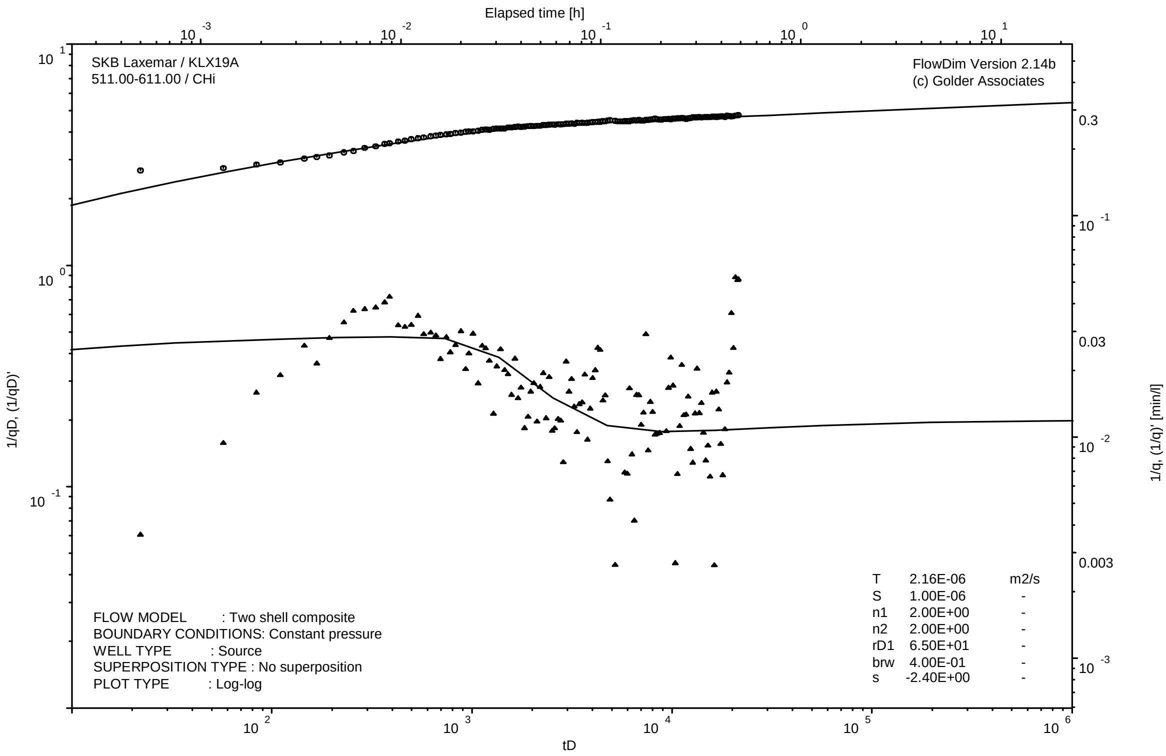
Analysis diagrams



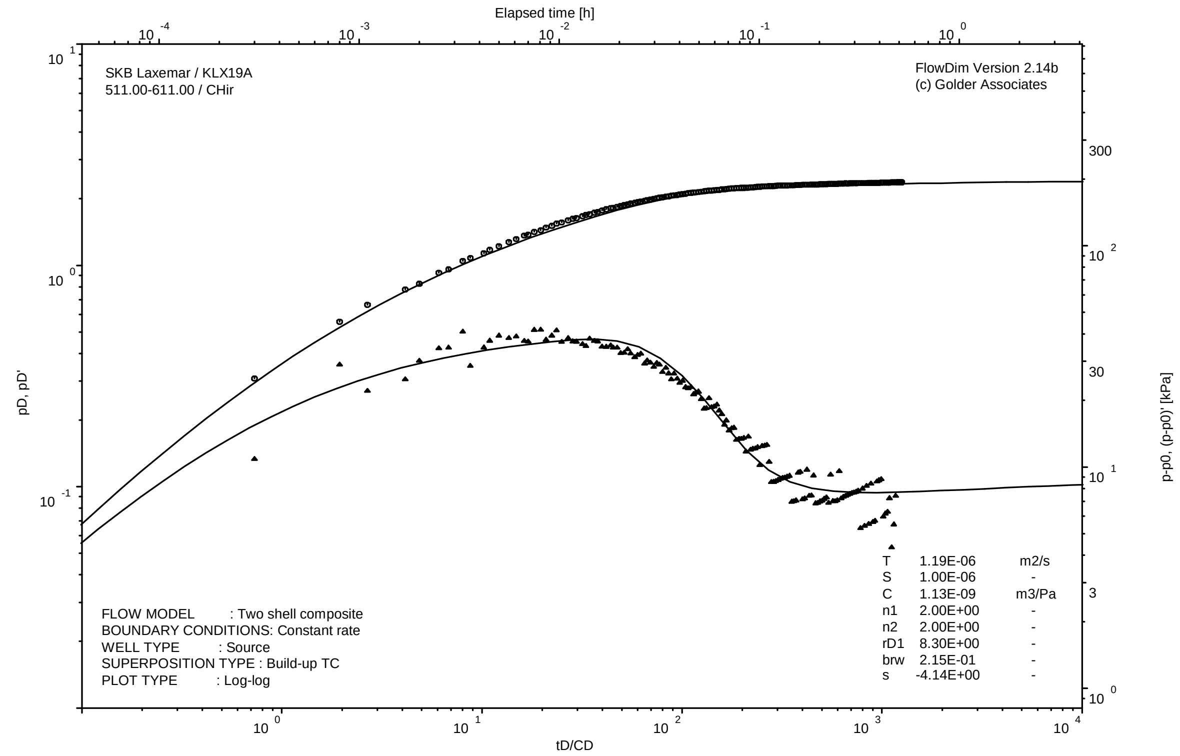
Pressure and flow rate vs. time; cartesian plot



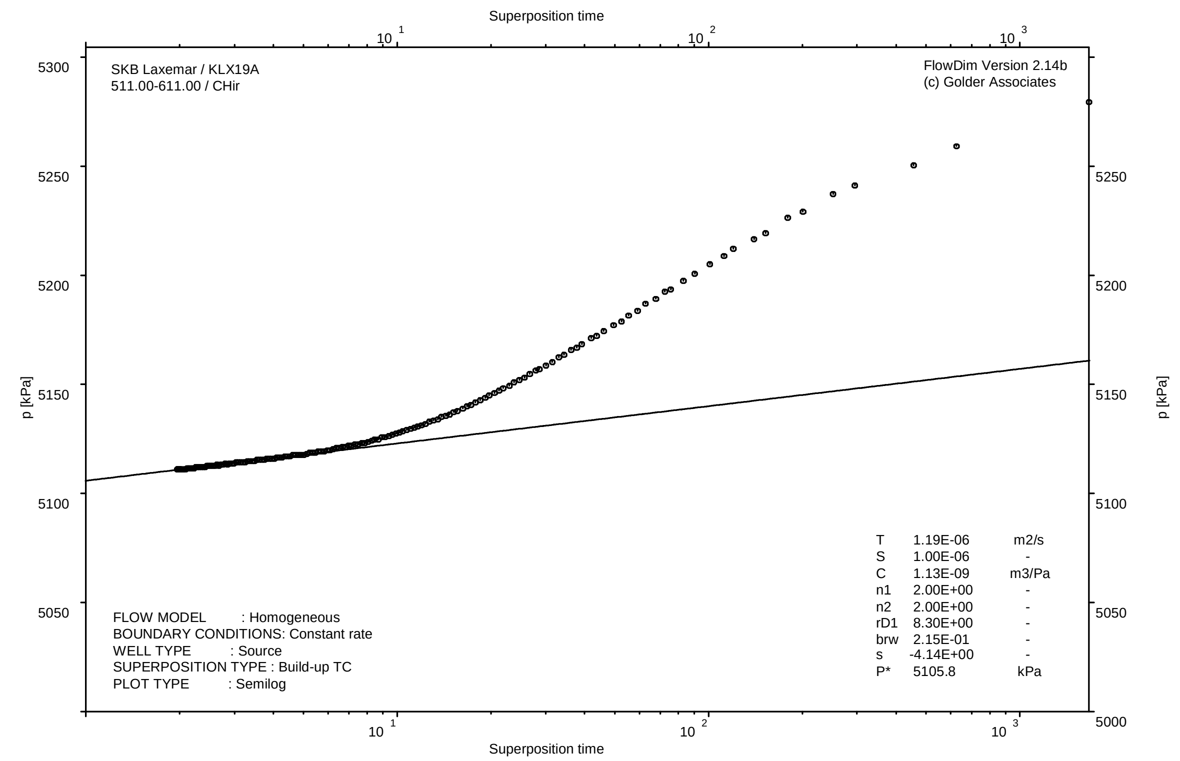
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

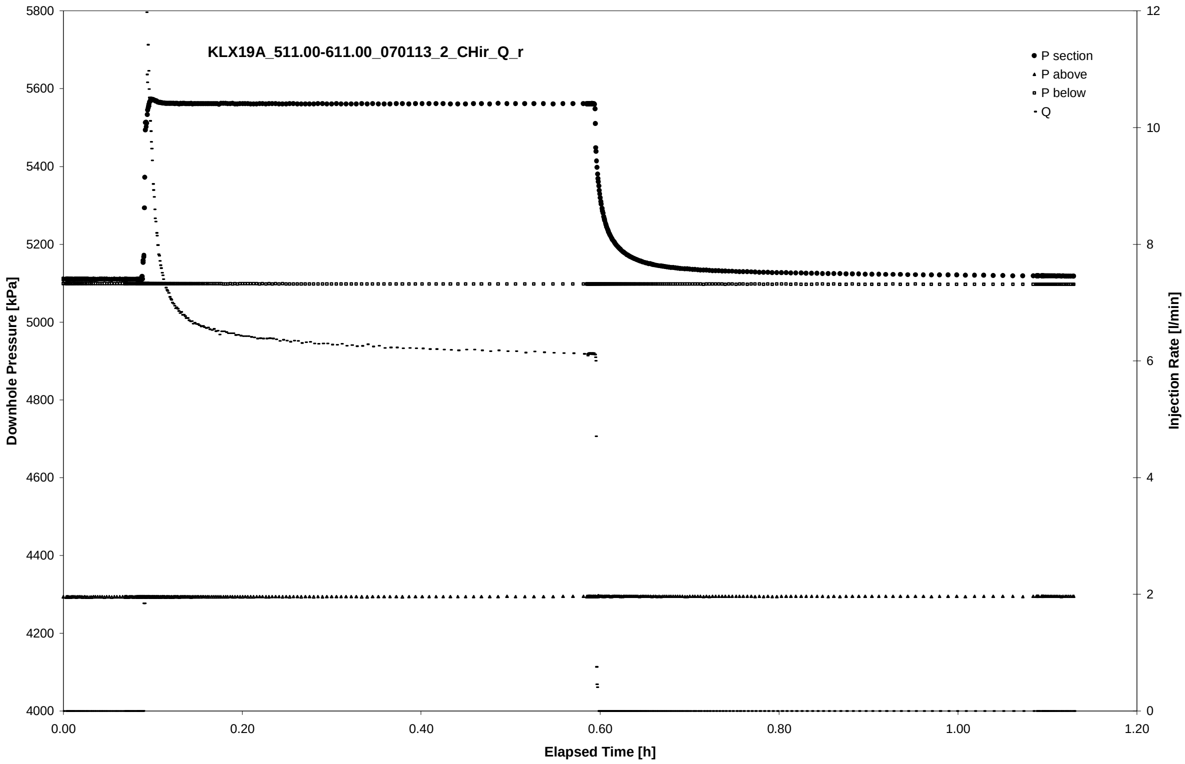


CHIR phase; HORNER match

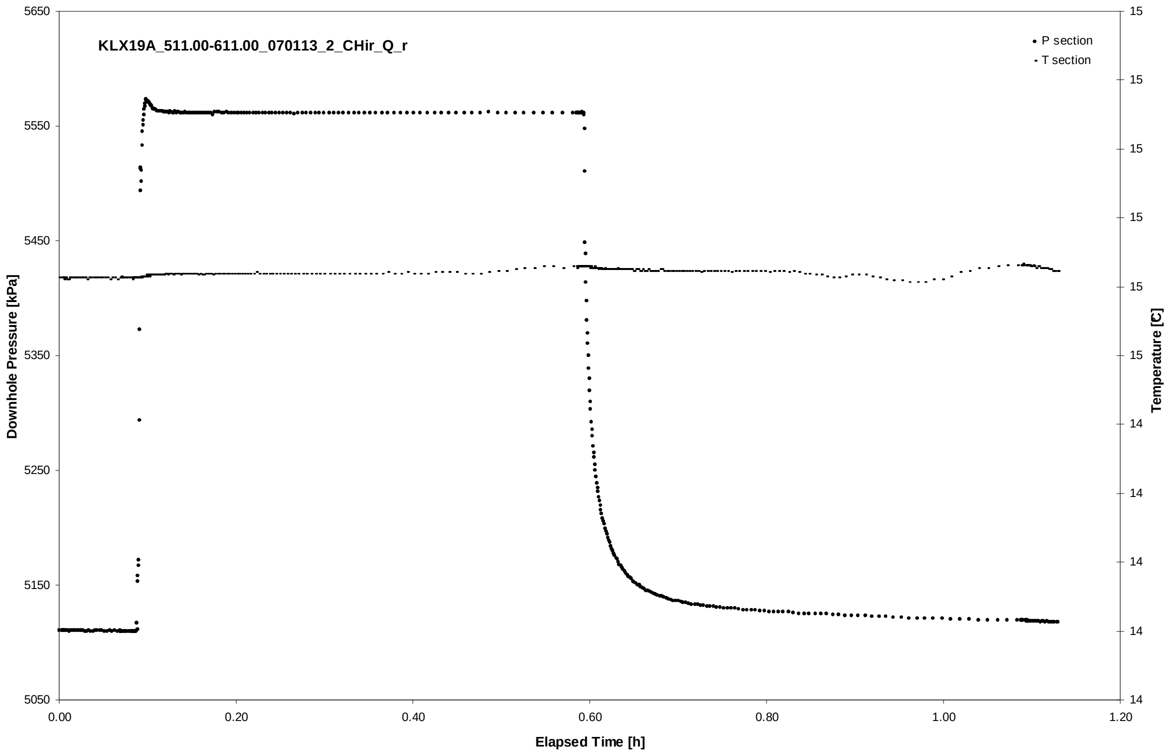
APPENDIX 2-5a

Test 511.00 – 611.00 m

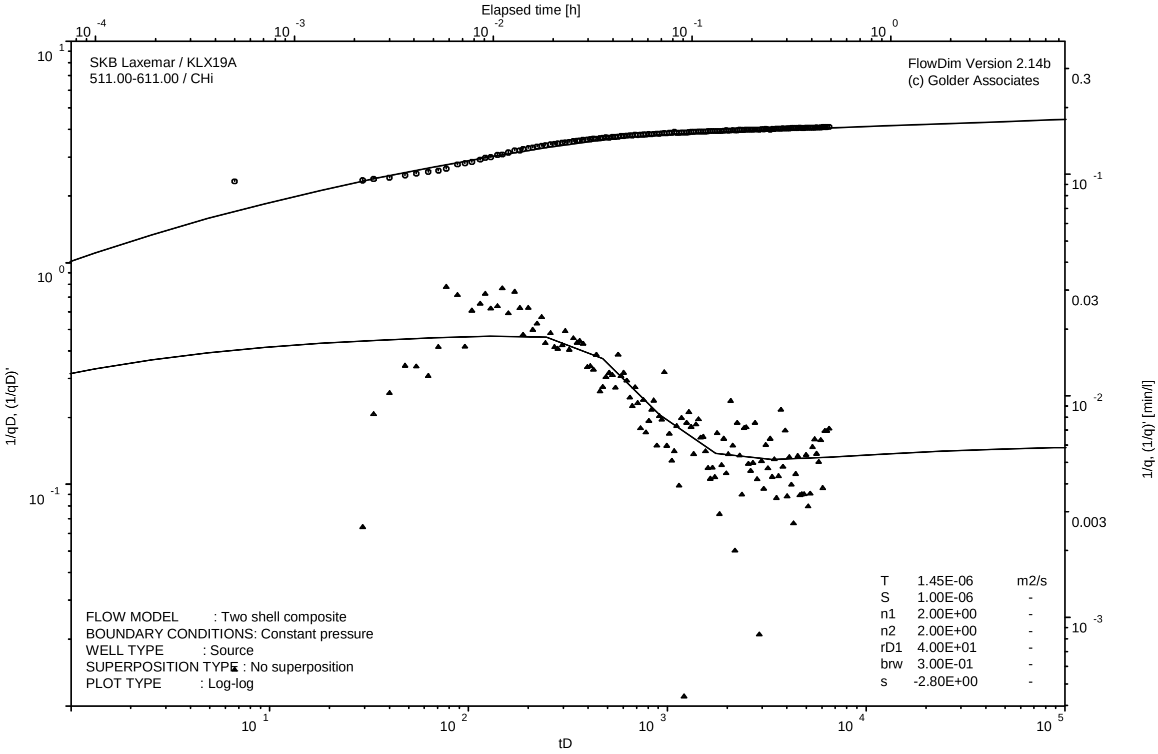
Analysis diagrams



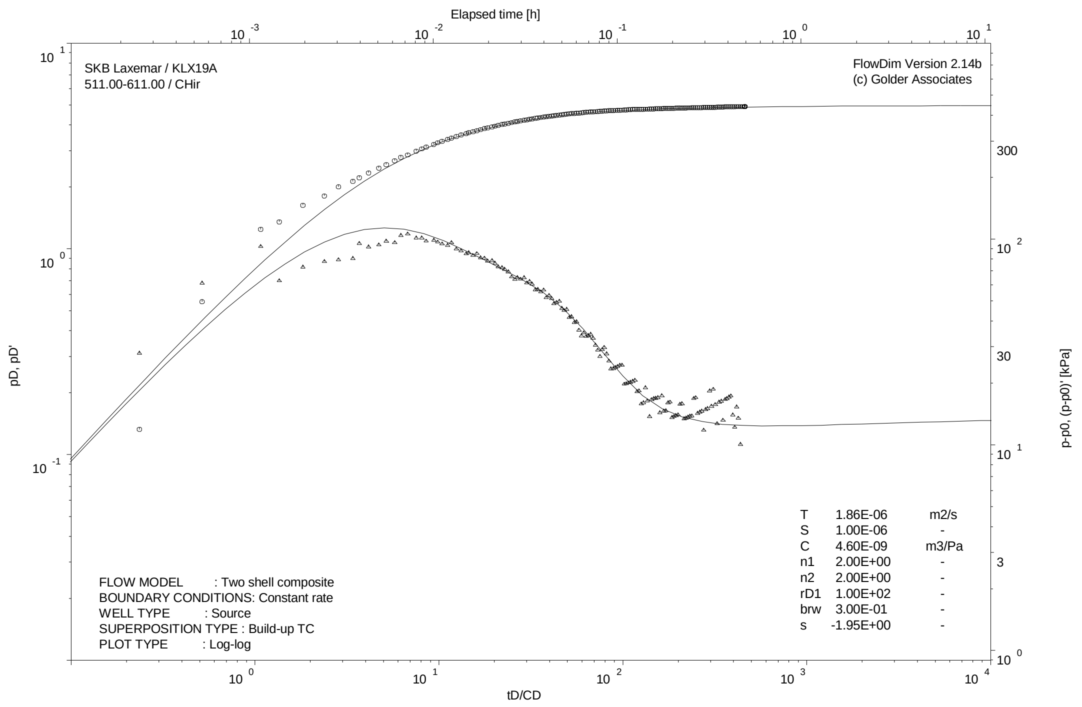
Pressure and flow rate vs. time; cartesian plot



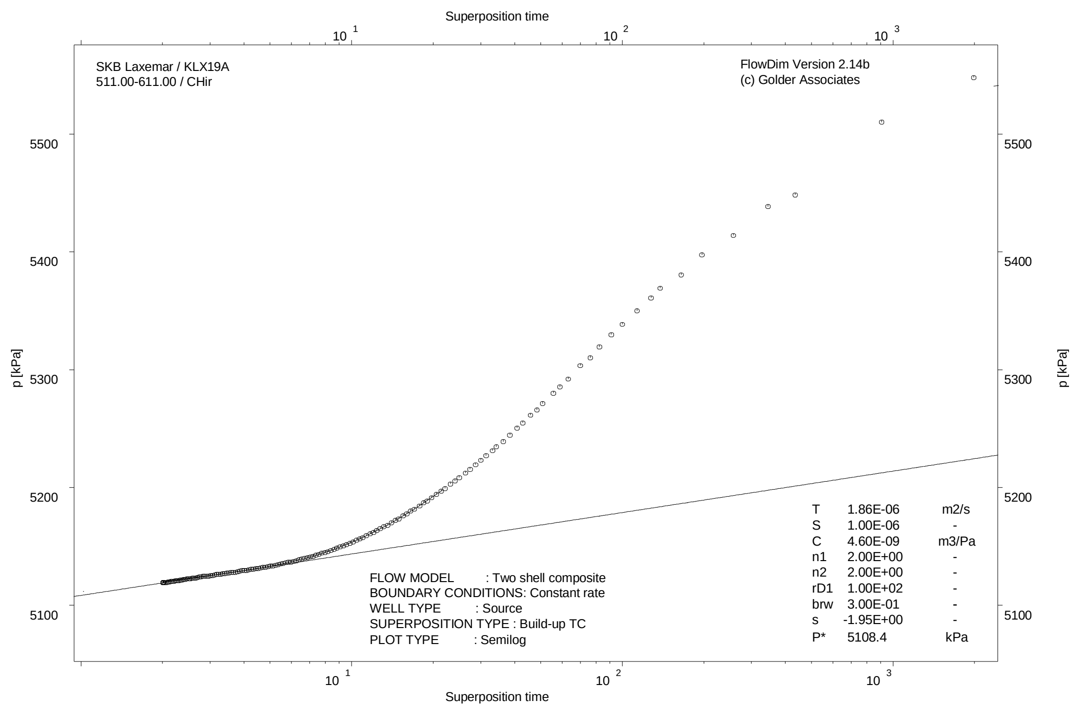
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

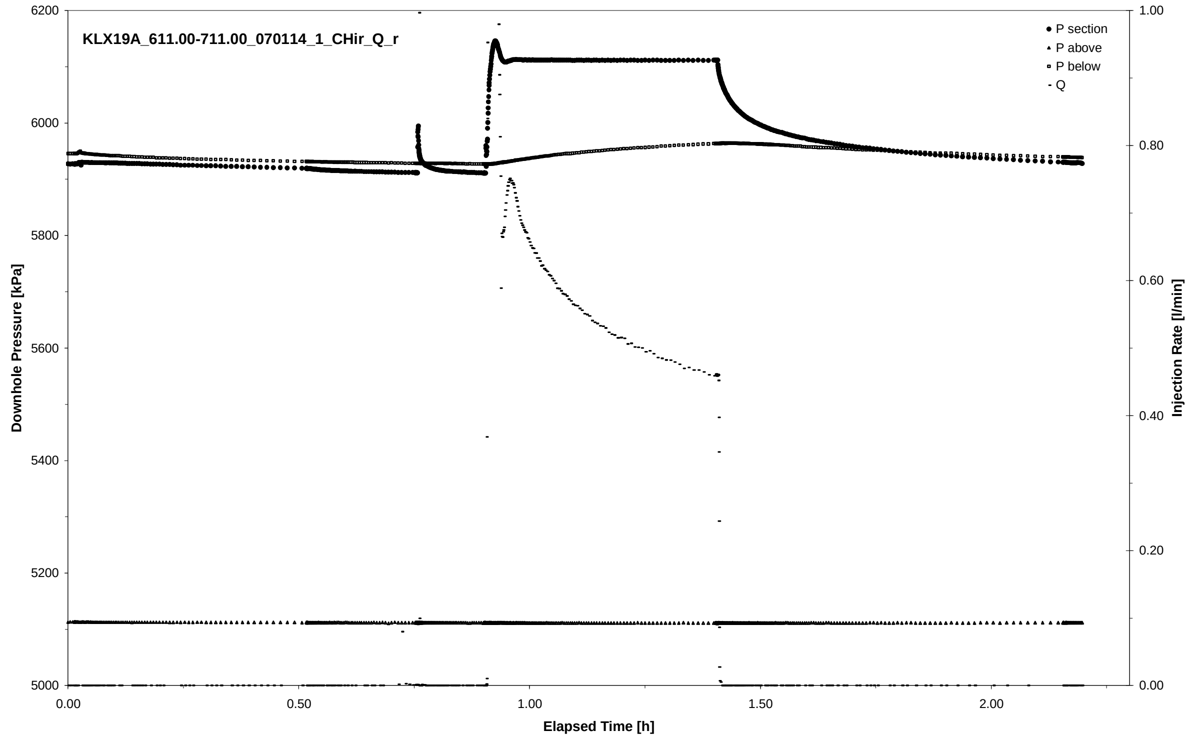


CHIR phase; HORNER match

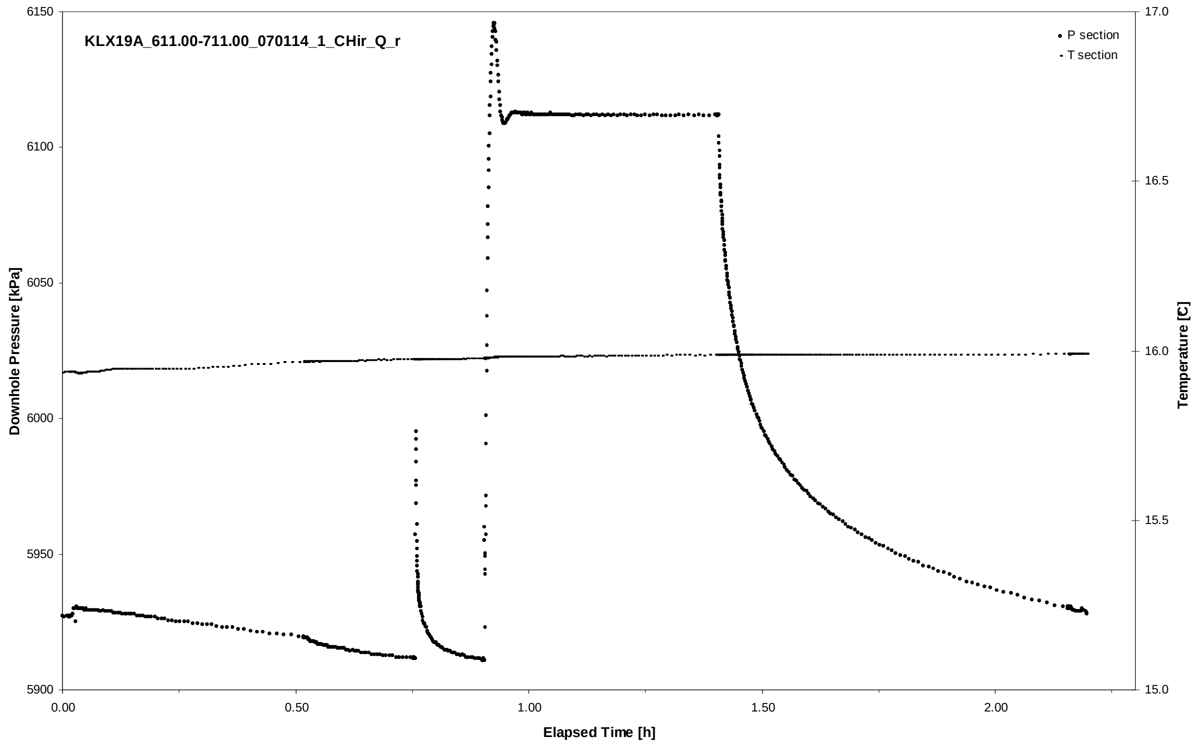
APPENDIX 2-6

Test 611.00 – 711.00 m

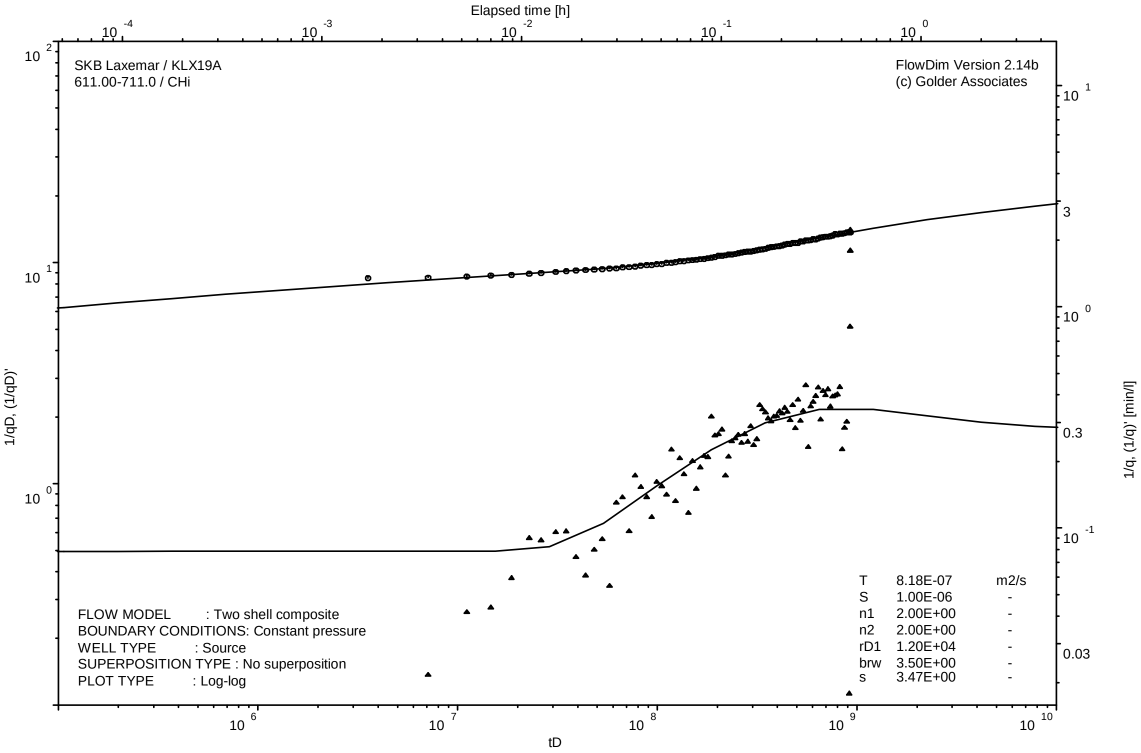
Analysis diagrams



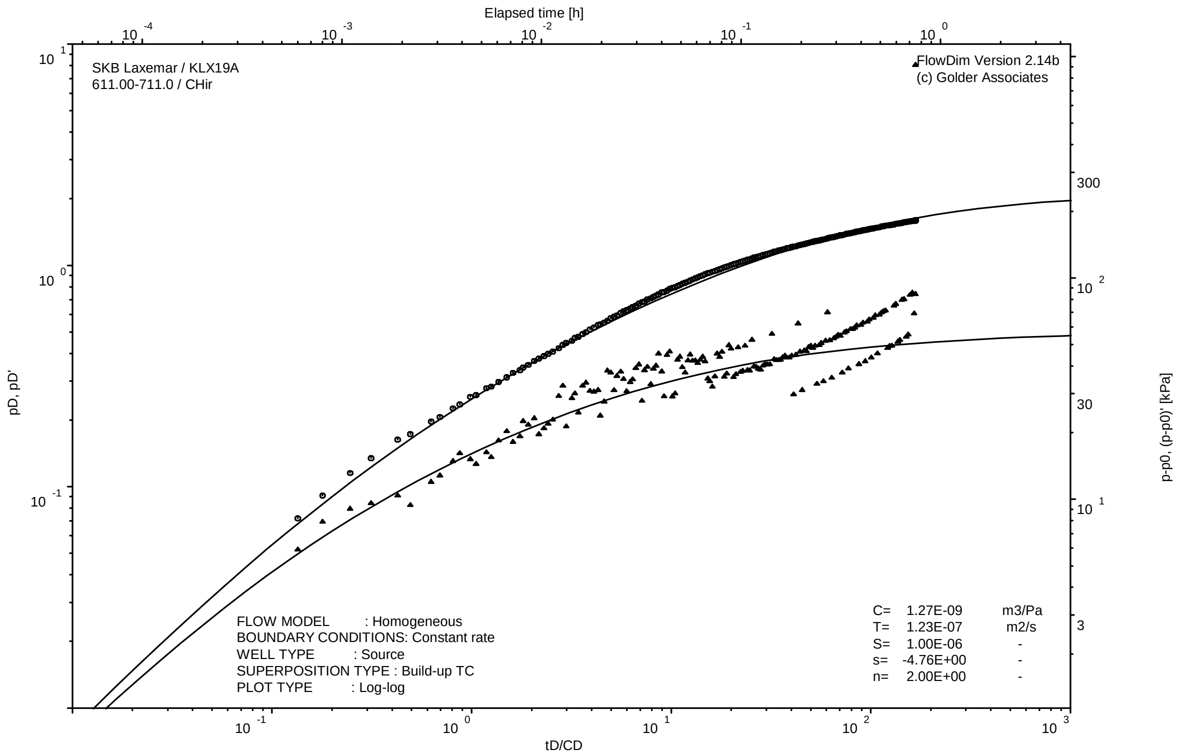
Pressure and flow rate vs. time; cartesian plot



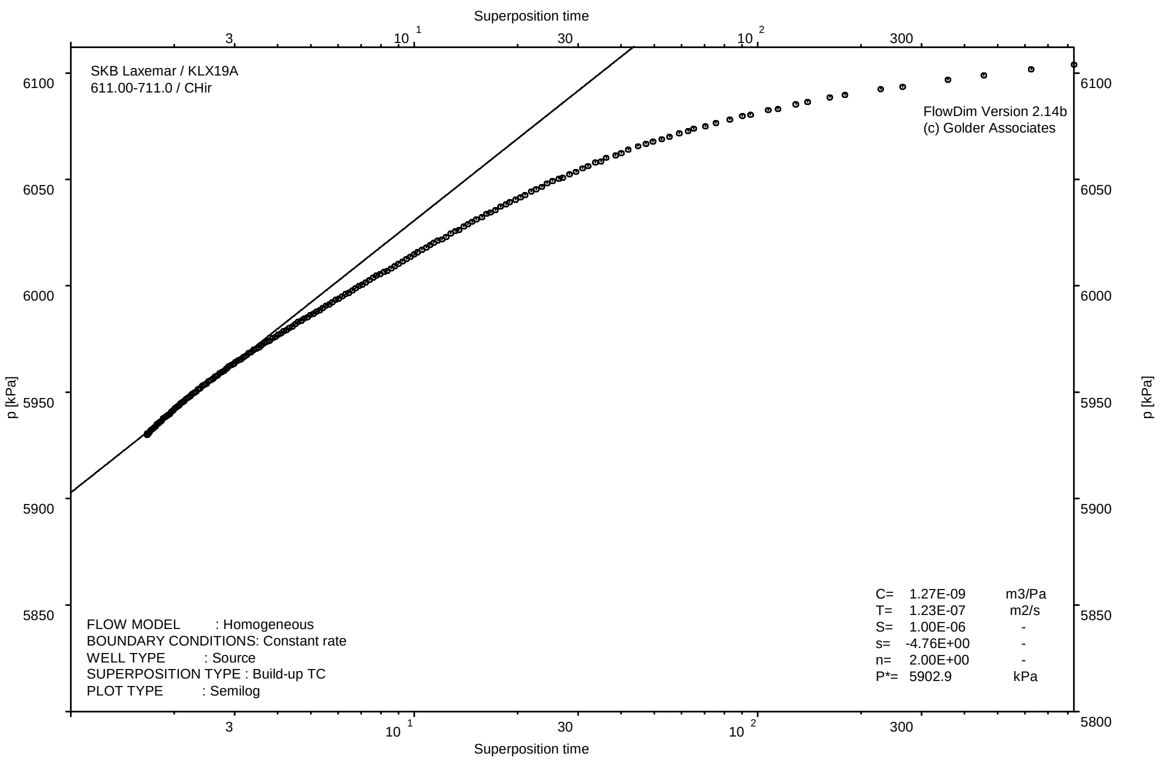
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

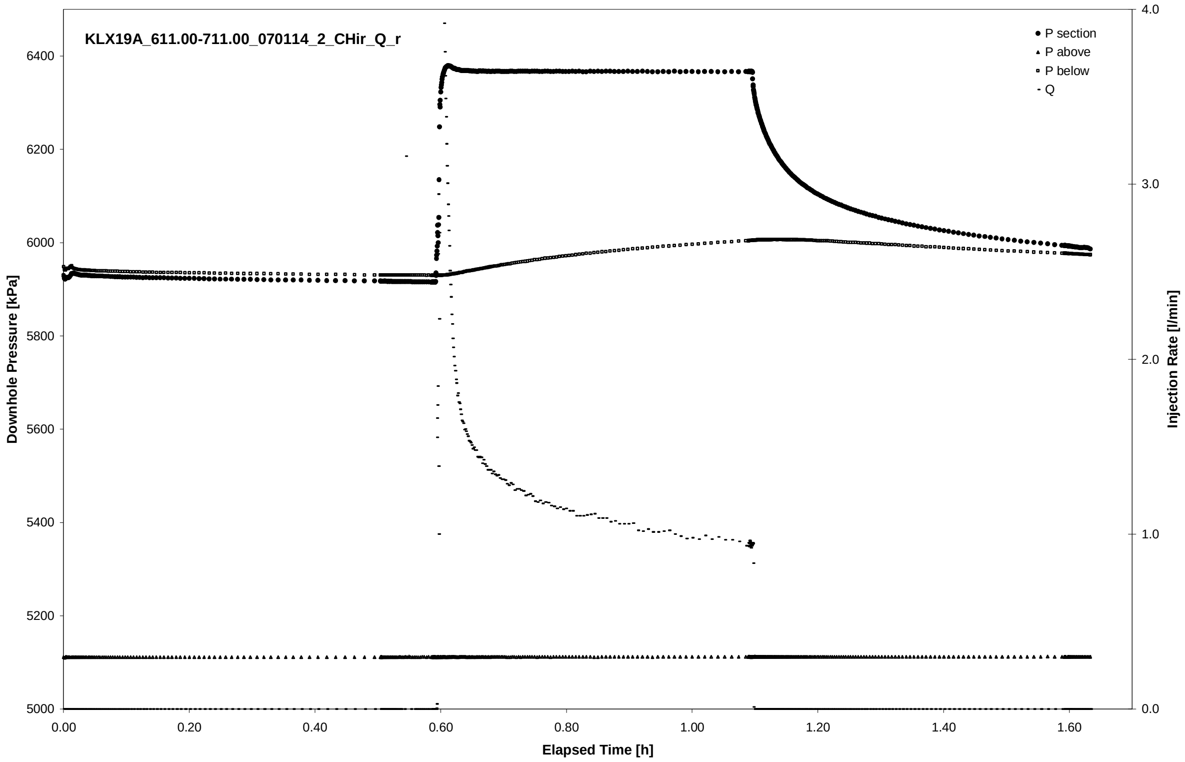


CHIR phase; HORNER match

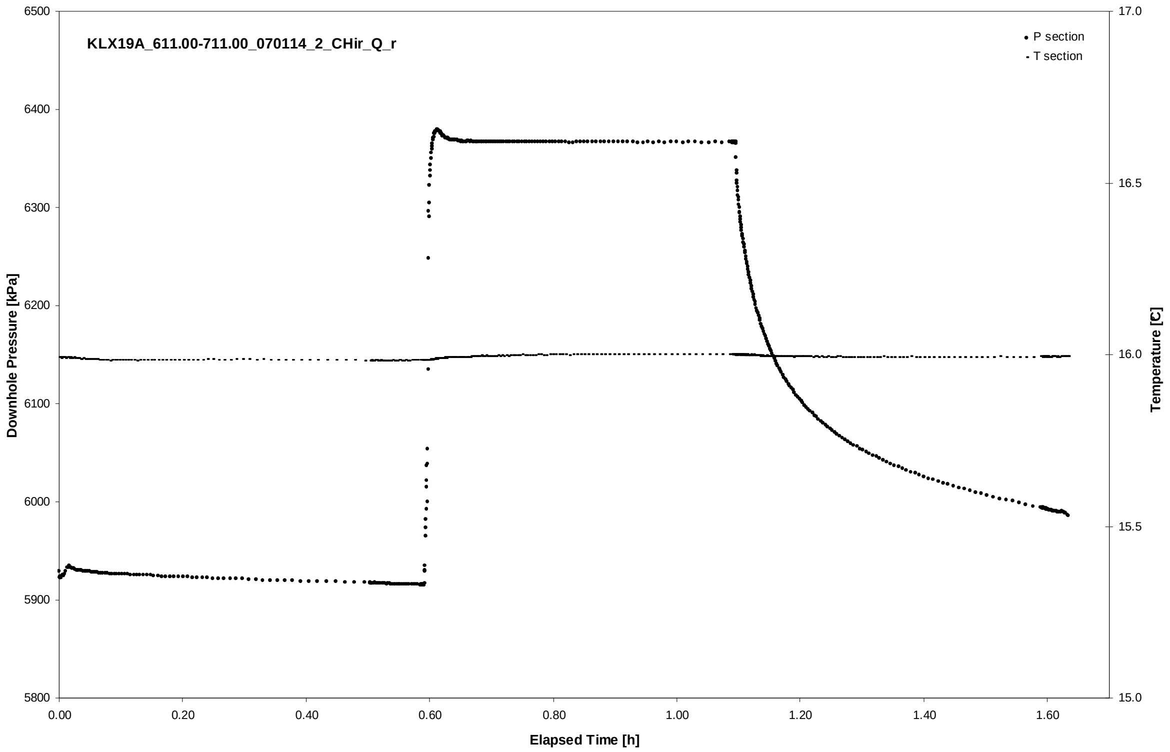
APPENDIX 2-6a

Test 611.00 – 711.00 m

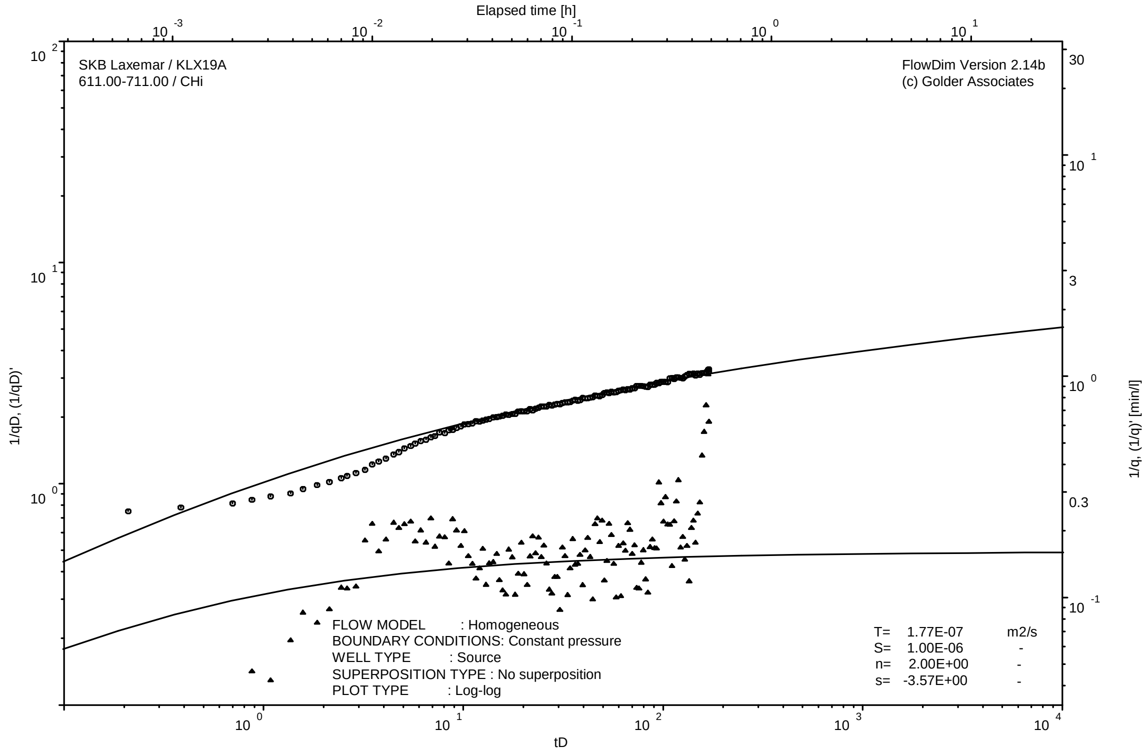
Analysis diagrams



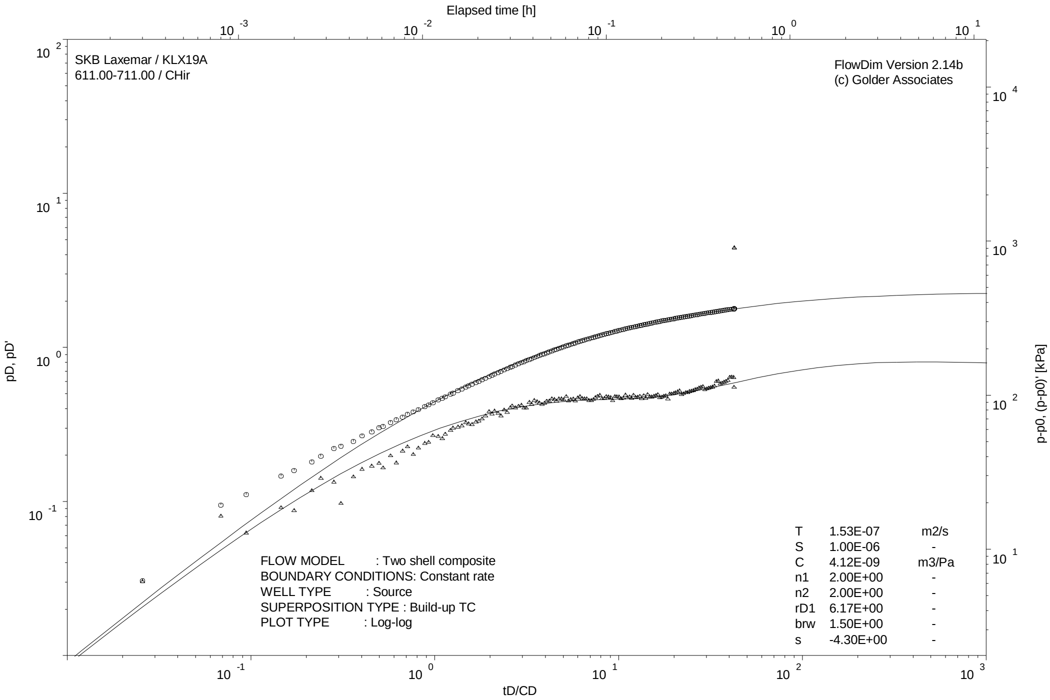
Pressure and flow rate vs. time; cartesian plot



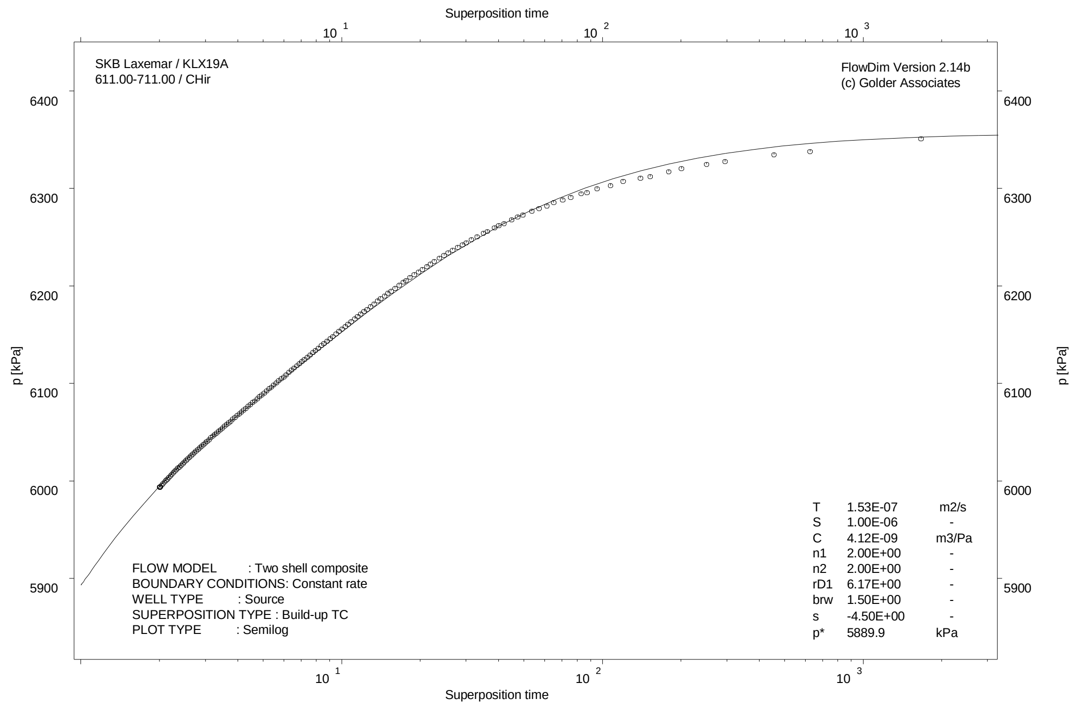
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

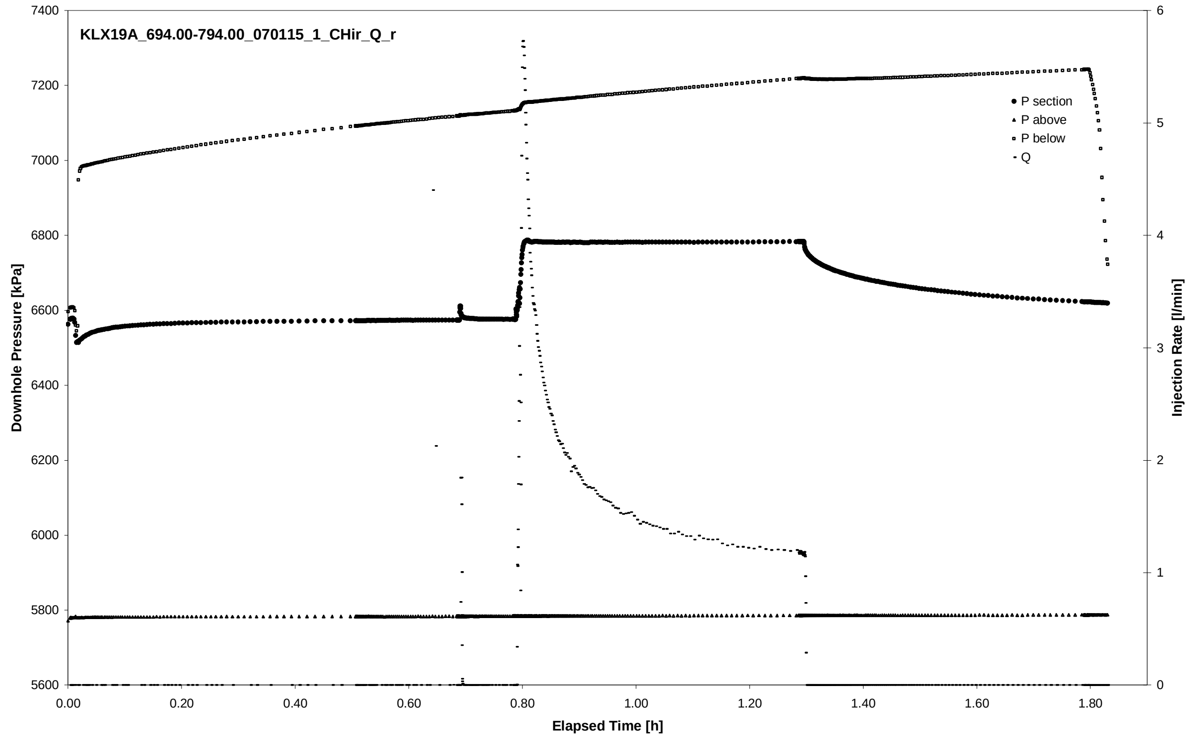


CHIR phase; HORNER match

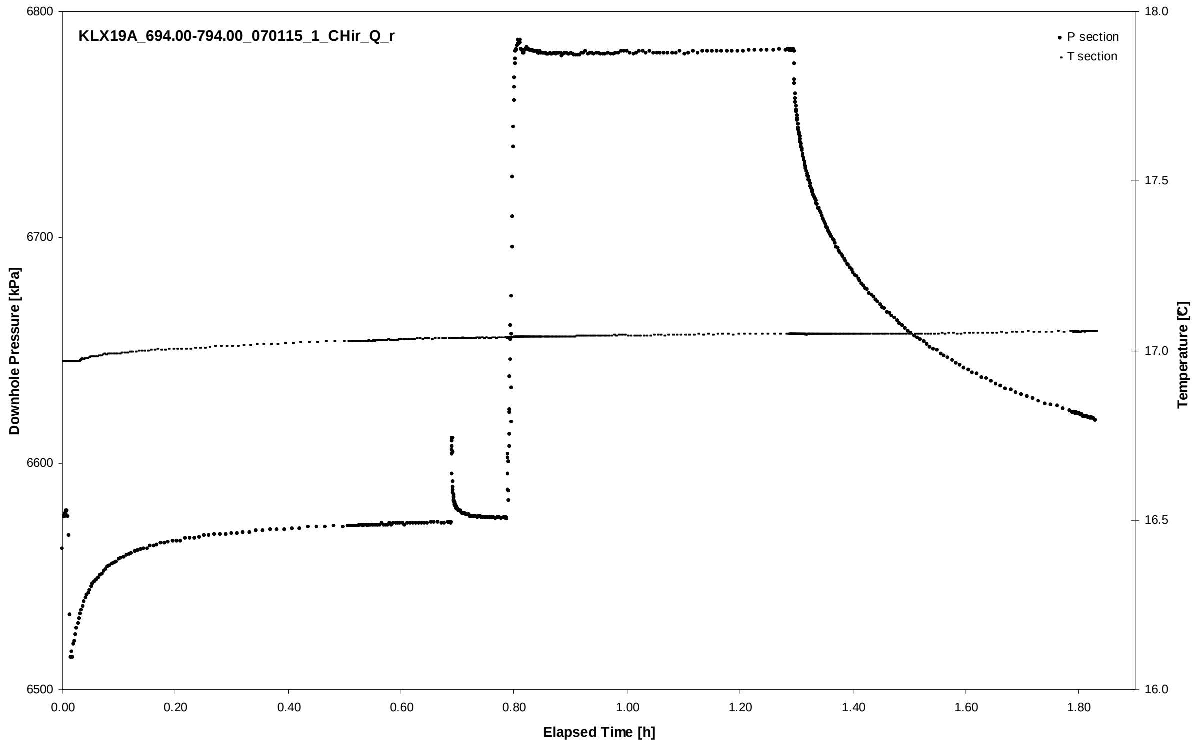
APPENDIX 2-7

Test 694.00 – 794.00 m

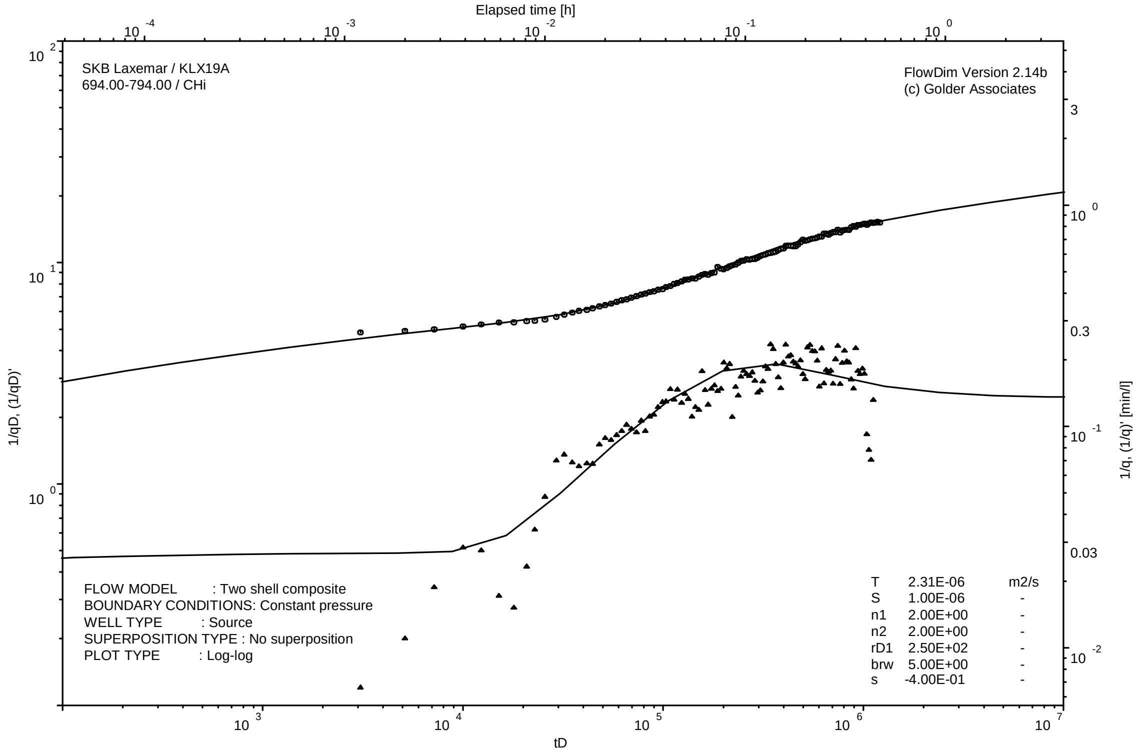
Analysis diagrams



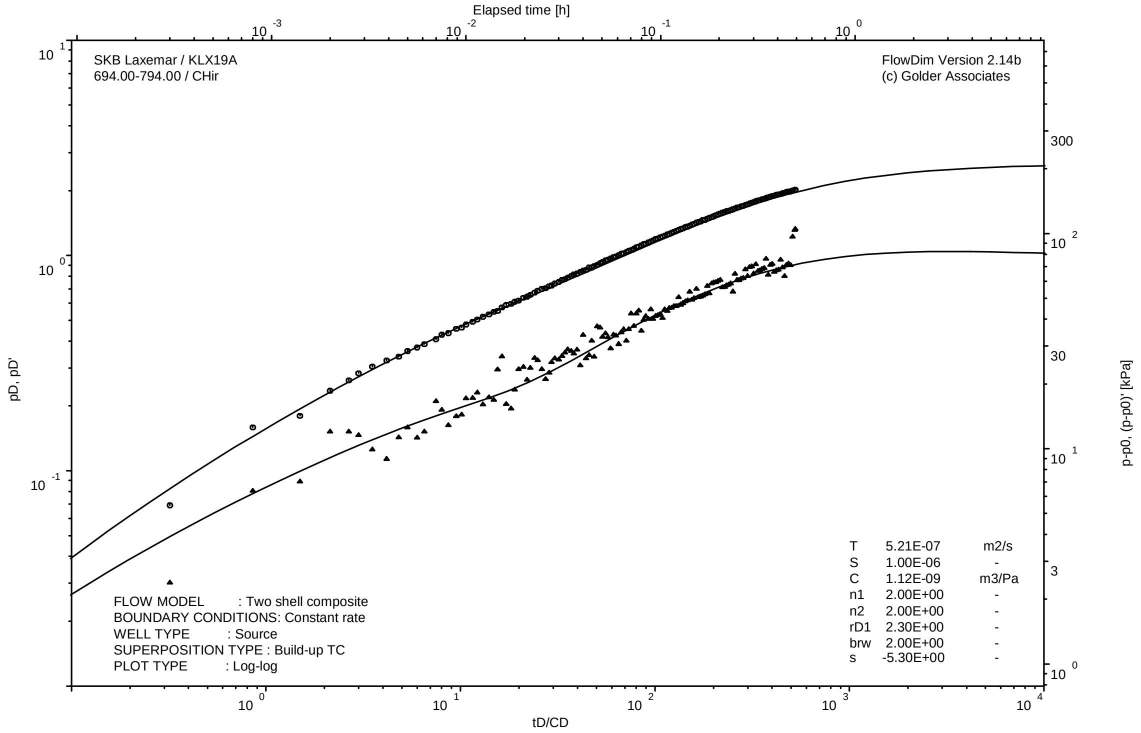
Pressure and flow rate vs. time; cartesian plot



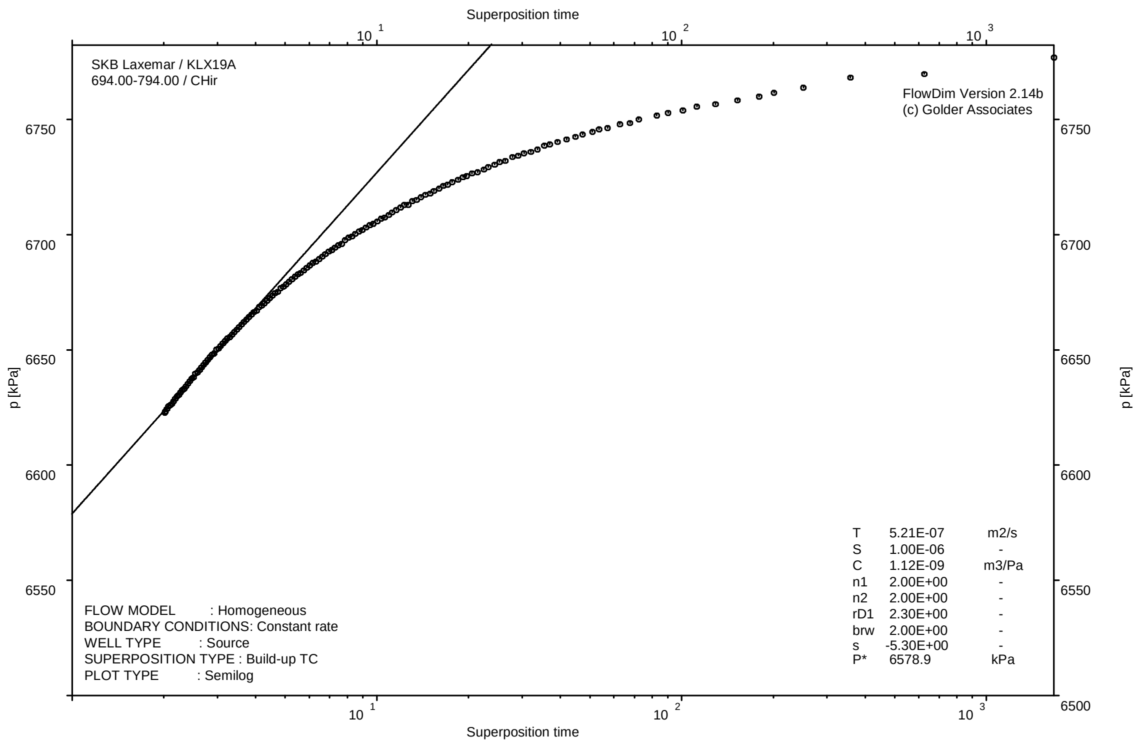
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

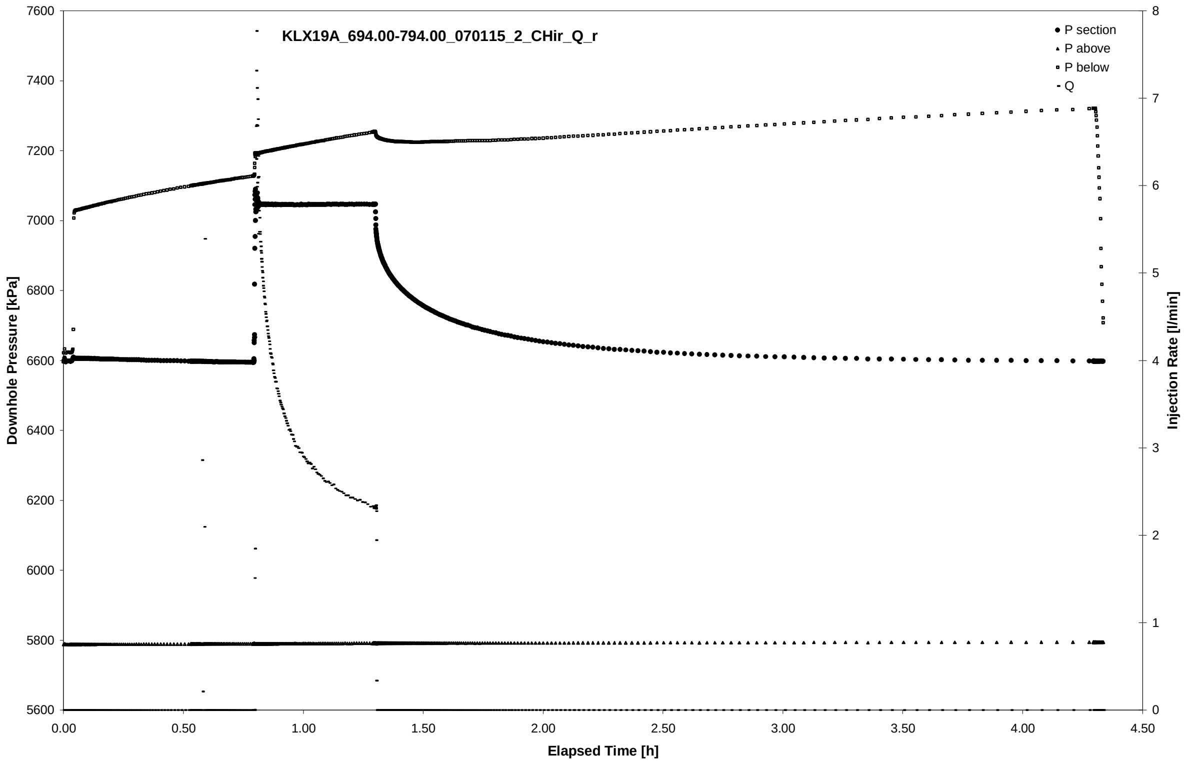


CHIR phase; HORNER match

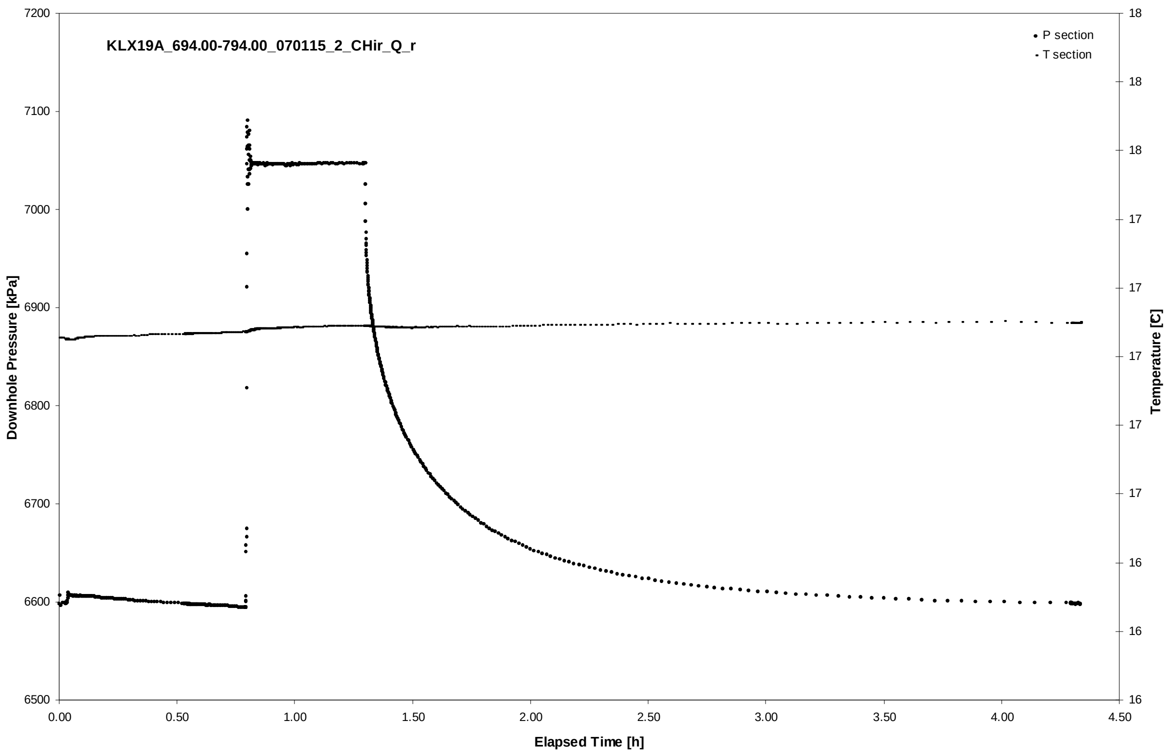
APPENDIX 2-7a

Test 694.00 – 794.00 m

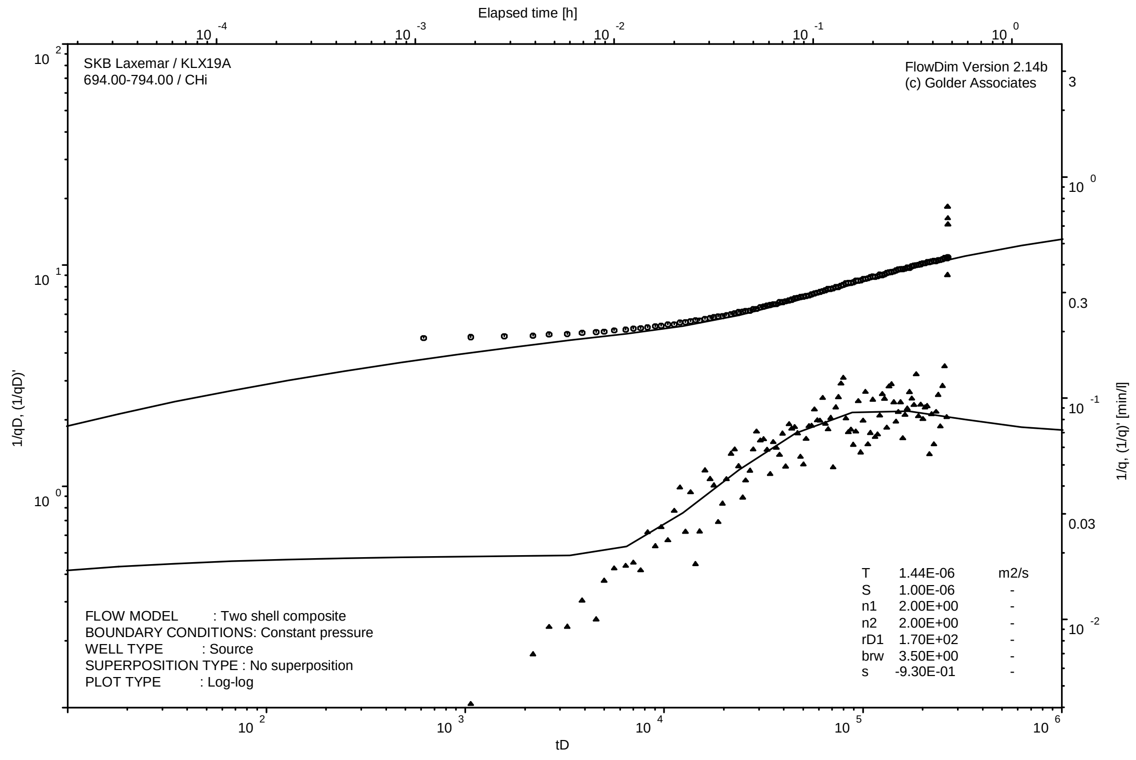
Analysis diagrams



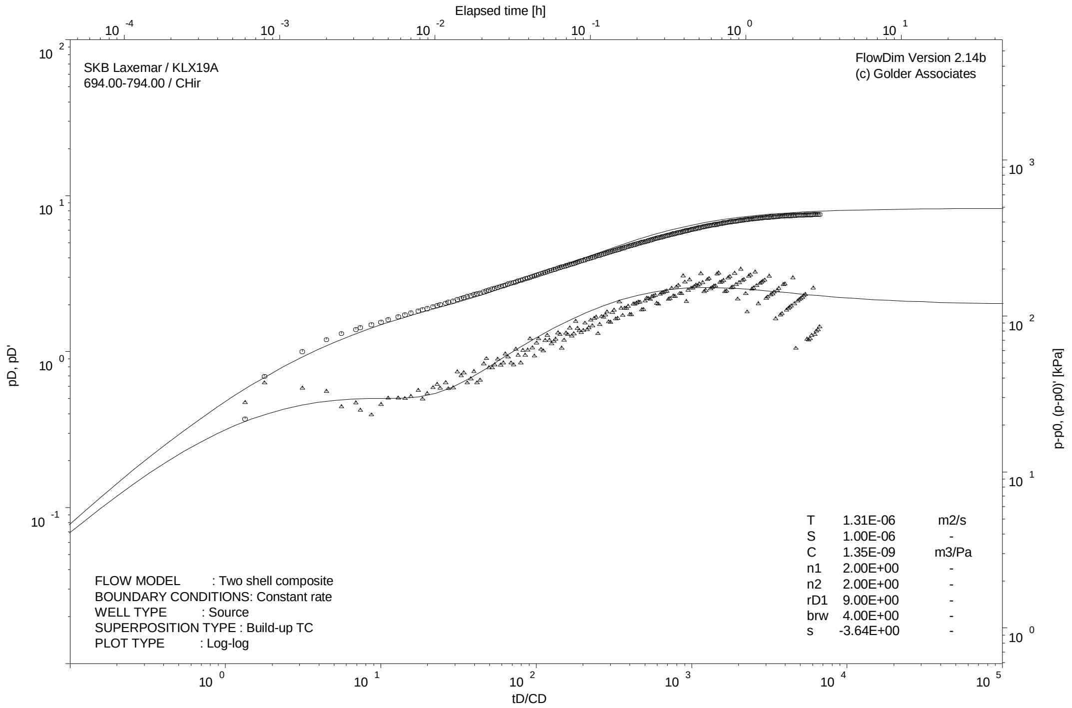
Pressure and flow rate vs. time; cartesian plot



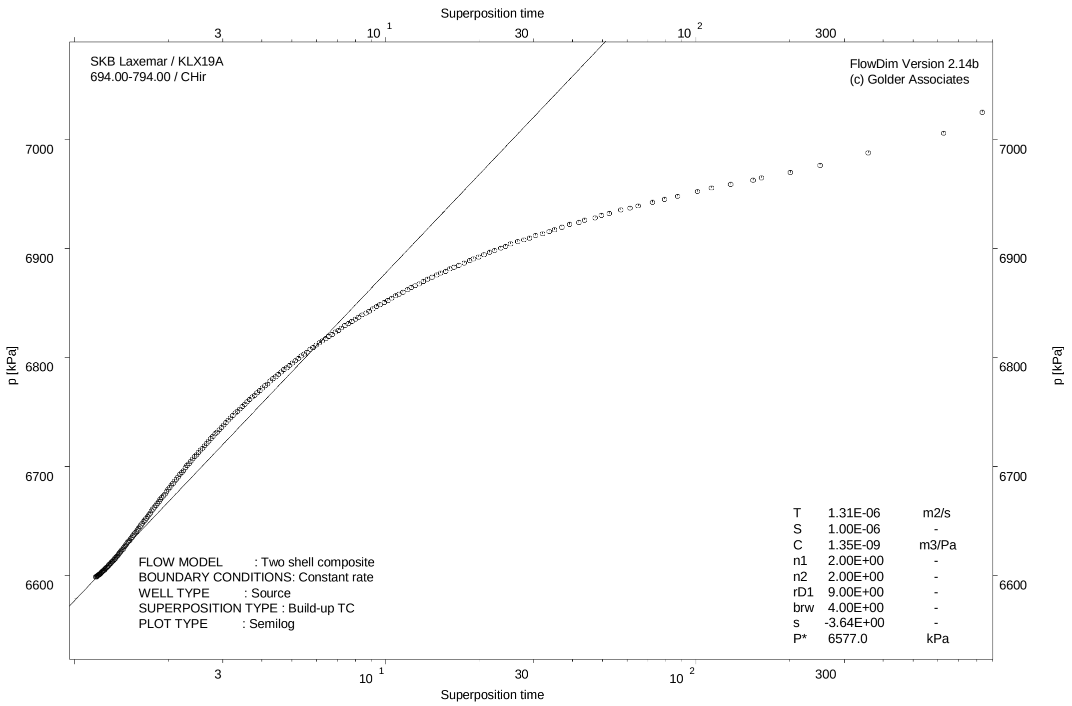
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

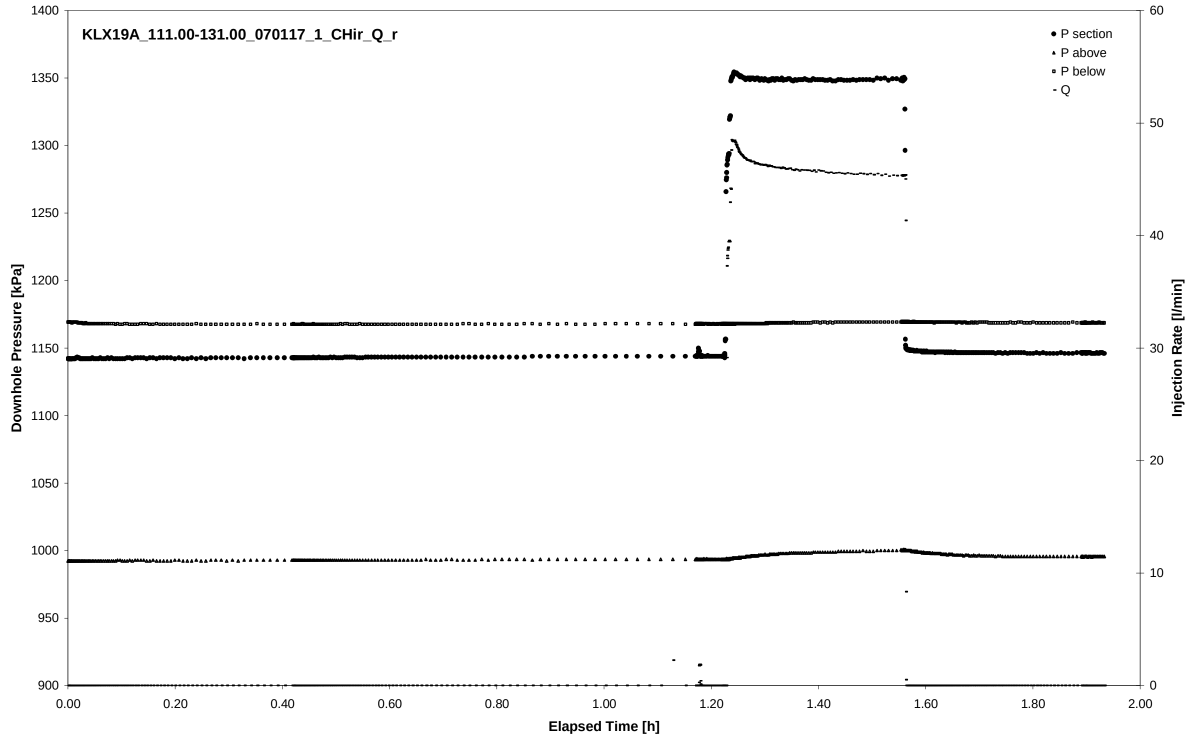


CHIR phase; HORNER match

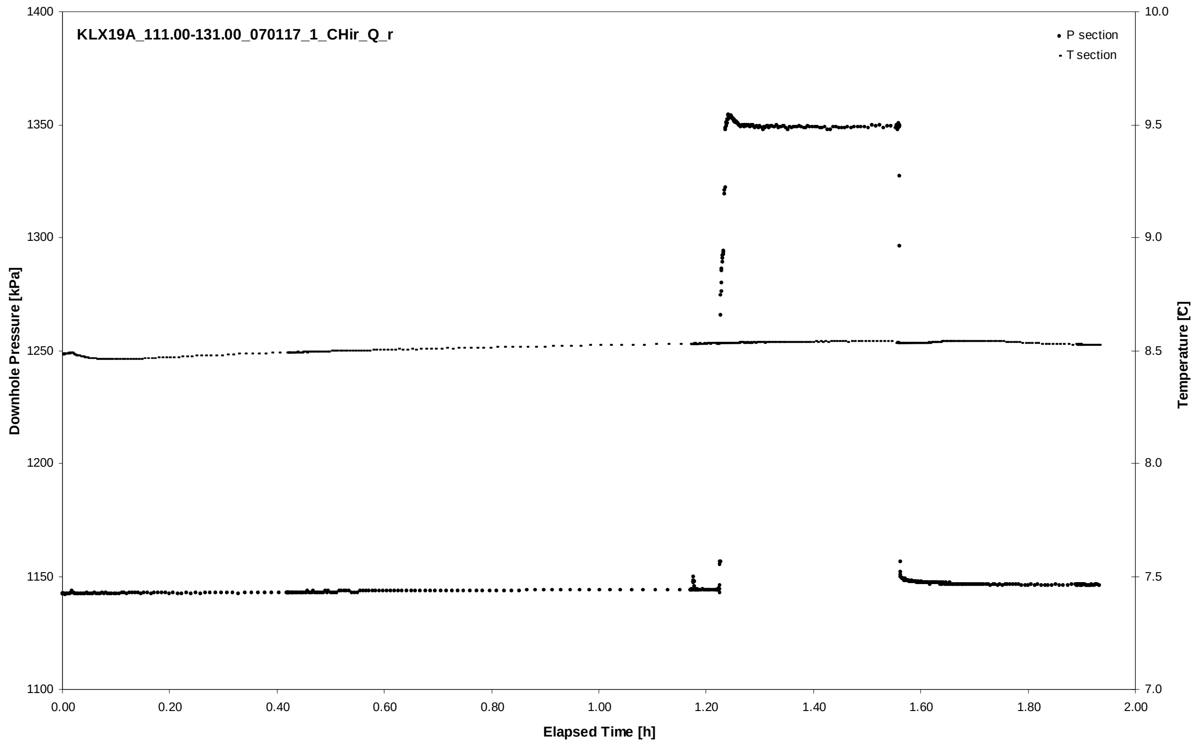
APPENDIX 2-8

Test 111.00 – 131.00 m

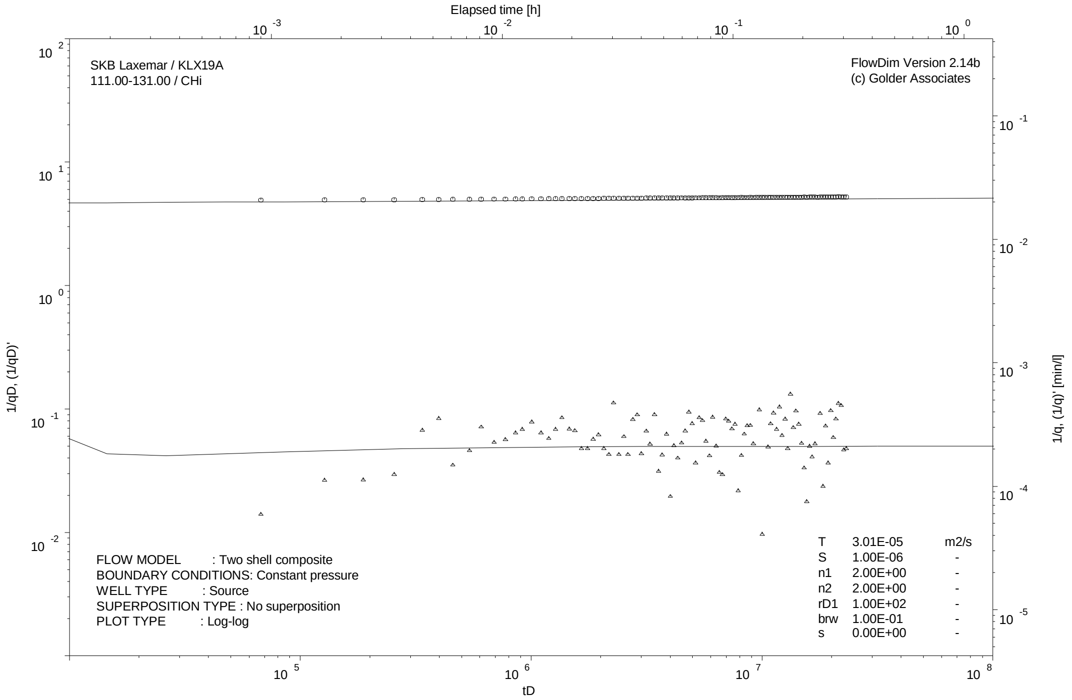
Analysis diagrams



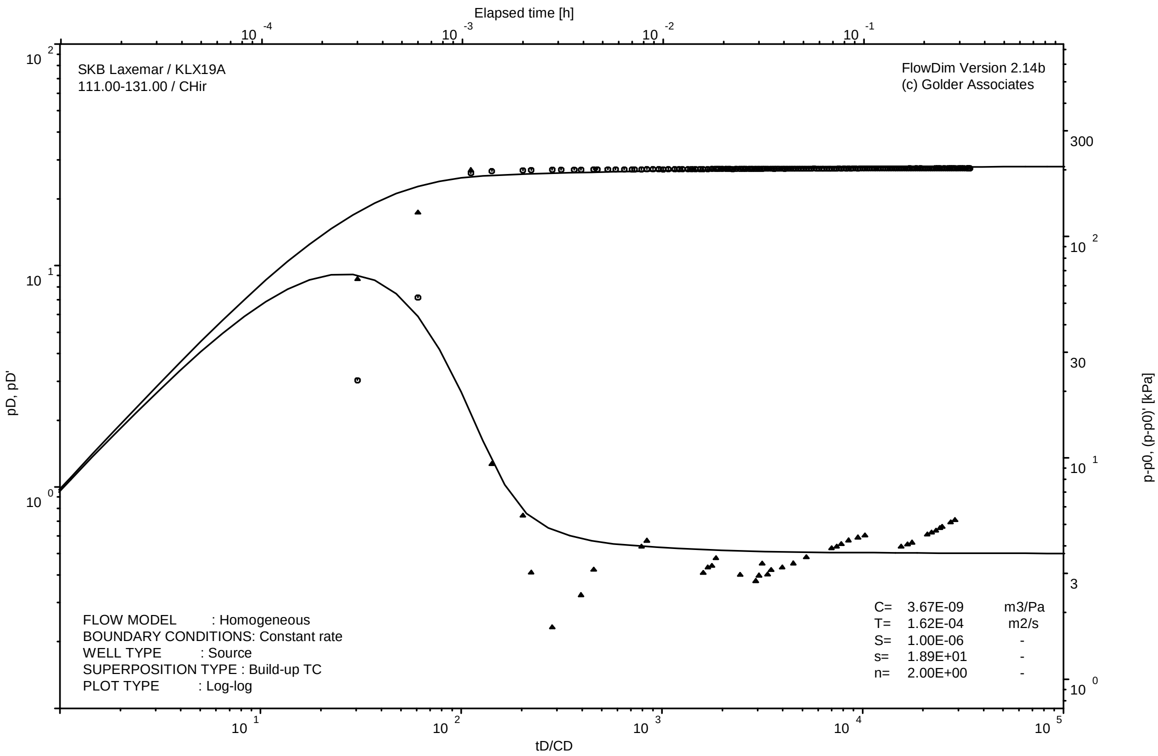
Pressure and flow rate vs. time; cartesian plot



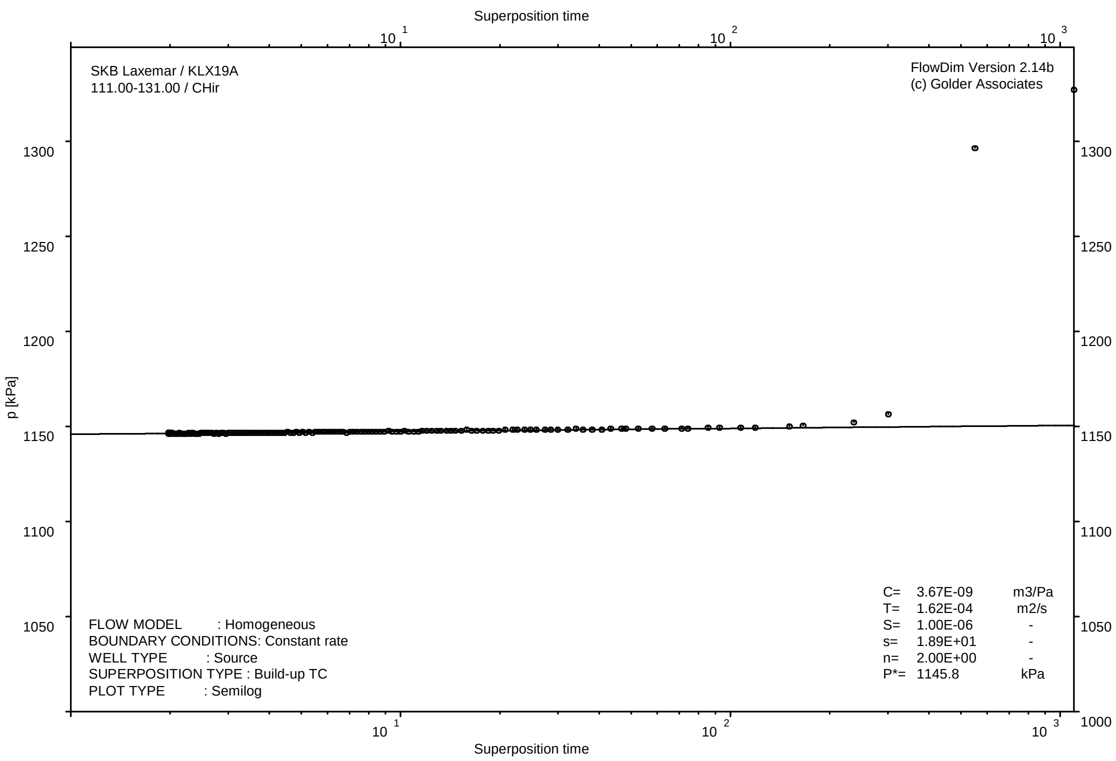
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

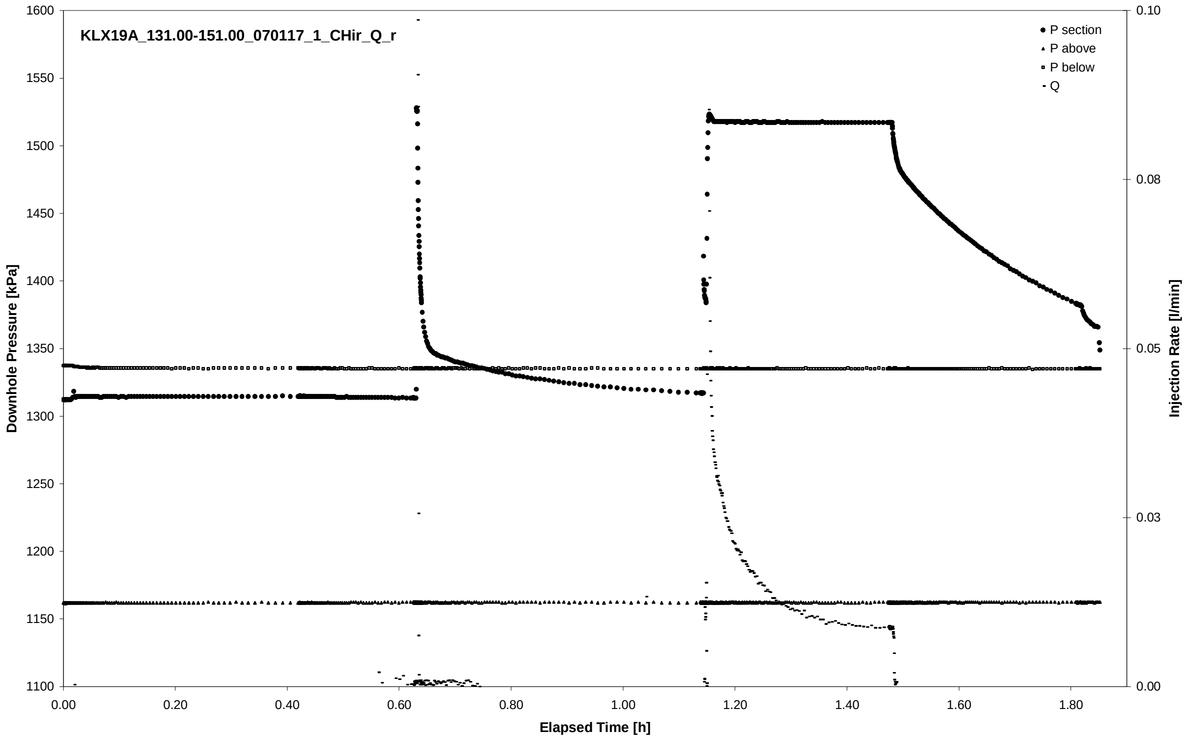


CHIR phase; HORNER match

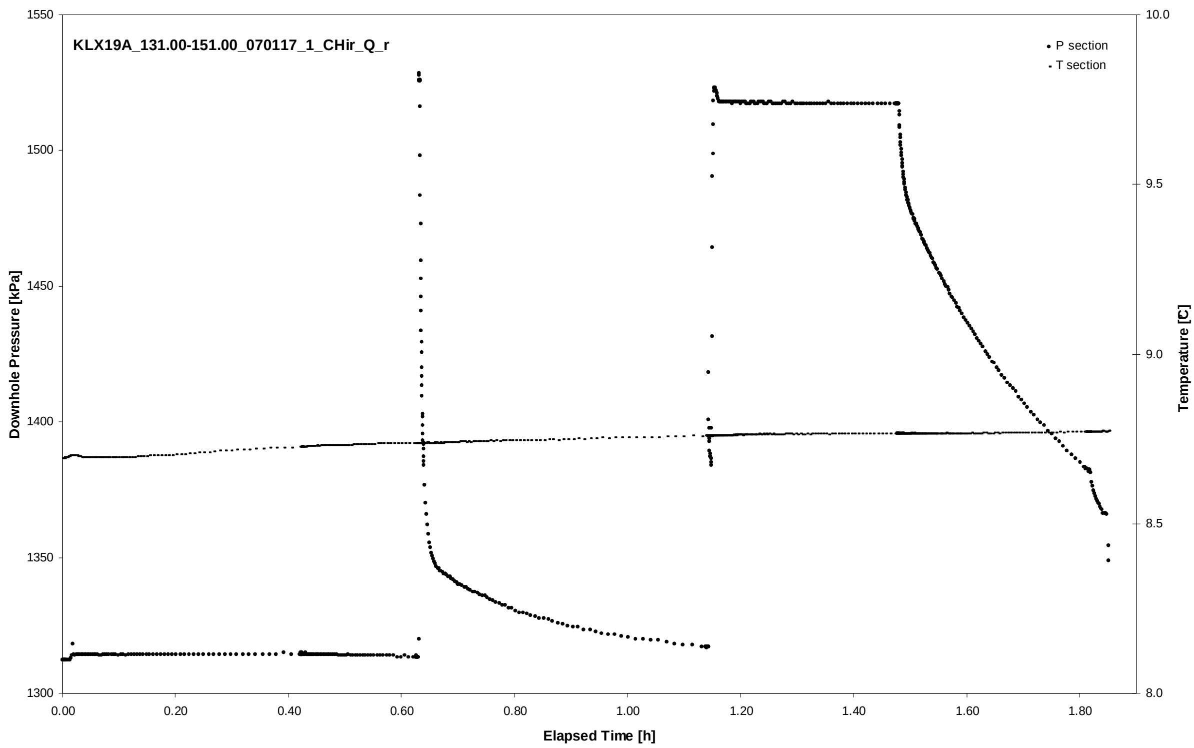
APPENDIX 2-9

Test 131.00 – 151.00 m

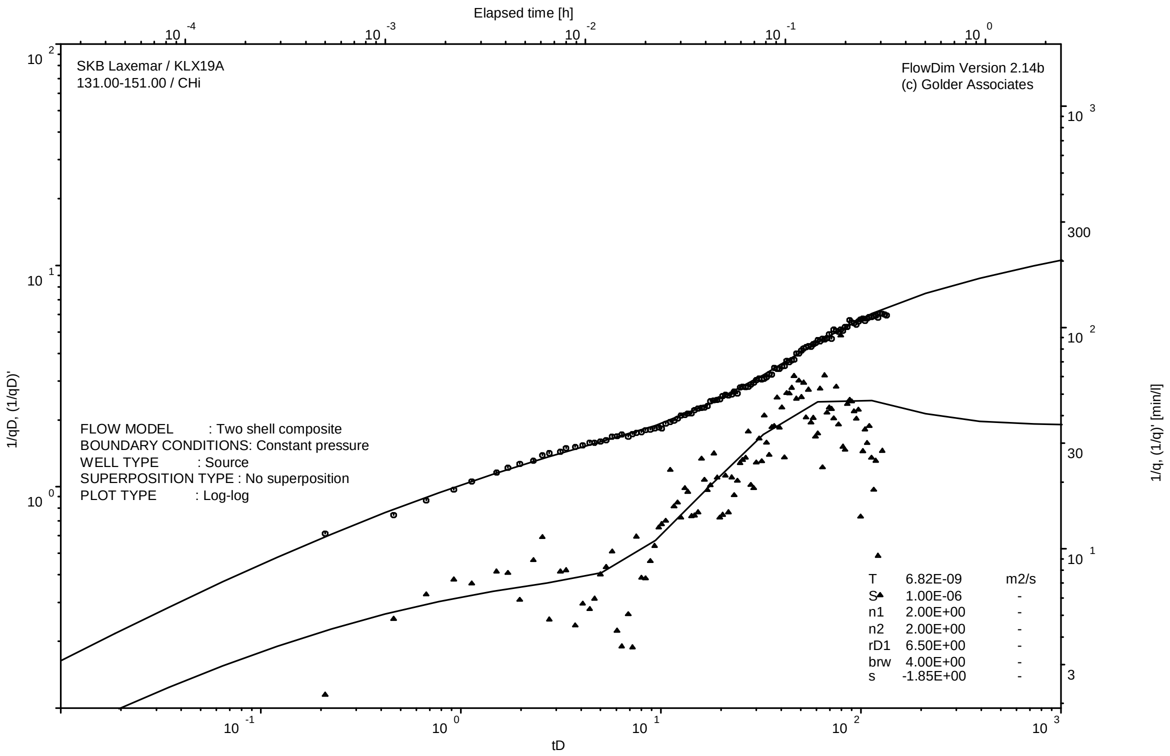
Analysis diagrams



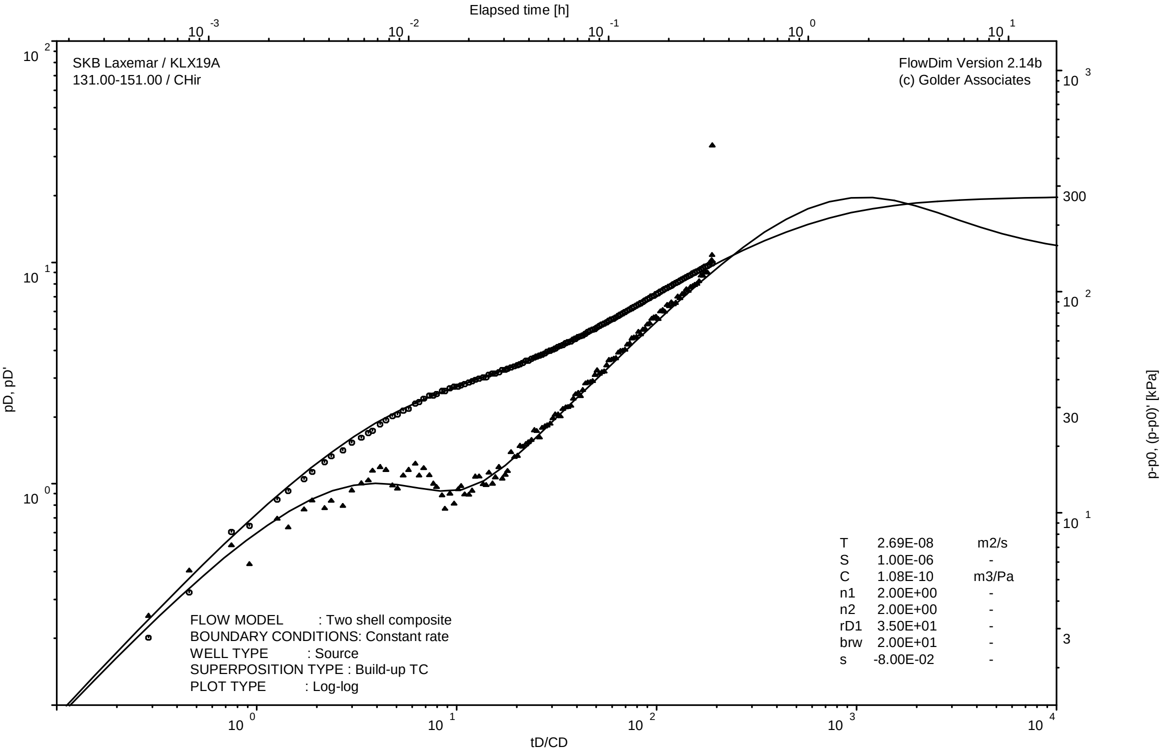
Pressure and flow rate vs. time; cartesian plot



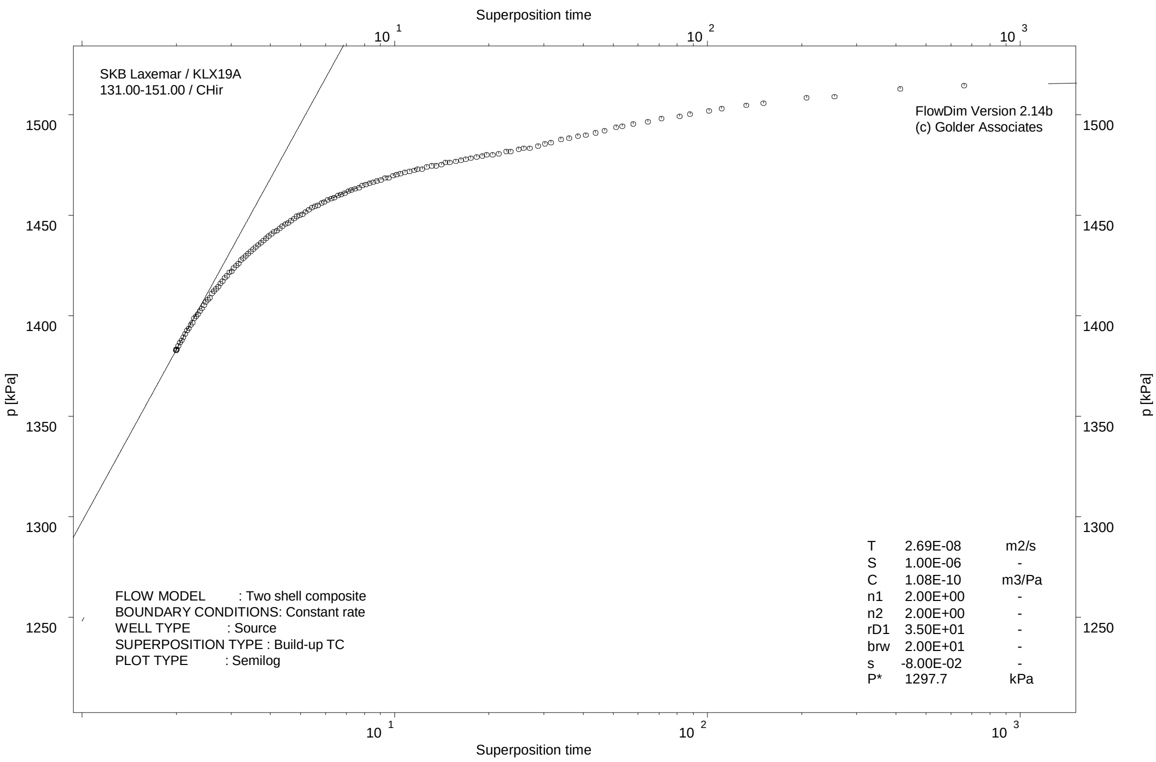
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

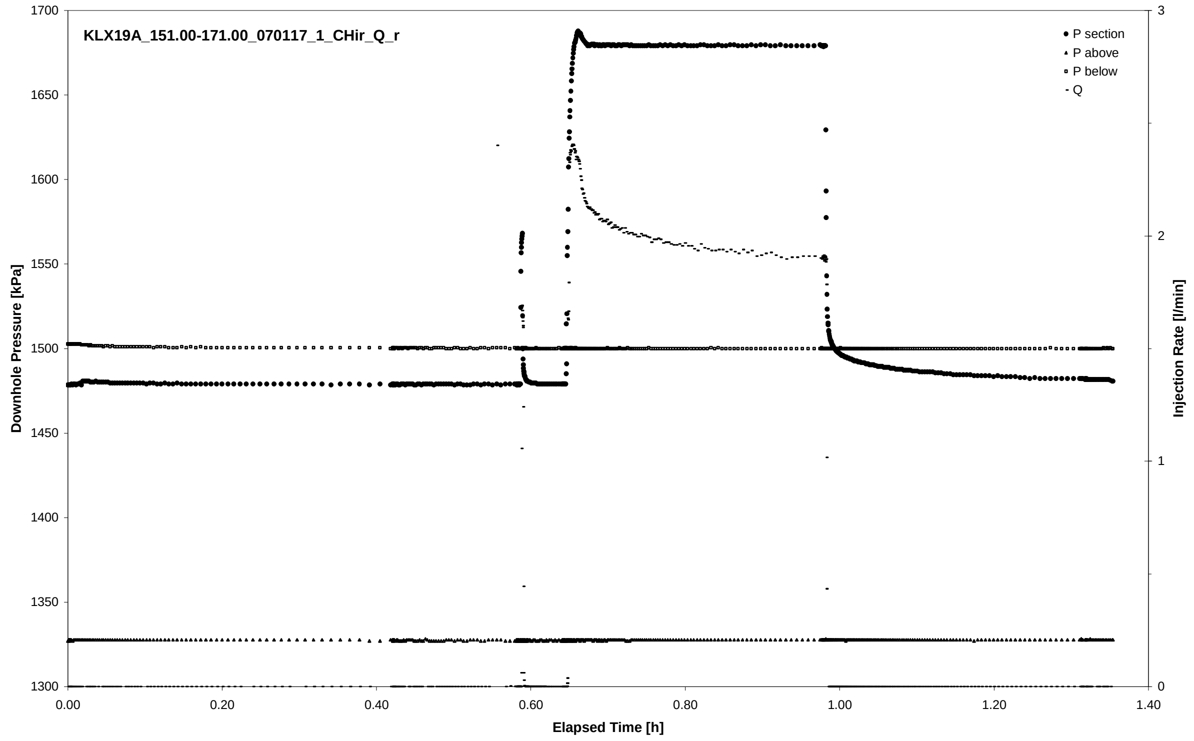


CHIR phase; HORNER match

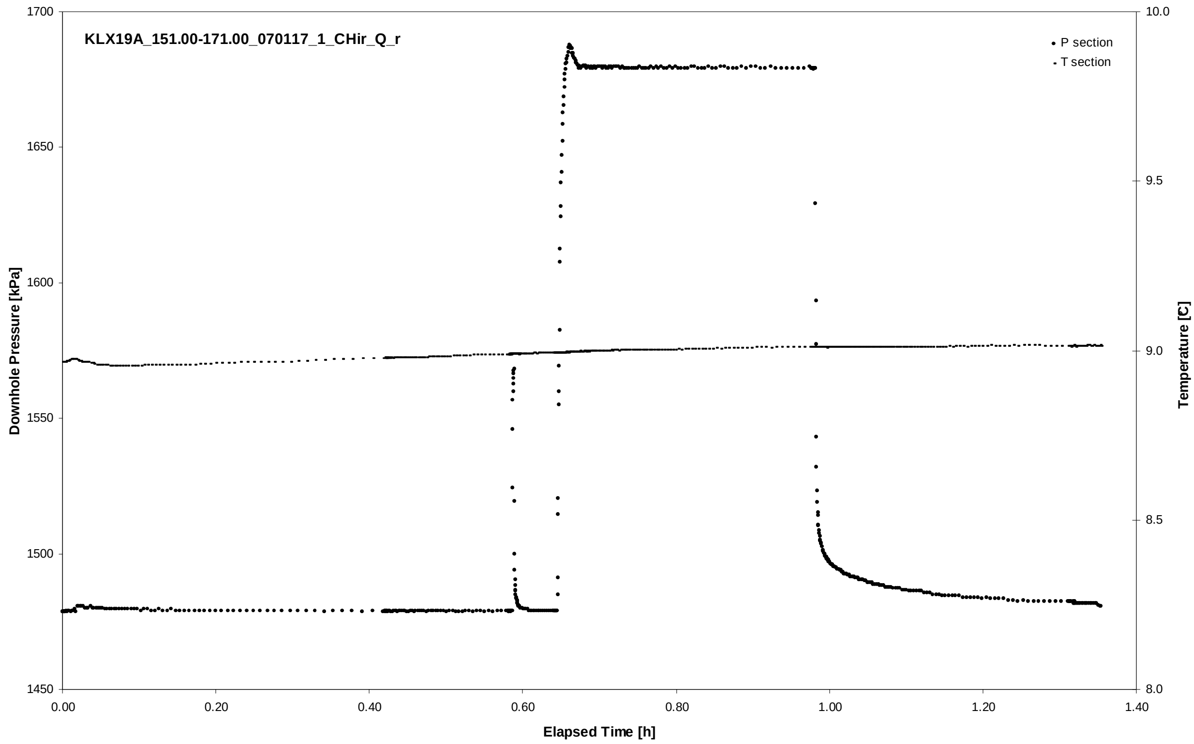
APPENDIX 2-10

Test 151.00 – 171.00 m

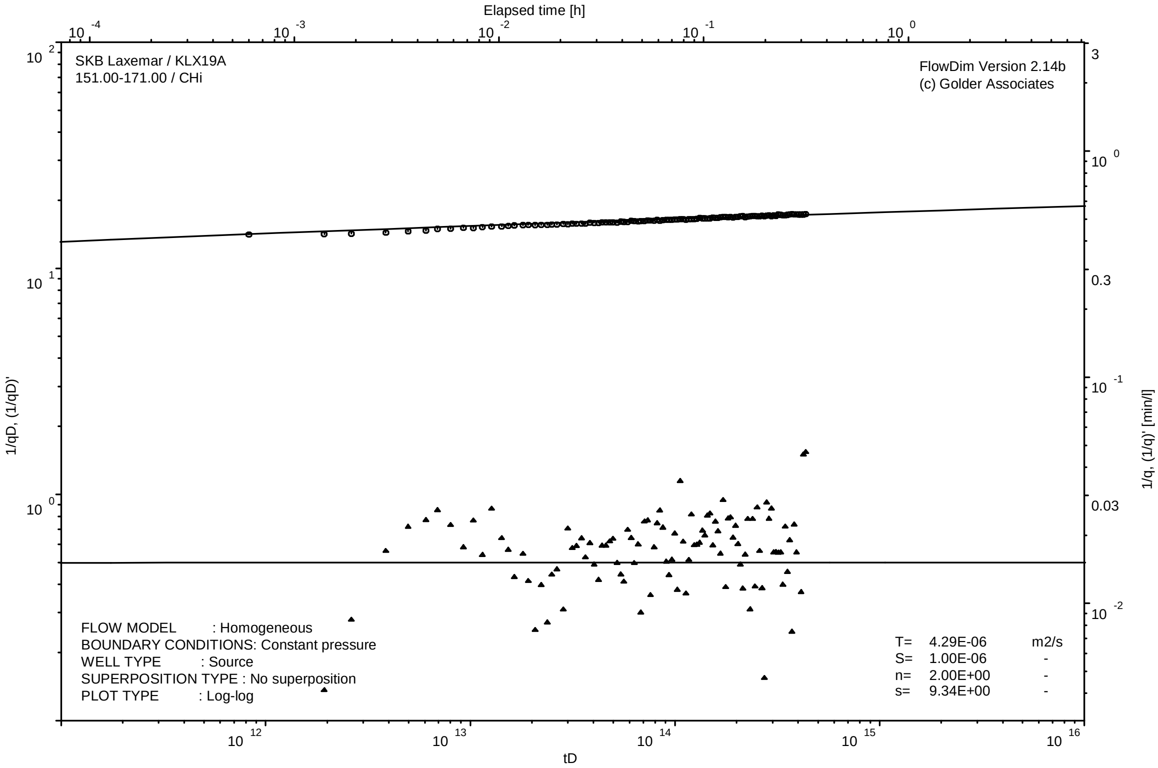
Analysis diagrams



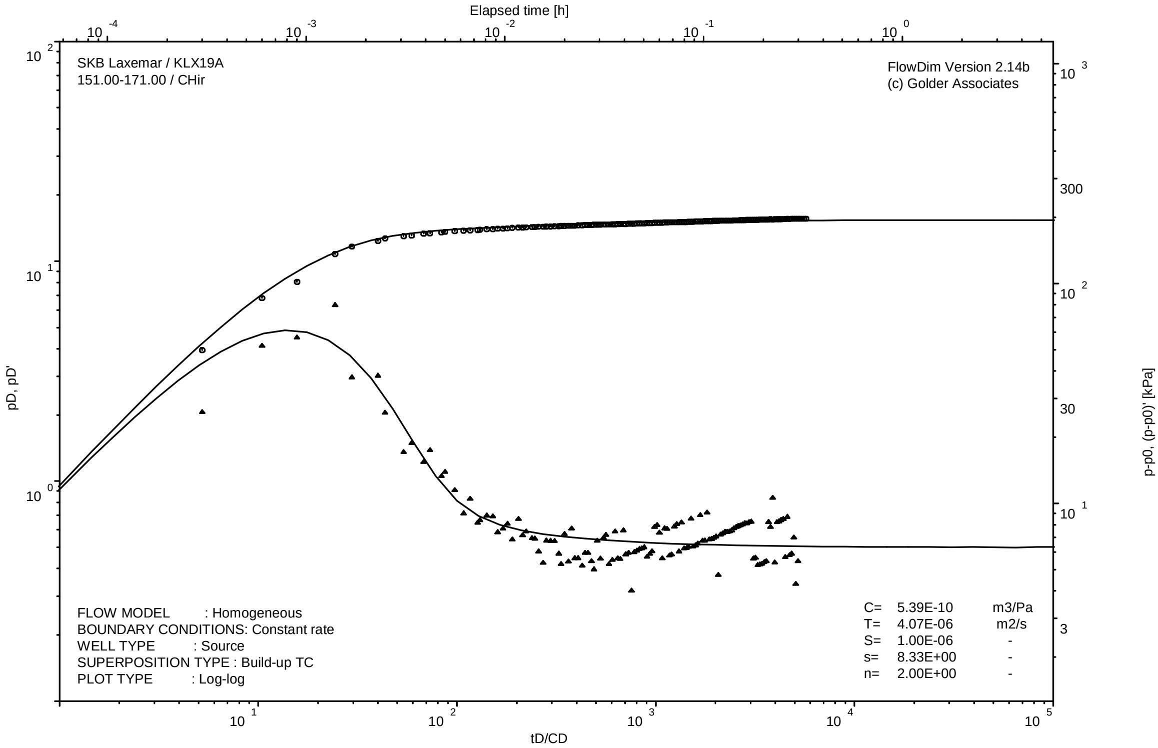
Pressure and flow rate vs. time; cartesian plot



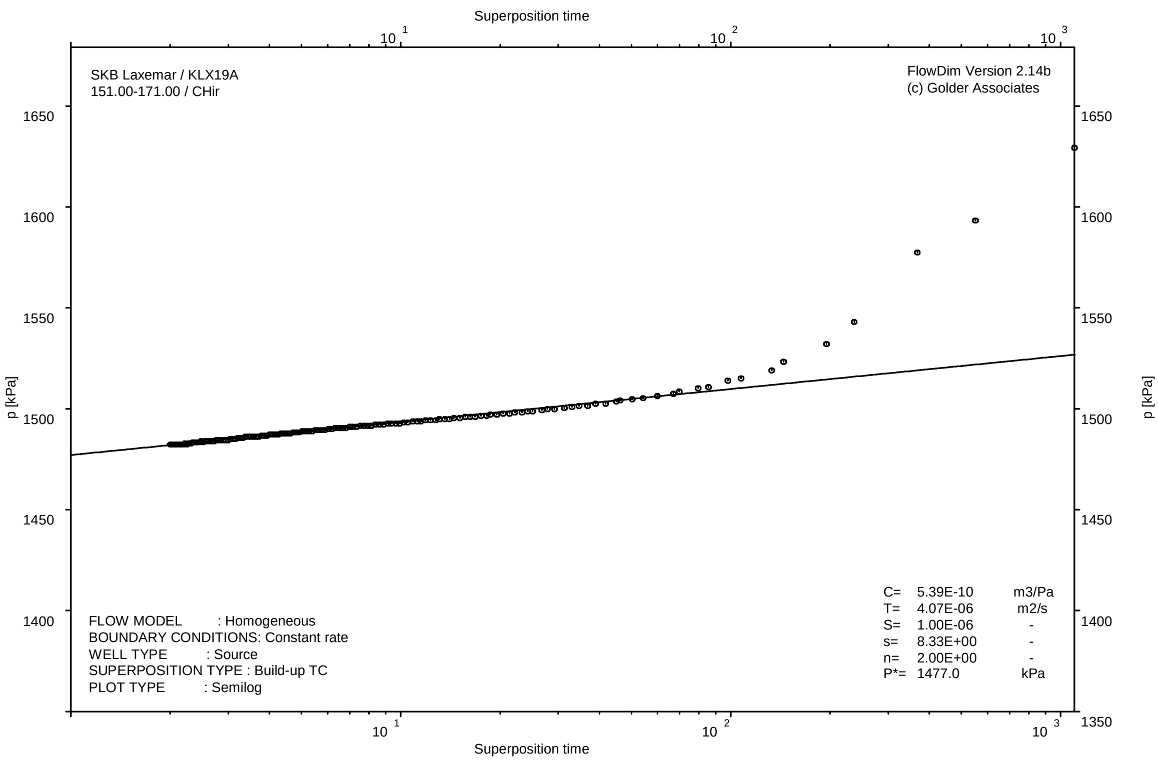
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

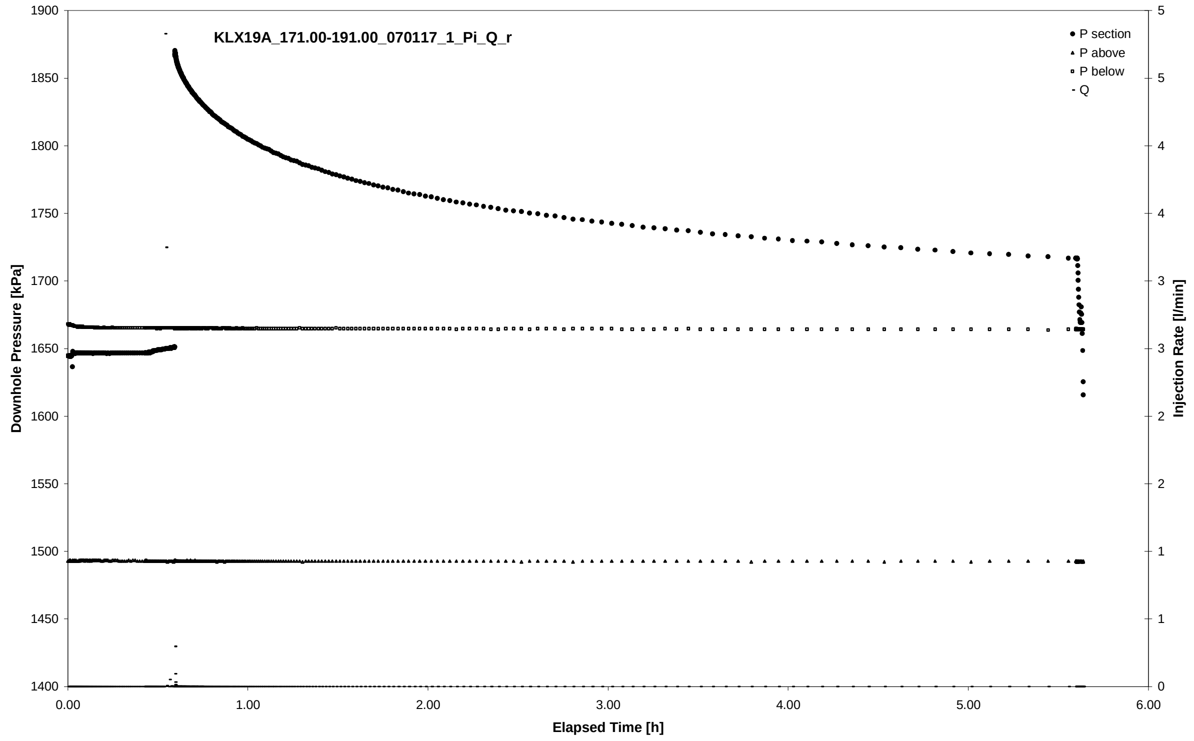


CHIR phase; HORNER match

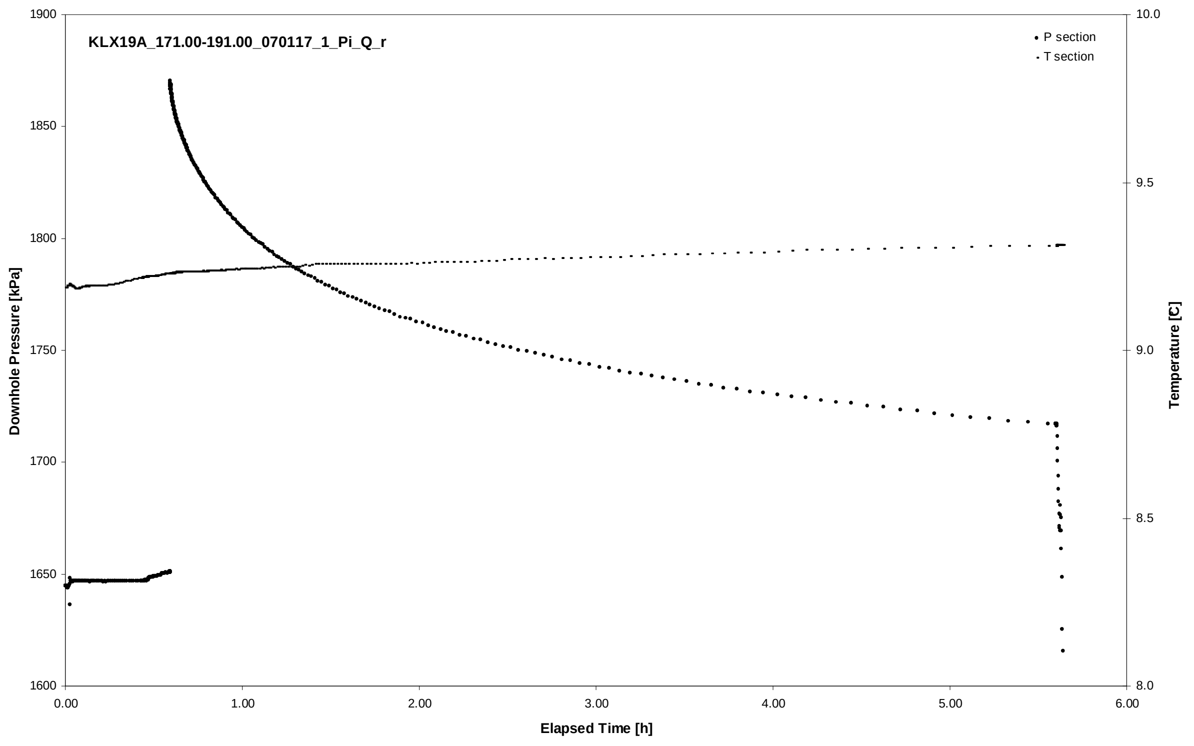
APPENDIX 2-11

Test 171.00 – 191.00 m

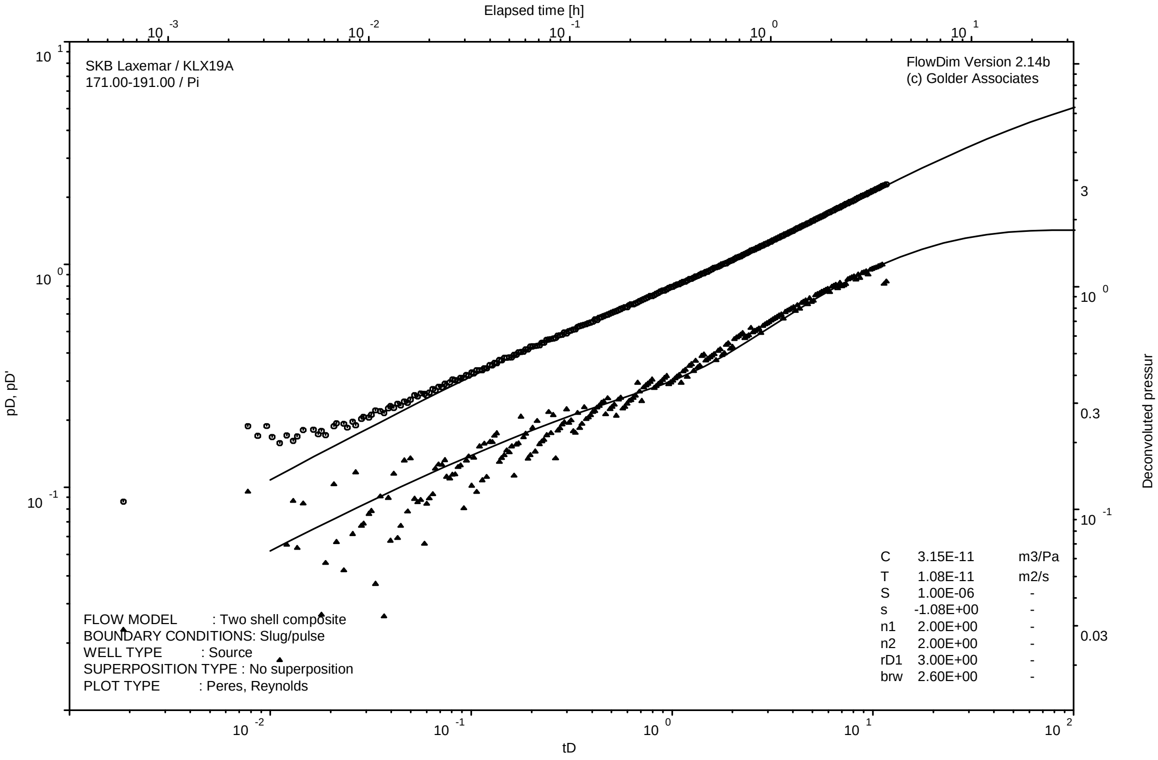
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

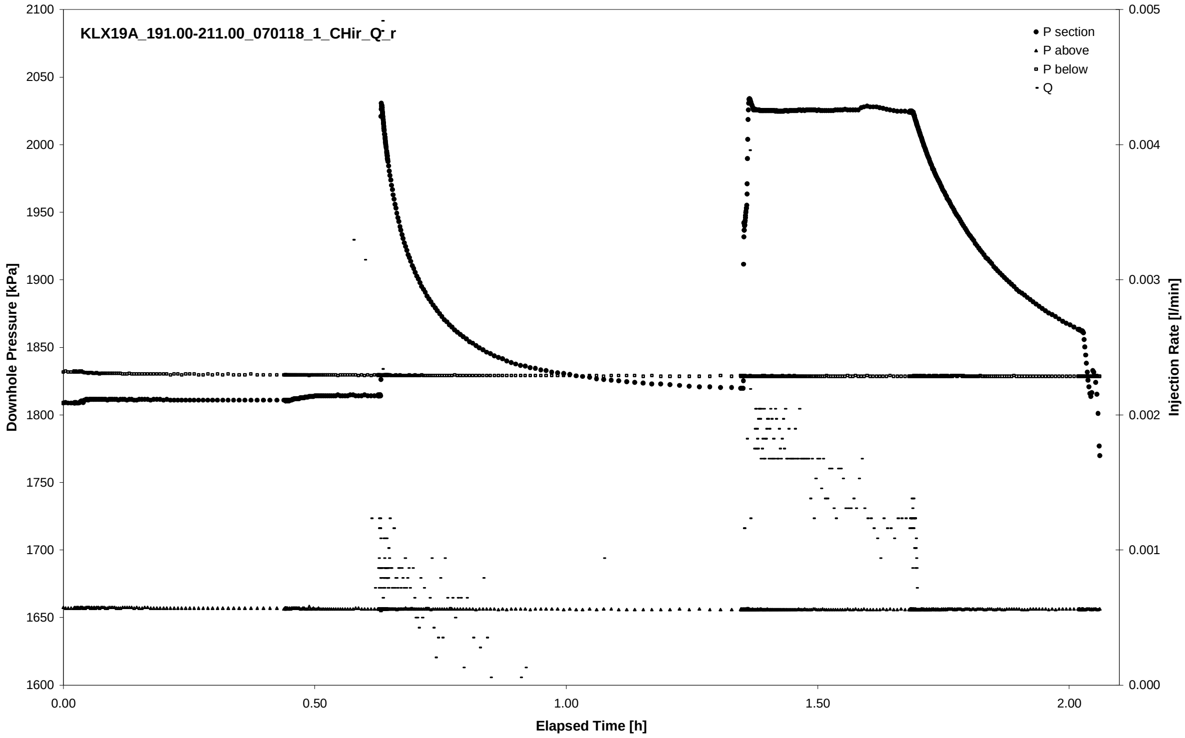


Pulse injection; deconvolution match

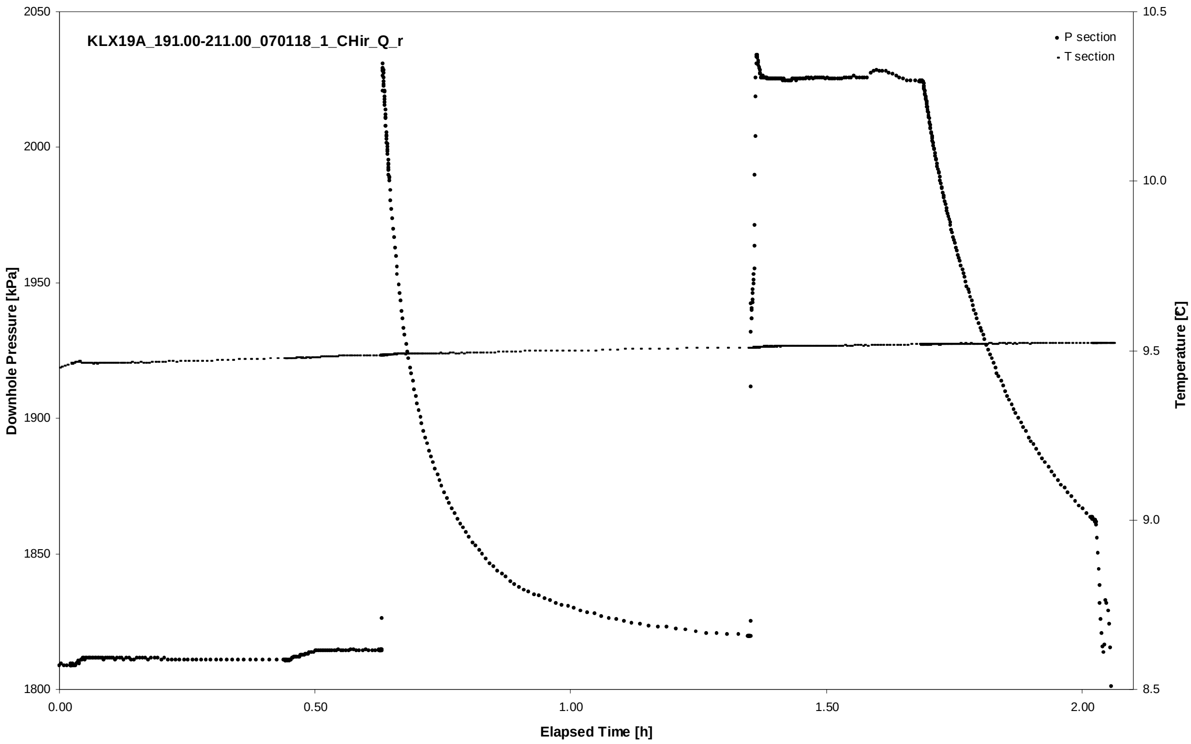
APPENDIX 2-12

Test 191.00 – 211.00 m

Analysis diagrams



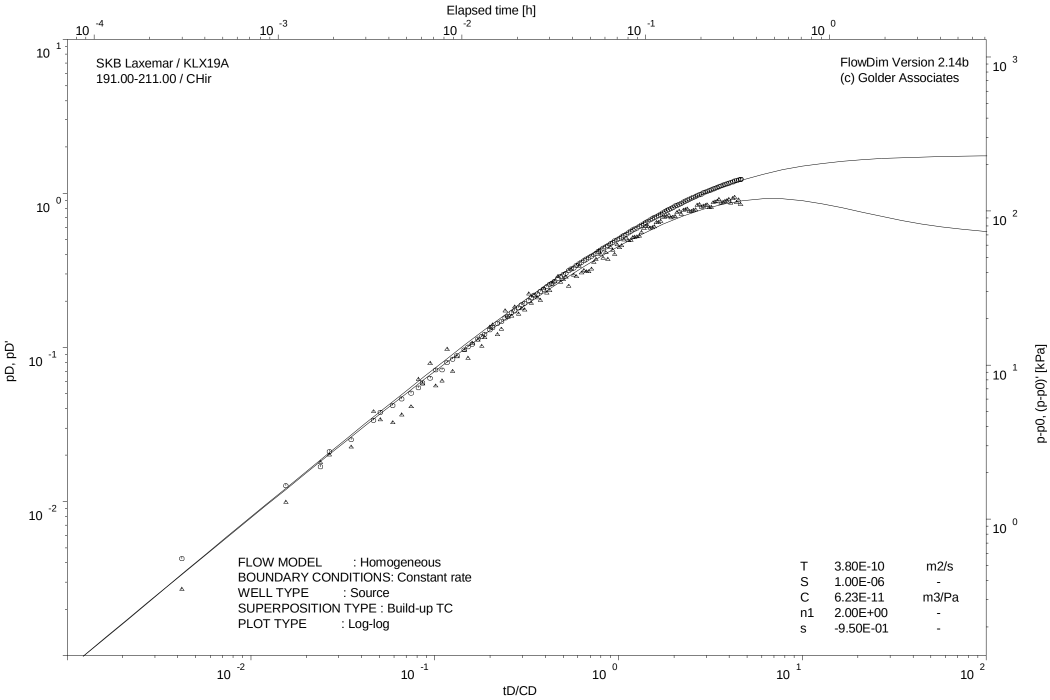
Pressure and flow rate vs. time; cartesian plot



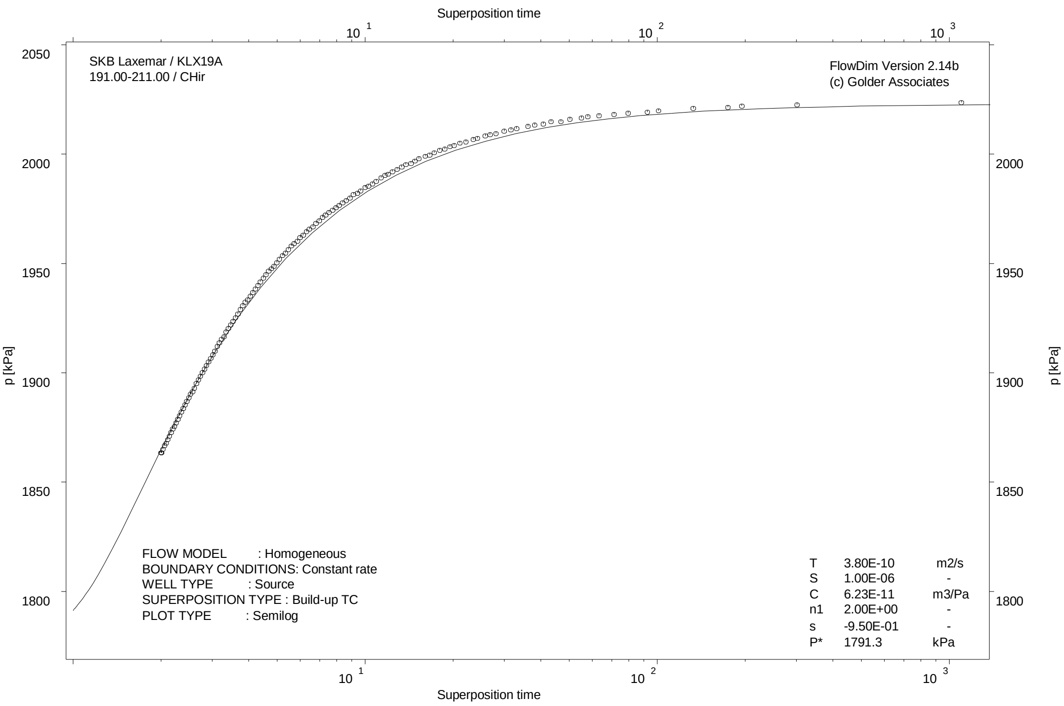
Interval pressure and temperature vs. time; cartesian plot

Not analysed

CHI phase; log-log match



CHIR phase; log-log match

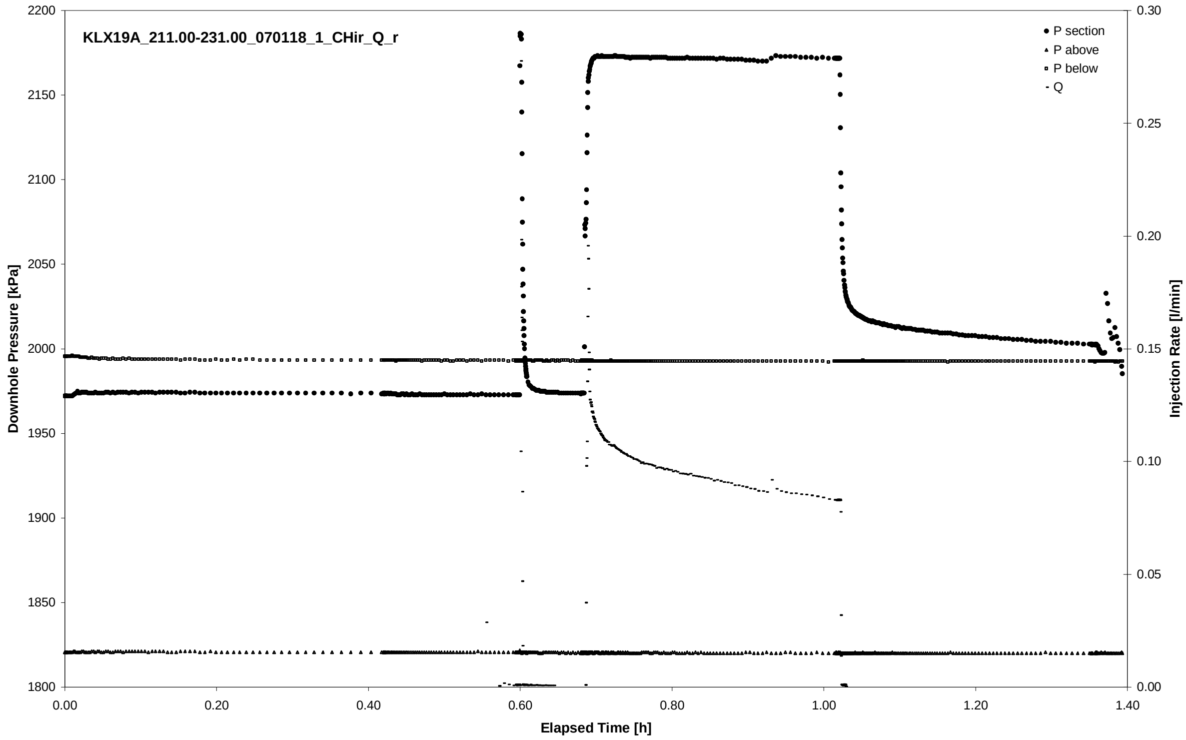


CHIR phase; HORNER match

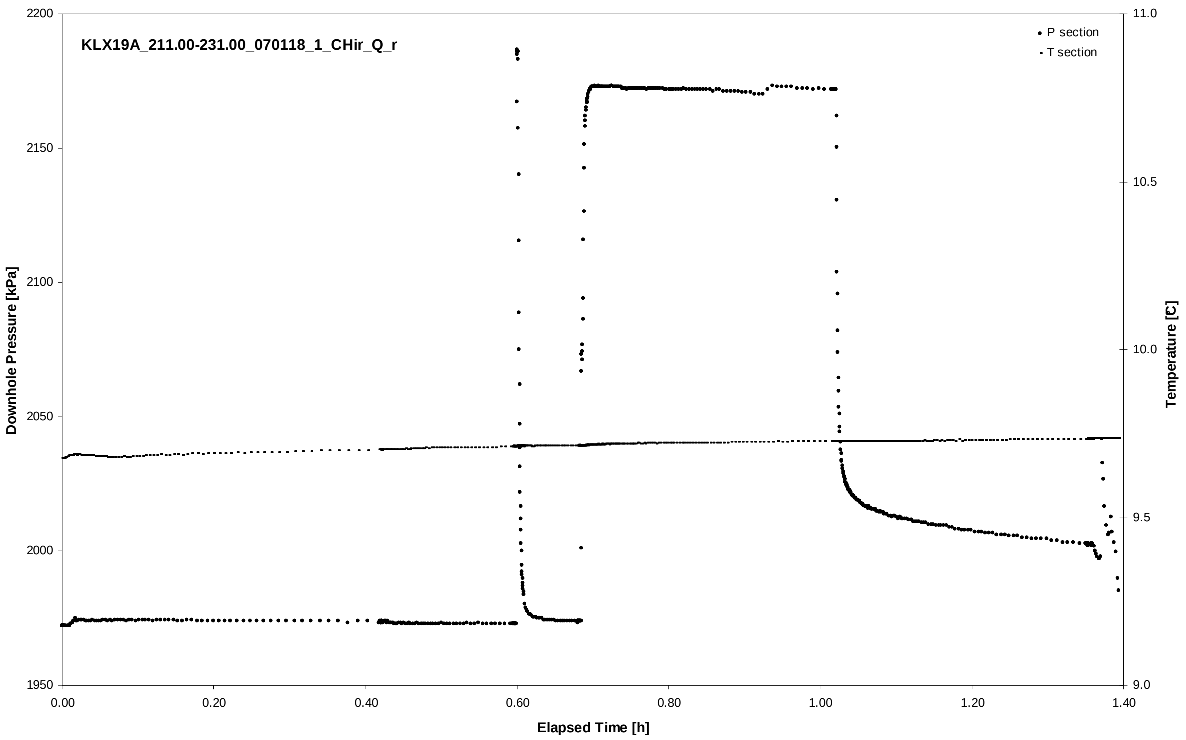
APPENDIX 2-13

Test 211.00 – 231.00 m

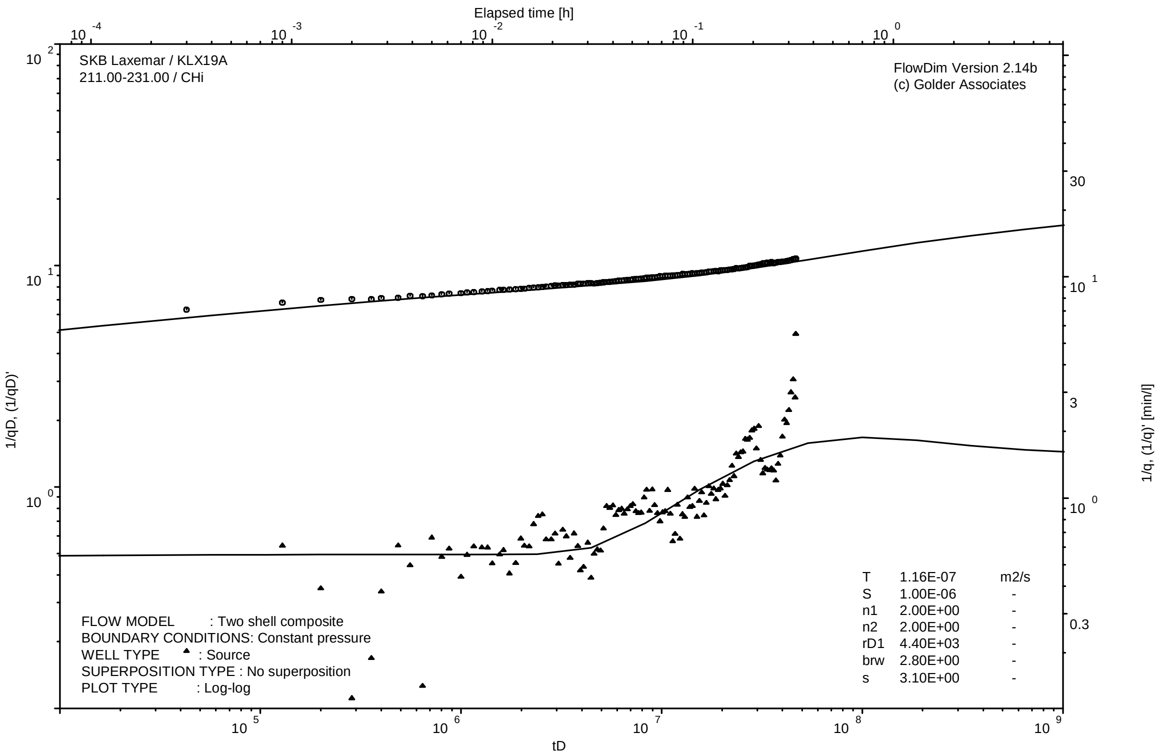
Analysis diagrams



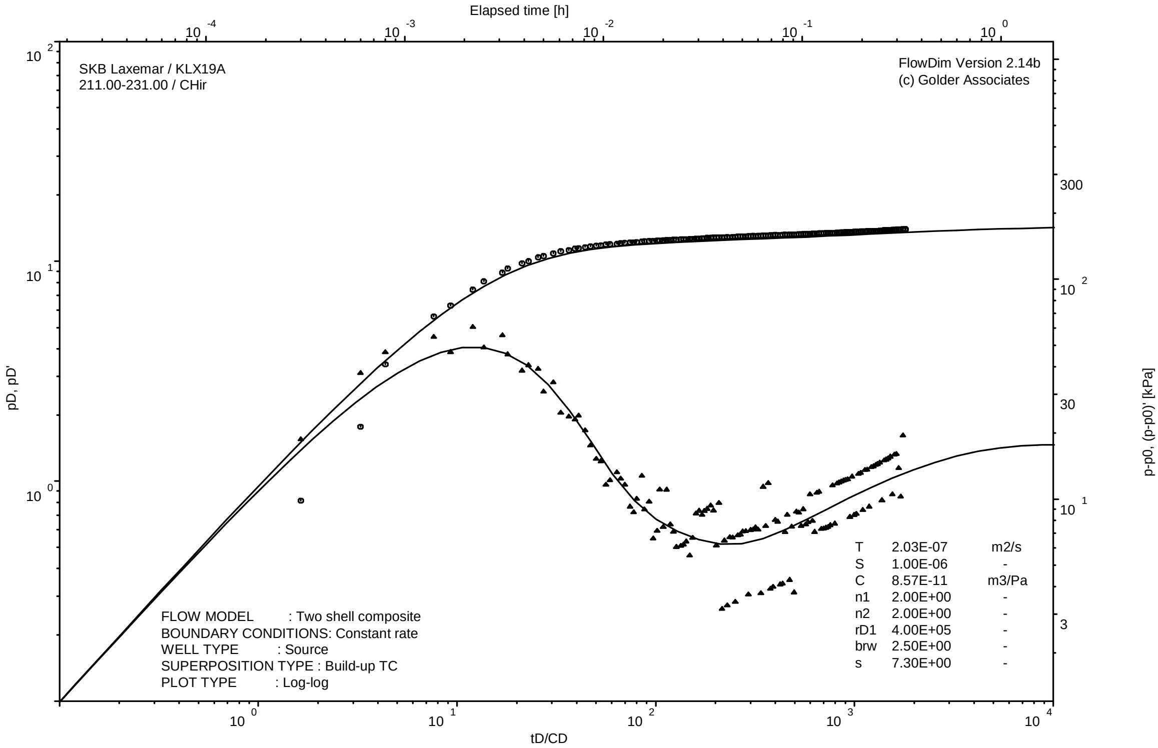
Pressure and flow rate vs. time; cartesian plot



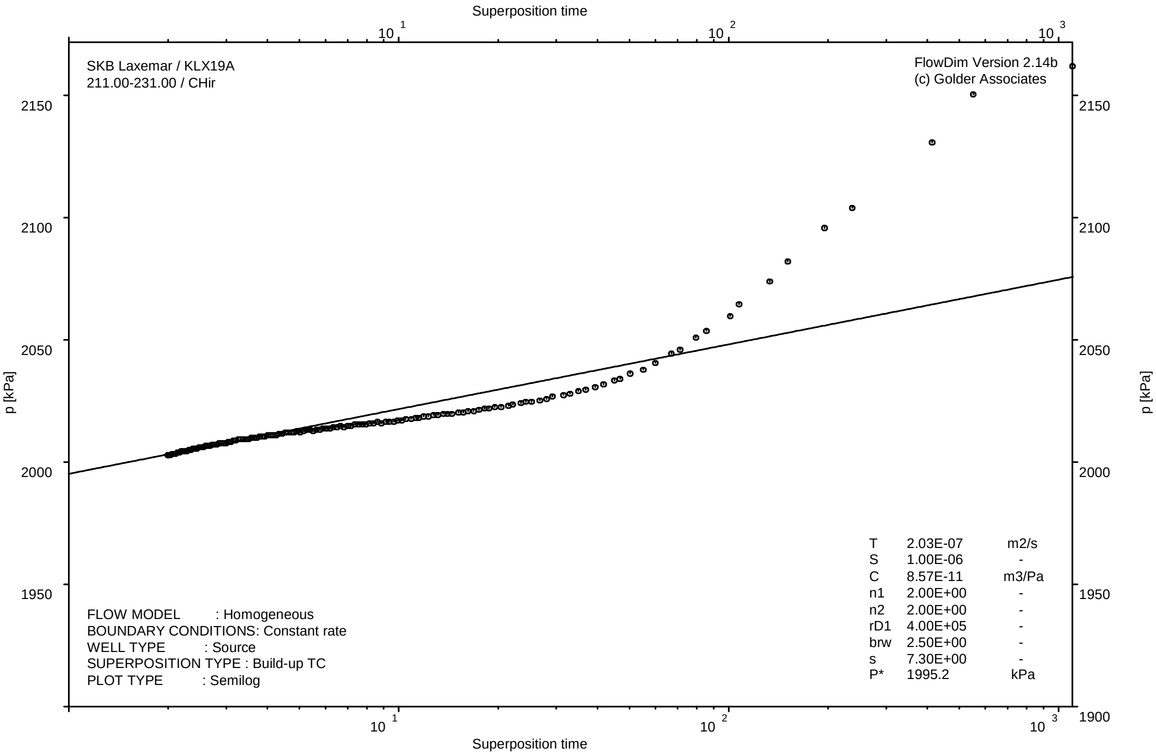
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

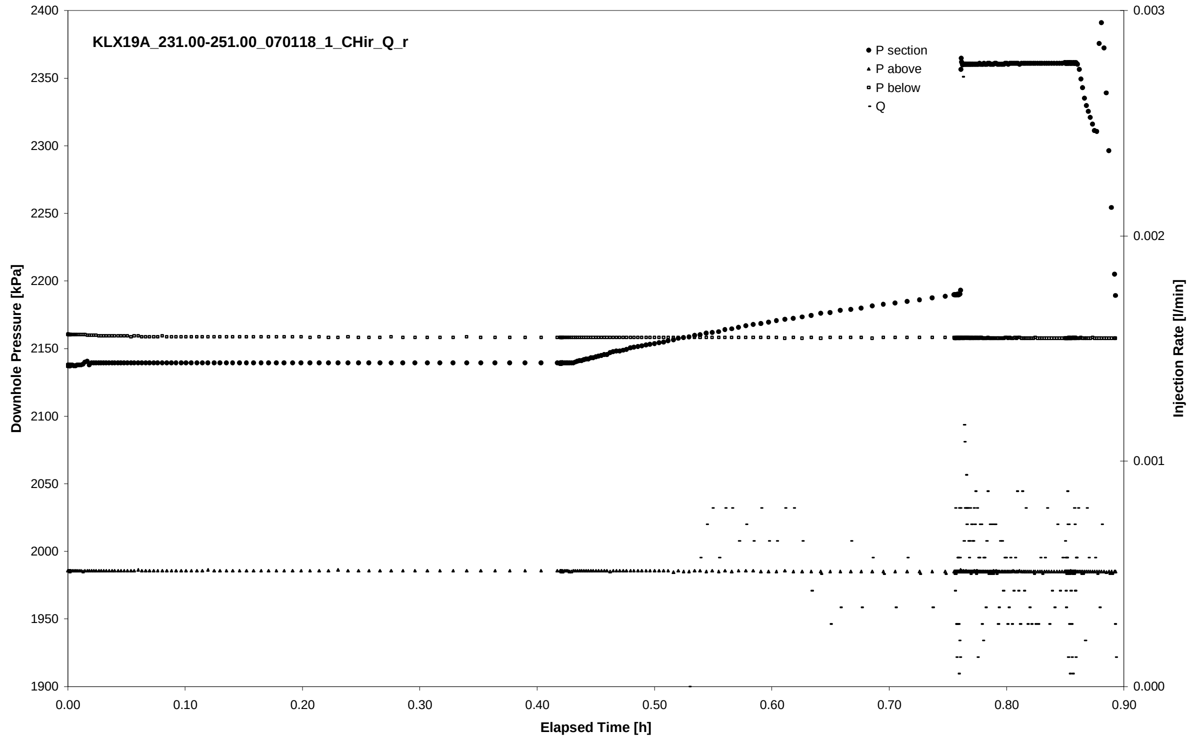


CHIR phase; HORNER match

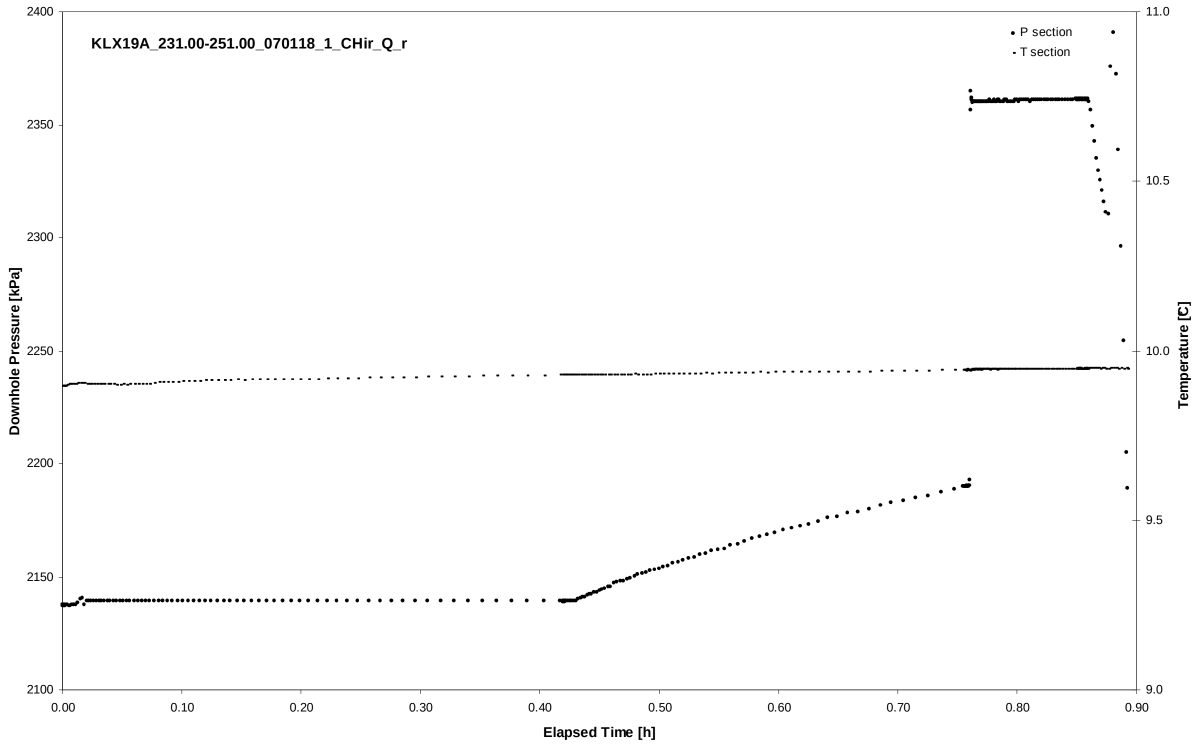
APPENDIX 2-14

Test 231.00 – 251.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

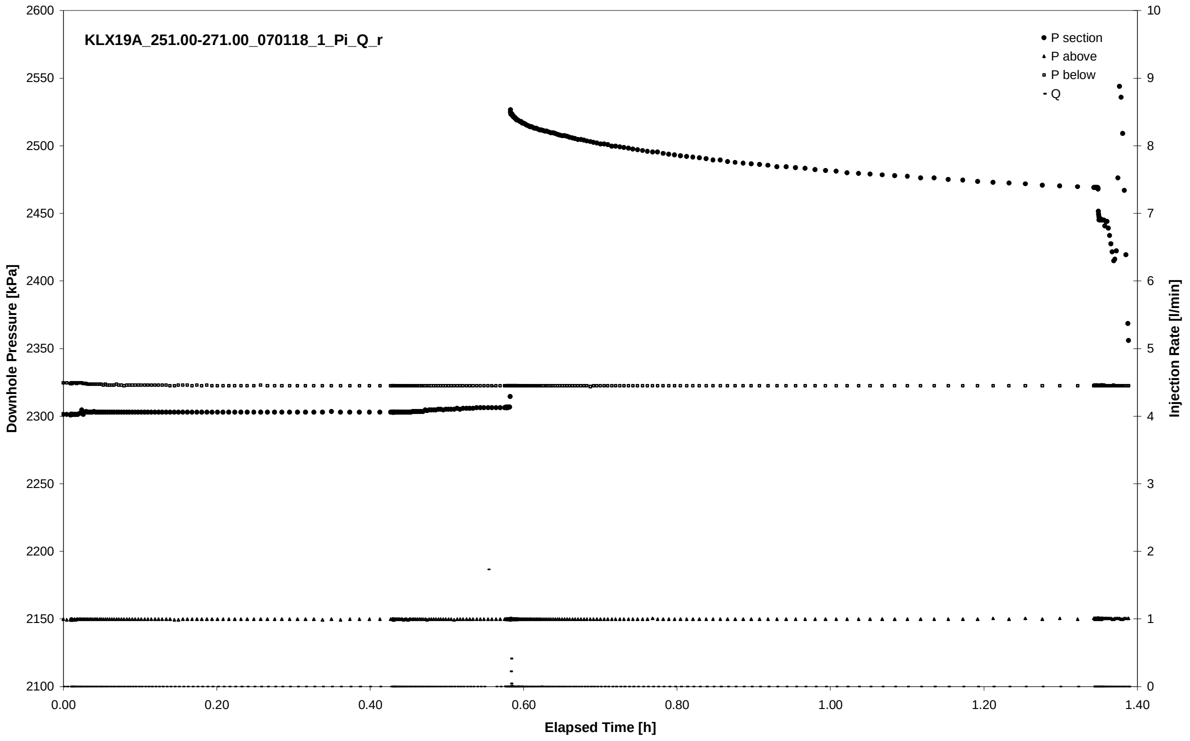
Not Analysed

CHIR phase; HORNER match

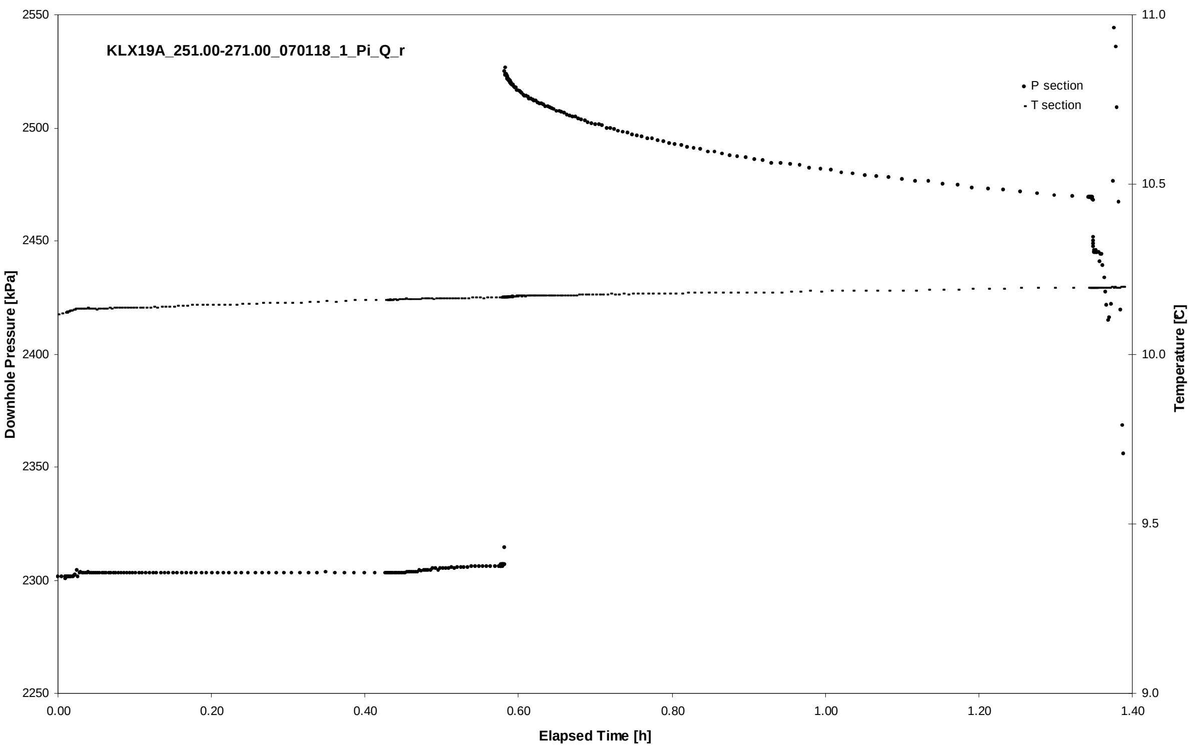
APPENDIX 2-15

Test 251.00 – 271.00 m

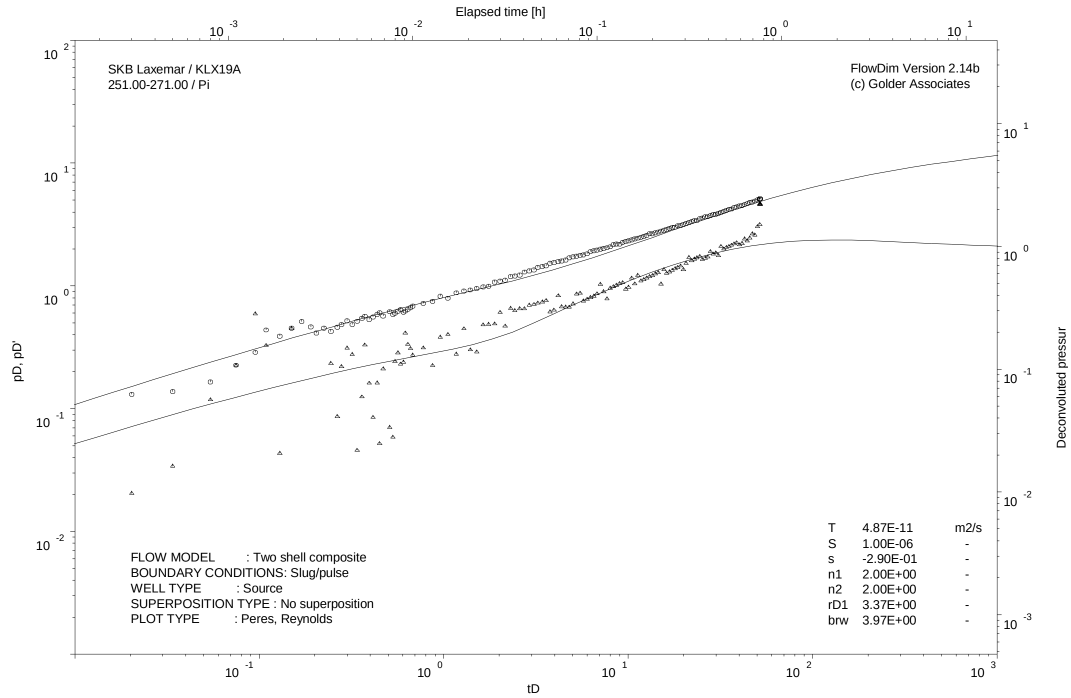
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

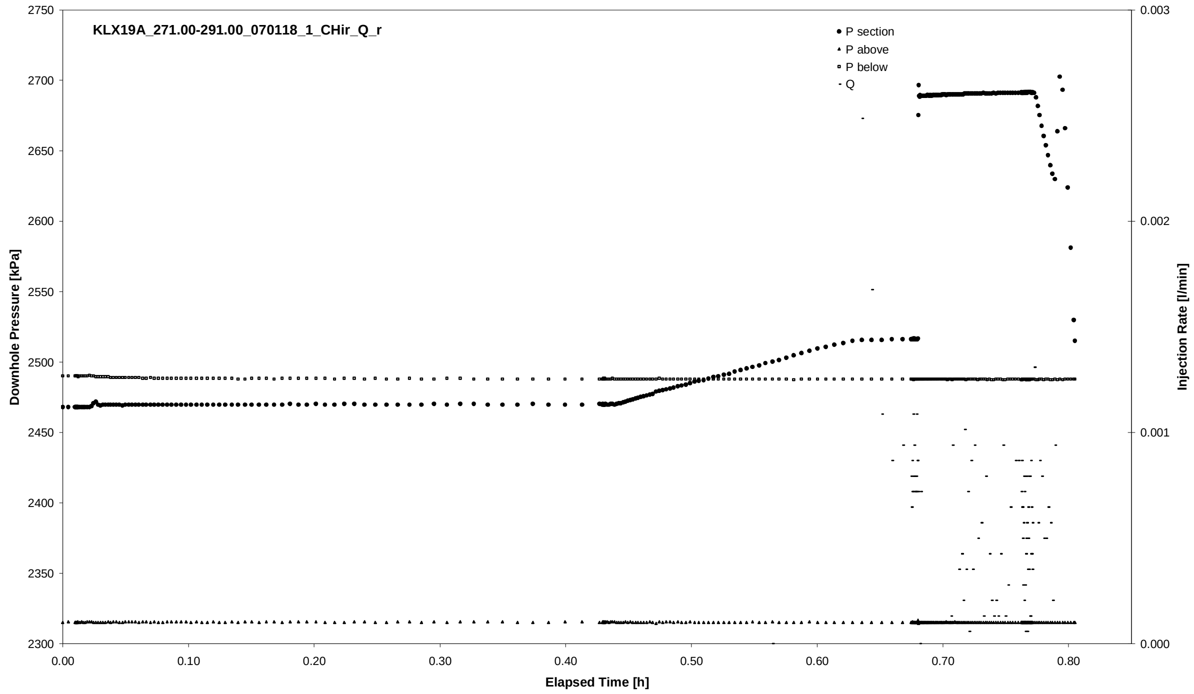


Pulse injection; deconvolution match

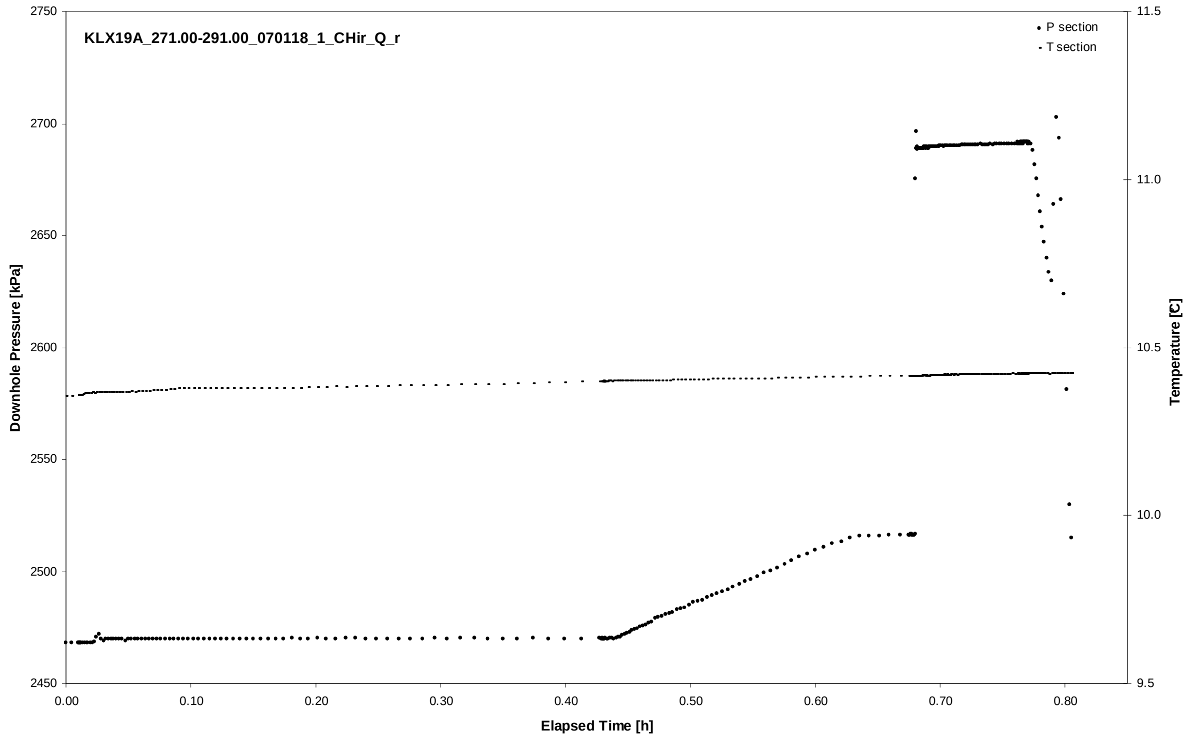
APPENDIX 2-16

Test 271.00 – 291.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

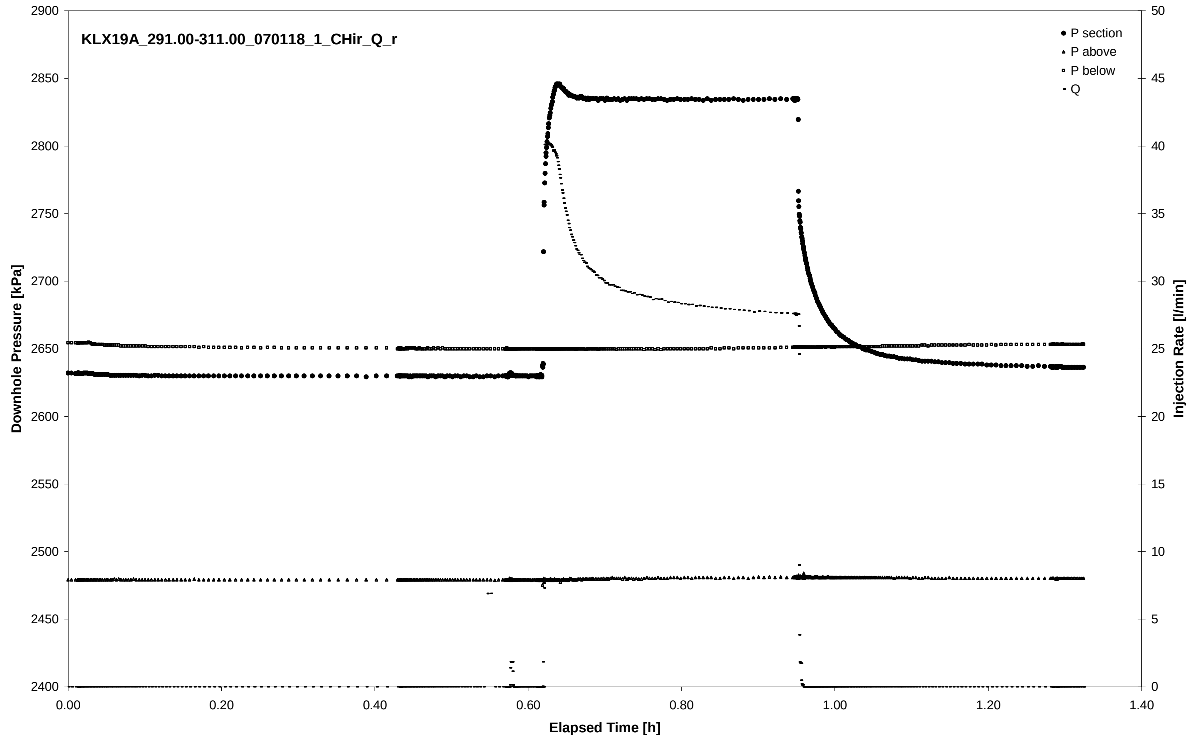
Not Analysed

CHIR phase; HORNER match

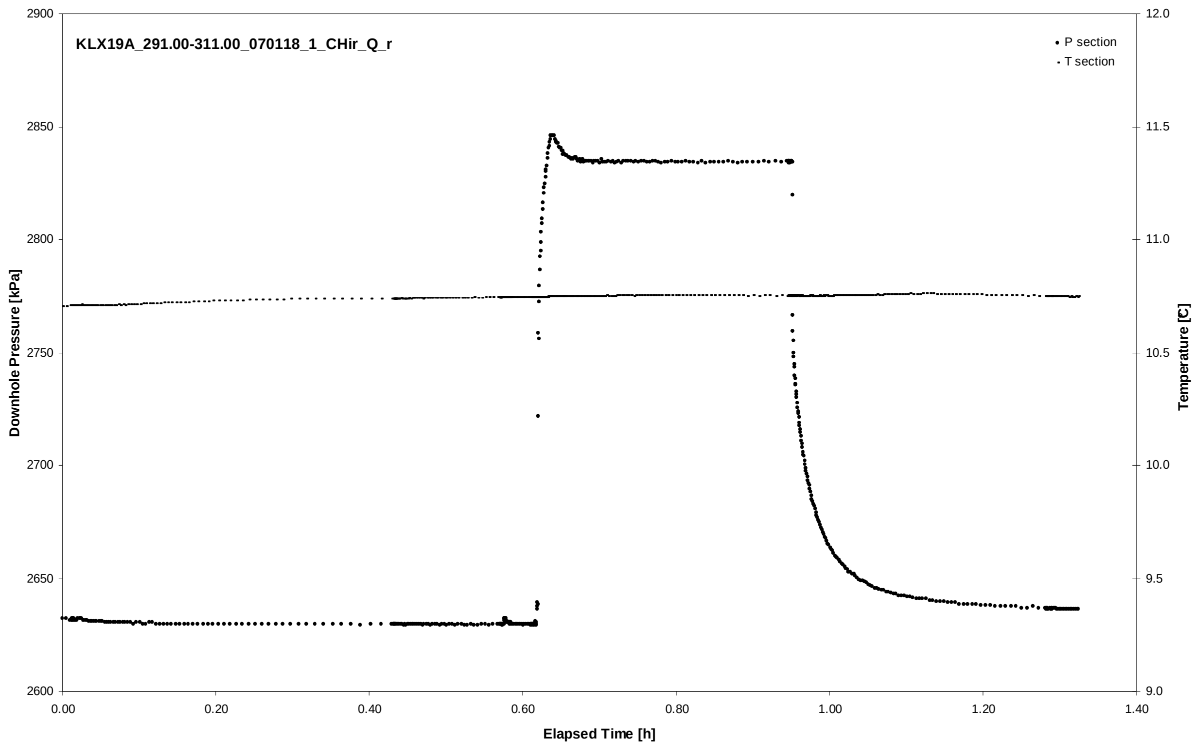
APPENDIX 2-17

Test 291.00 – 311.00 m

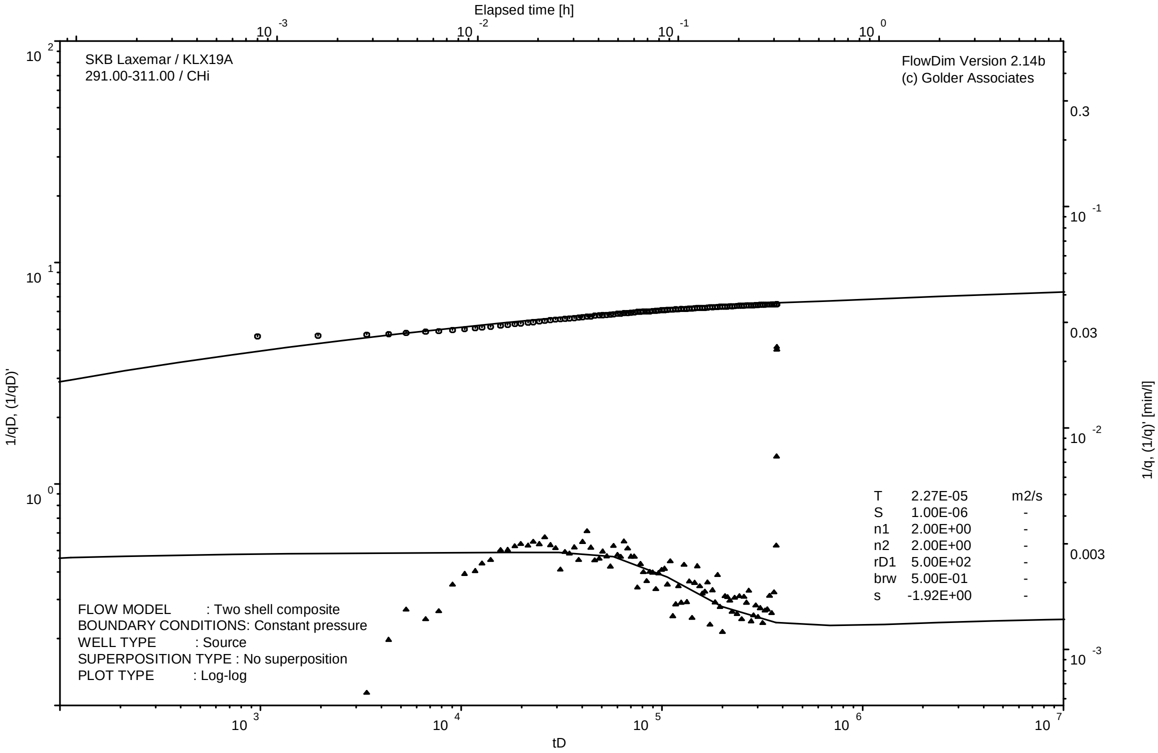
Analysis diagrams



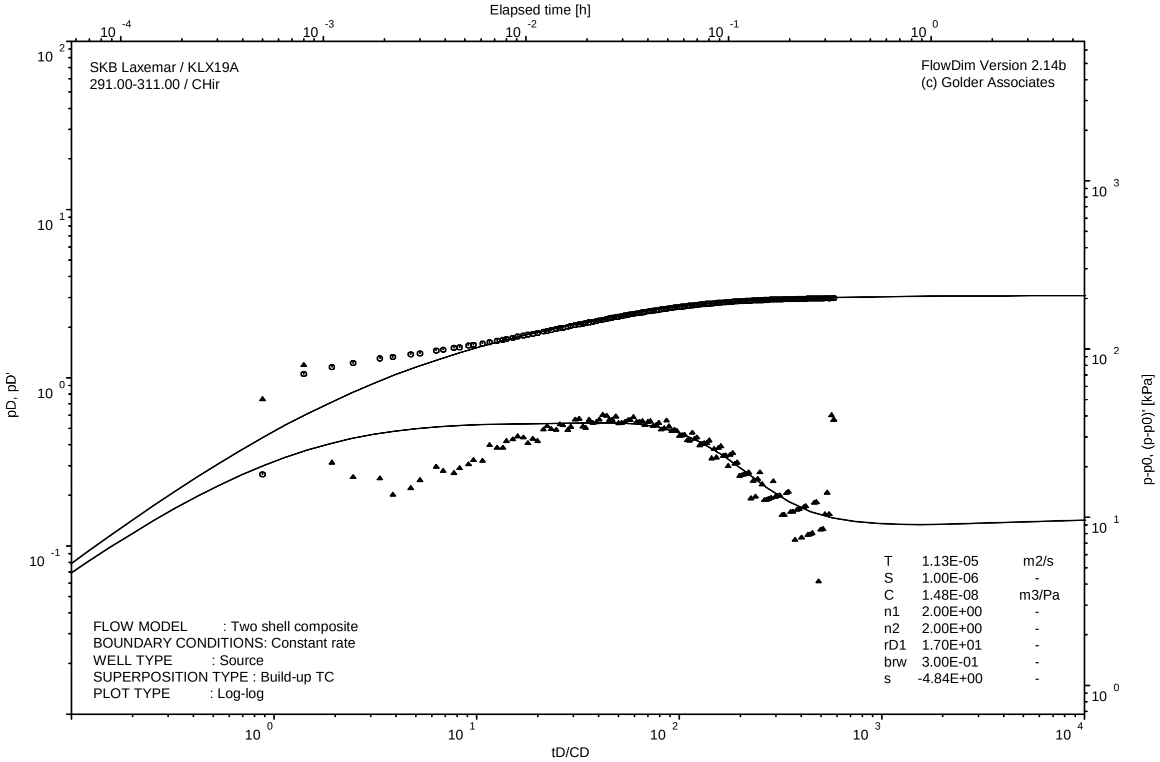
Pressure and flow rate vs. time; cartesian plot



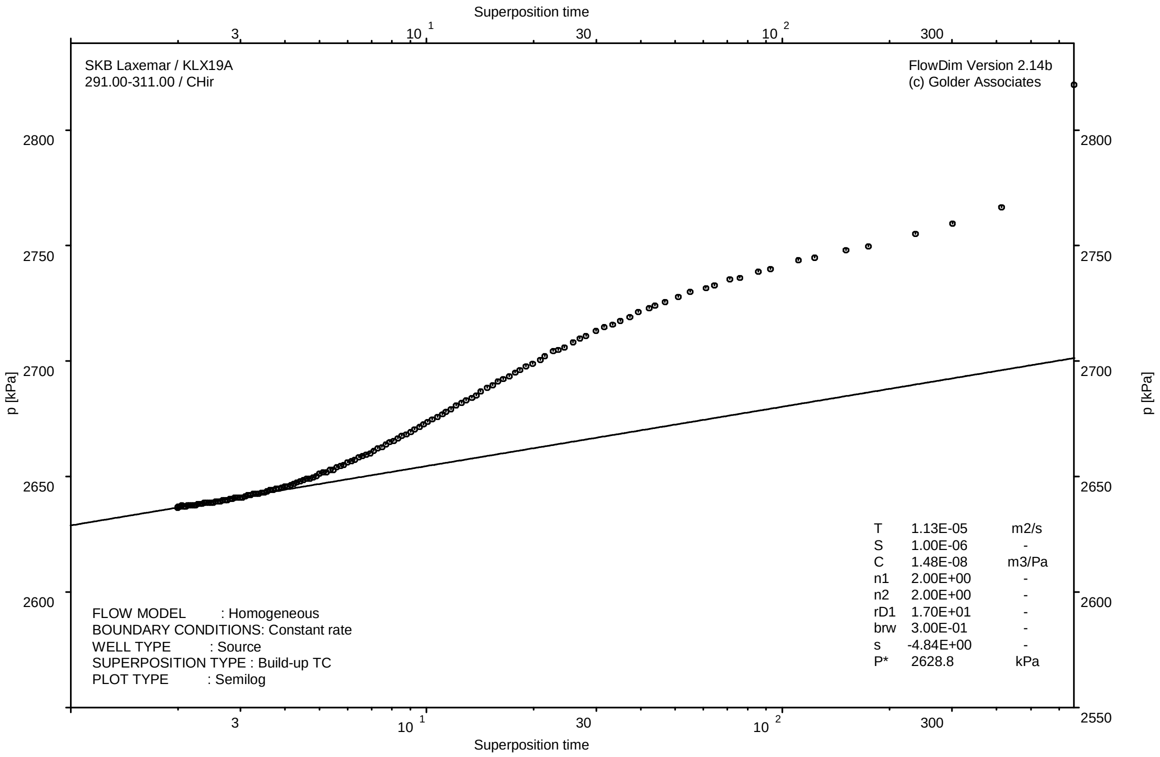
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

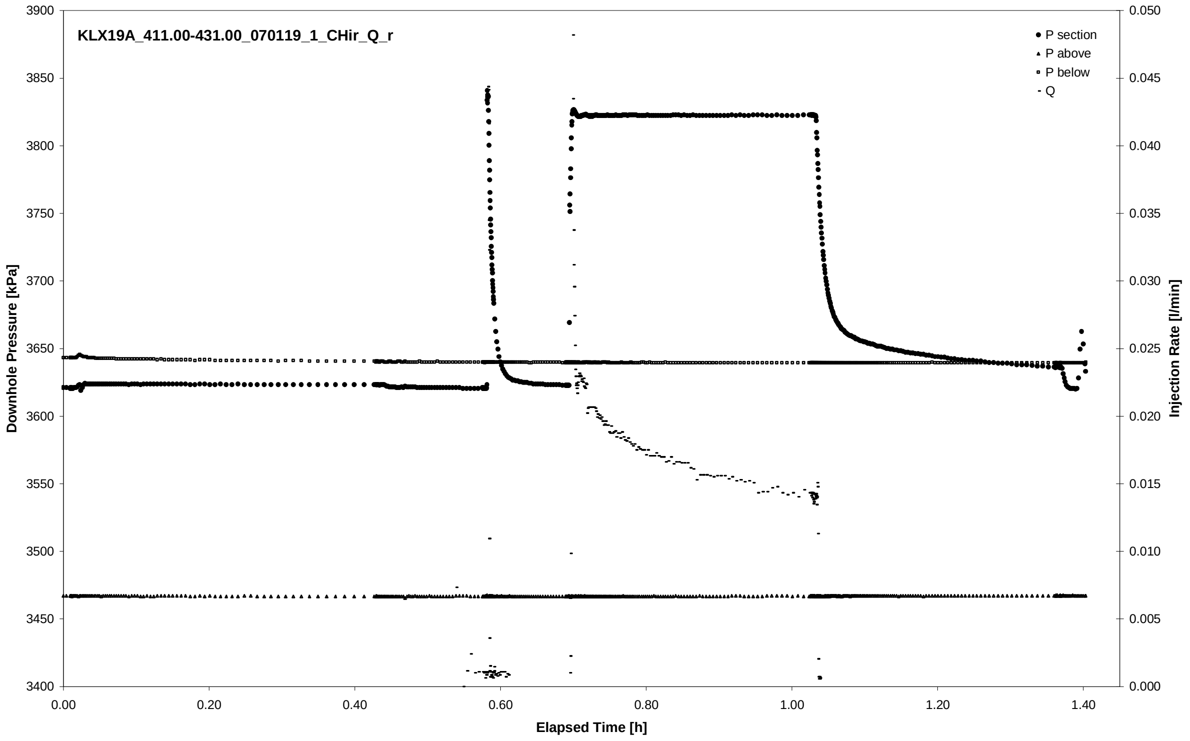


CHIR phase; HORNER match

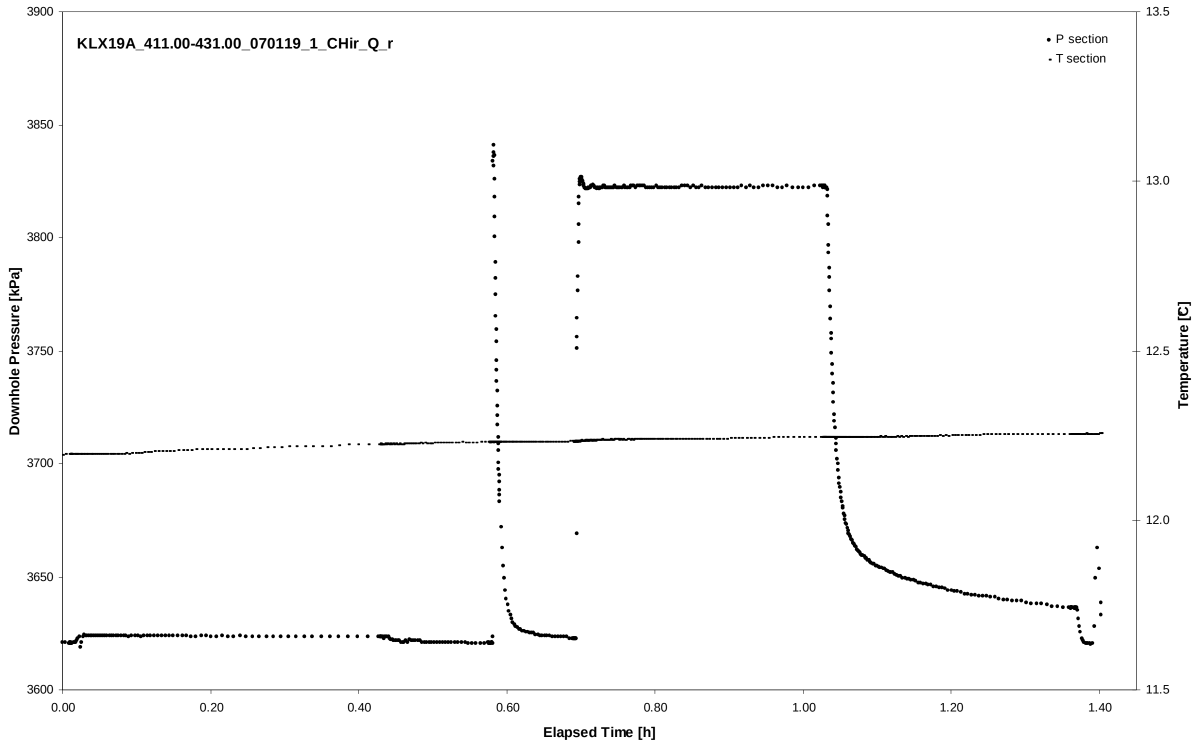
APPENDIX 2-18

Test 411.00 – 431.00 m

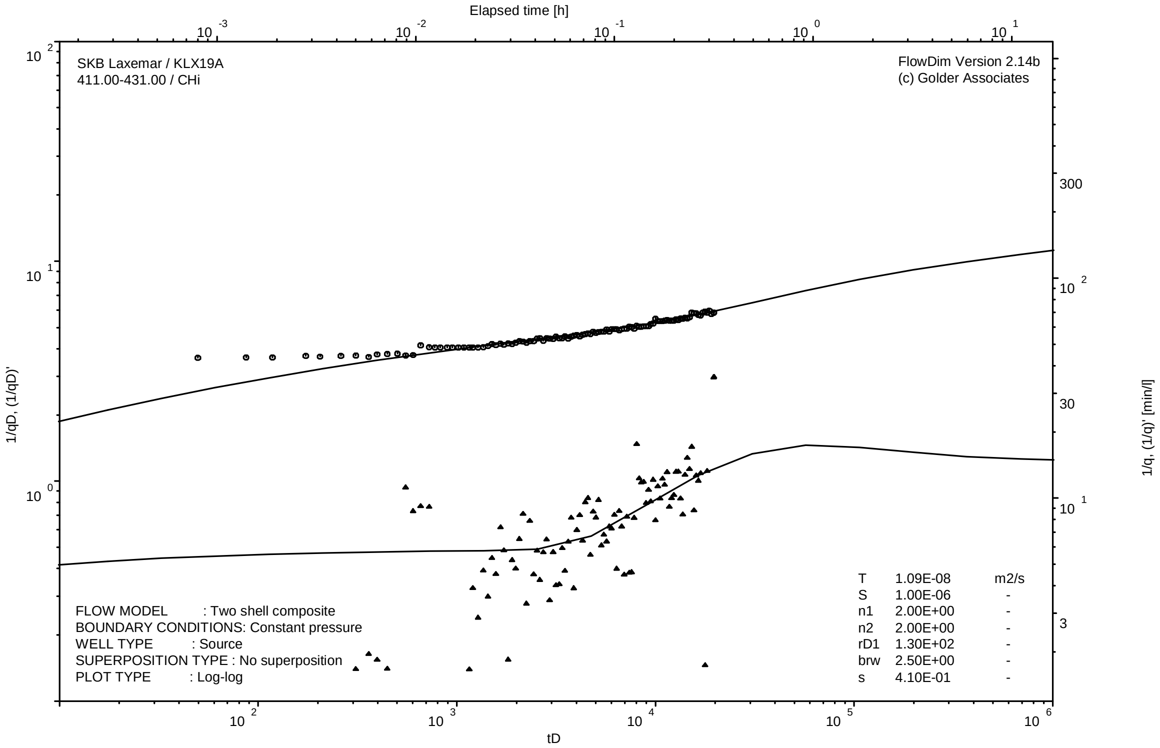
Analysis diagrams



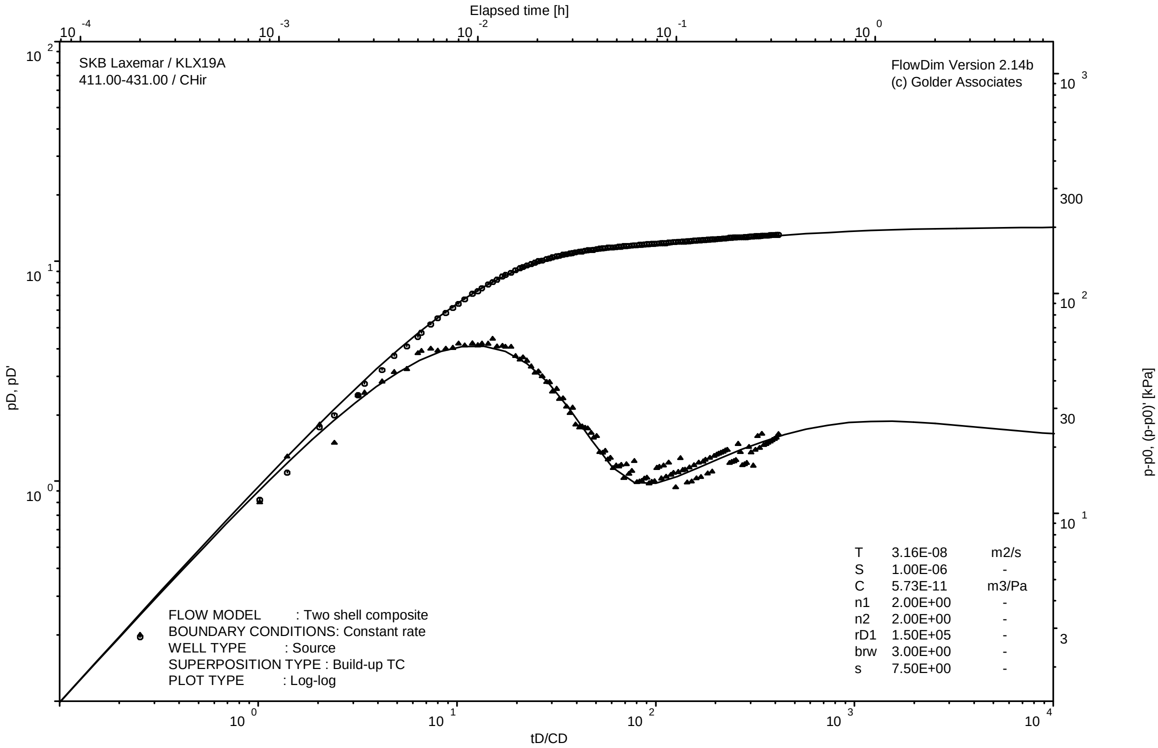
Pressure and flow rate vs. time; cartesian plot



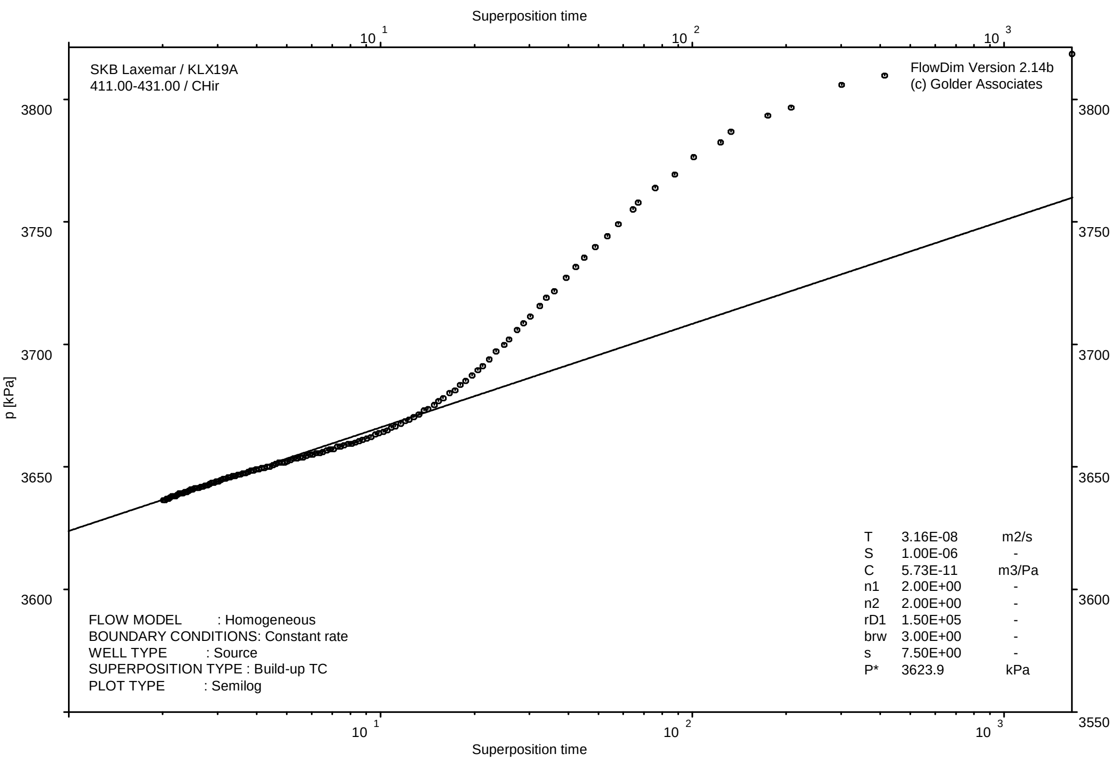
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

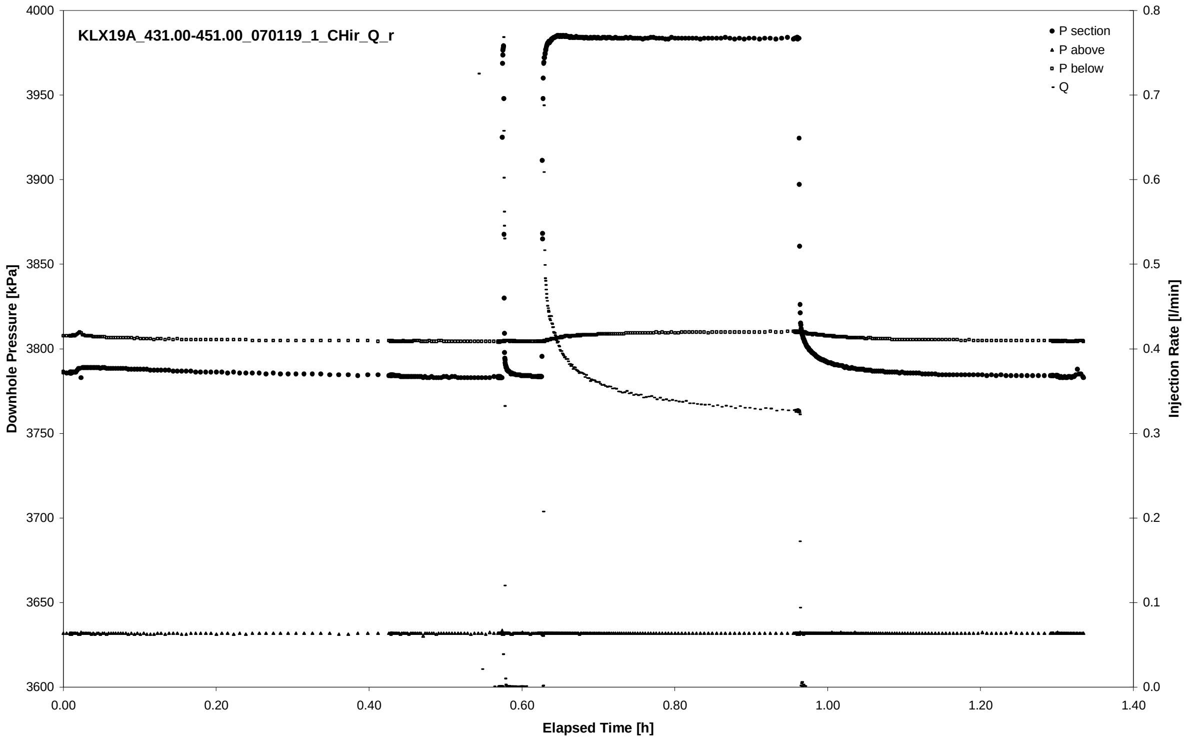


CHIR phase; HORNER match

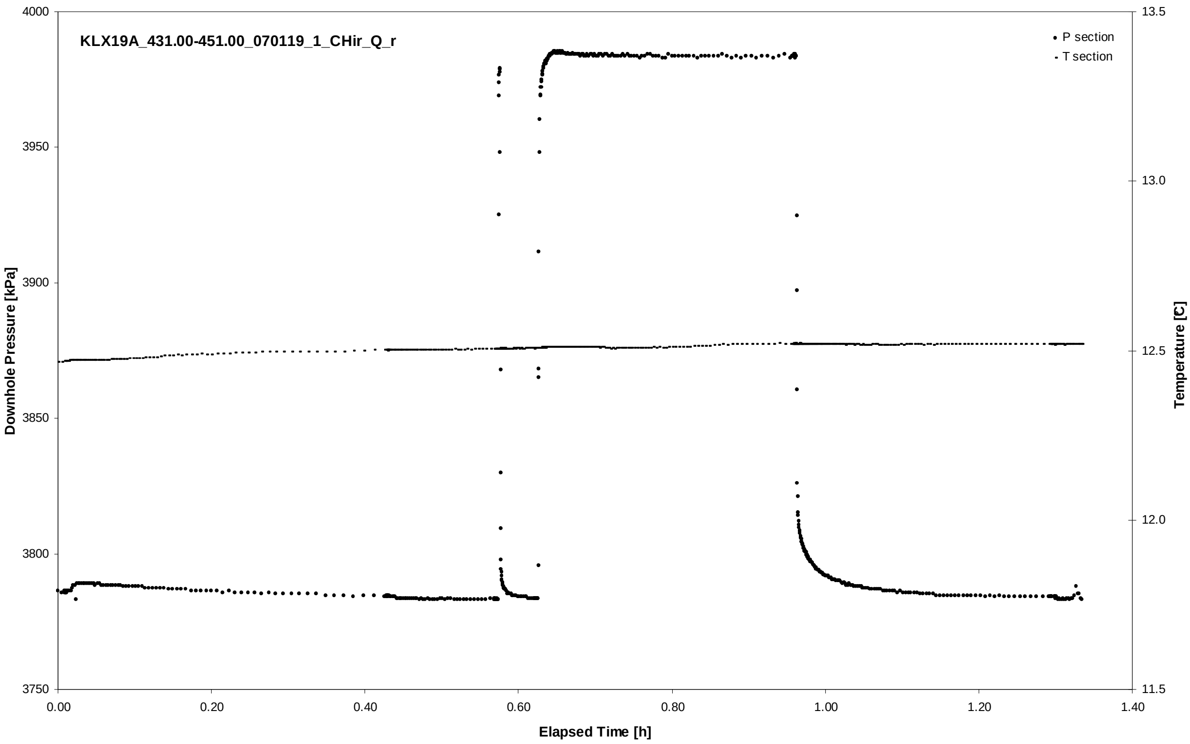
APPENDIX 2-19

Test 431.00 – 451.00 m

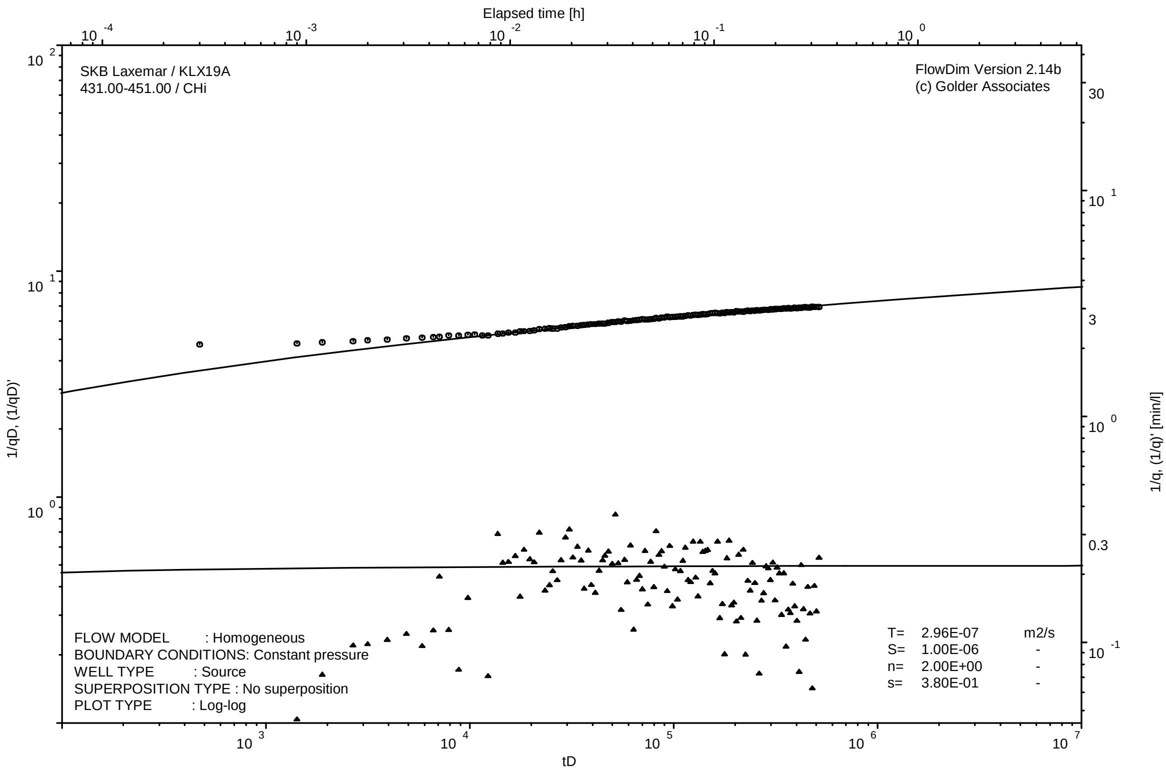
Analysis diagrams



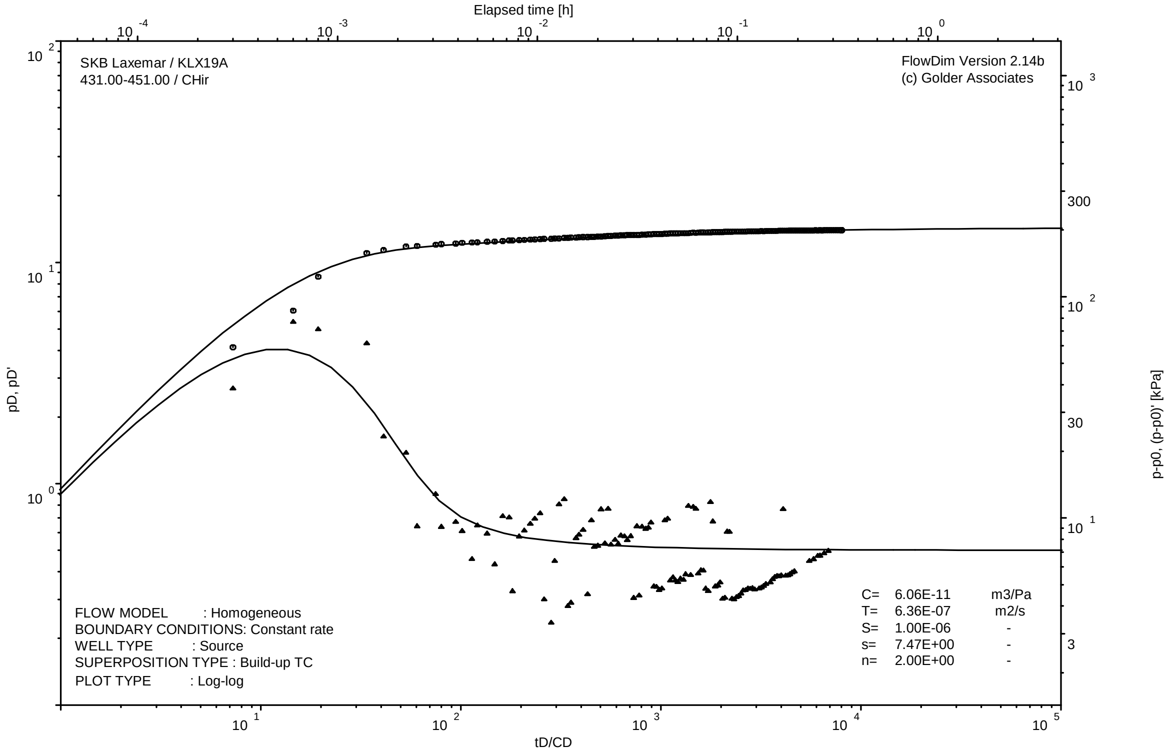
Pressure and flow rate vs. time; cartesian plot



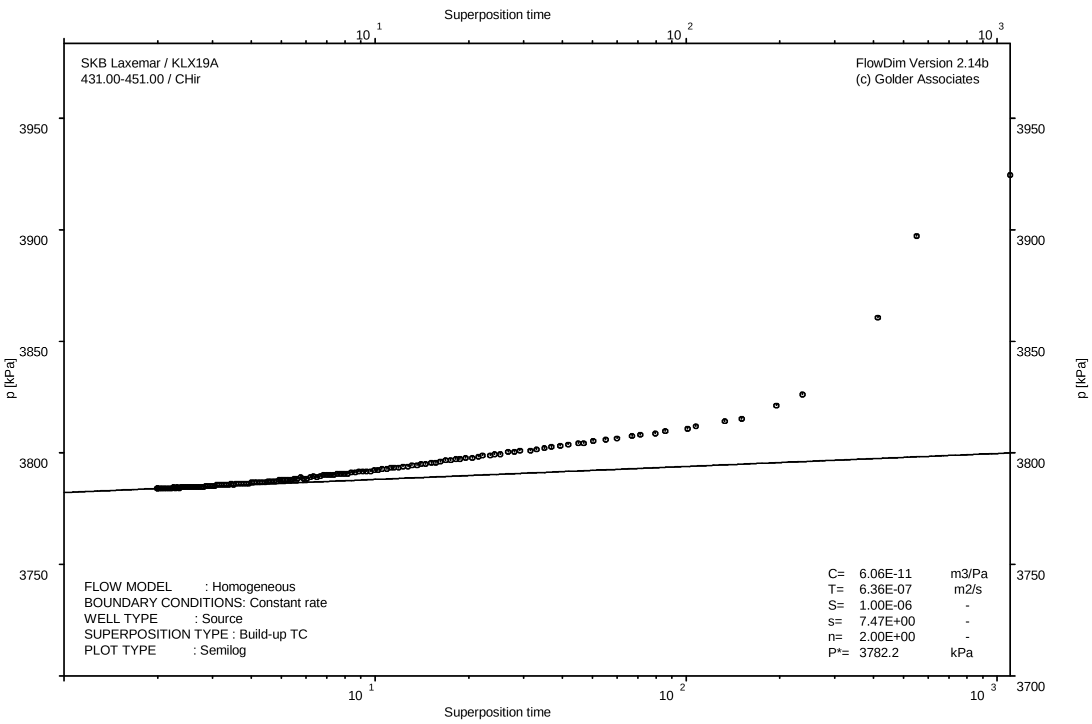
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

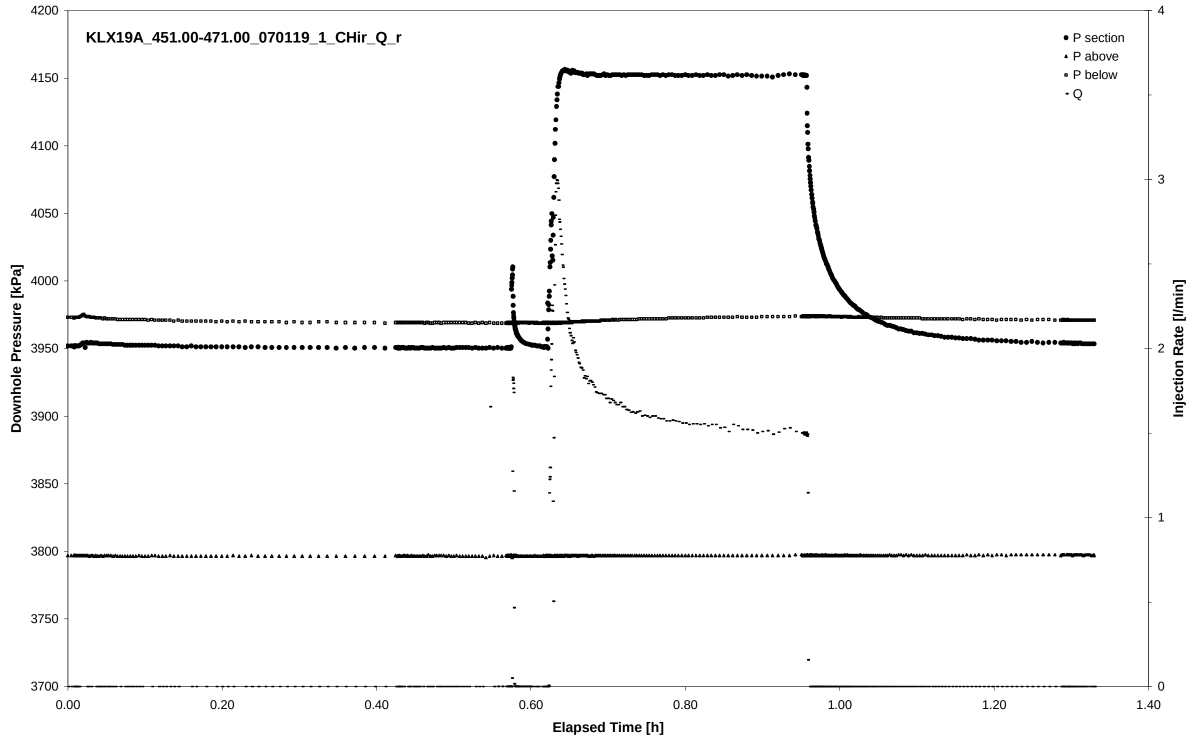


CHIR phase; HORNER match

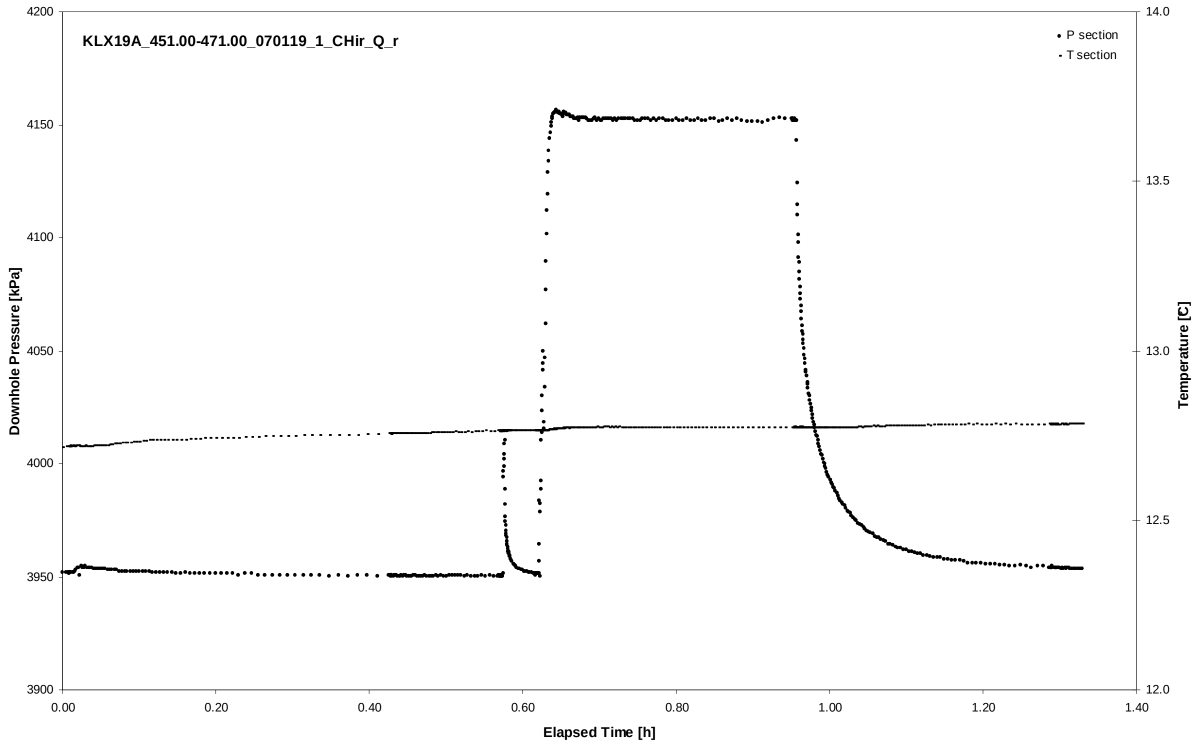
APPENDIX 2-20

Test 451.00 – 471.00 m

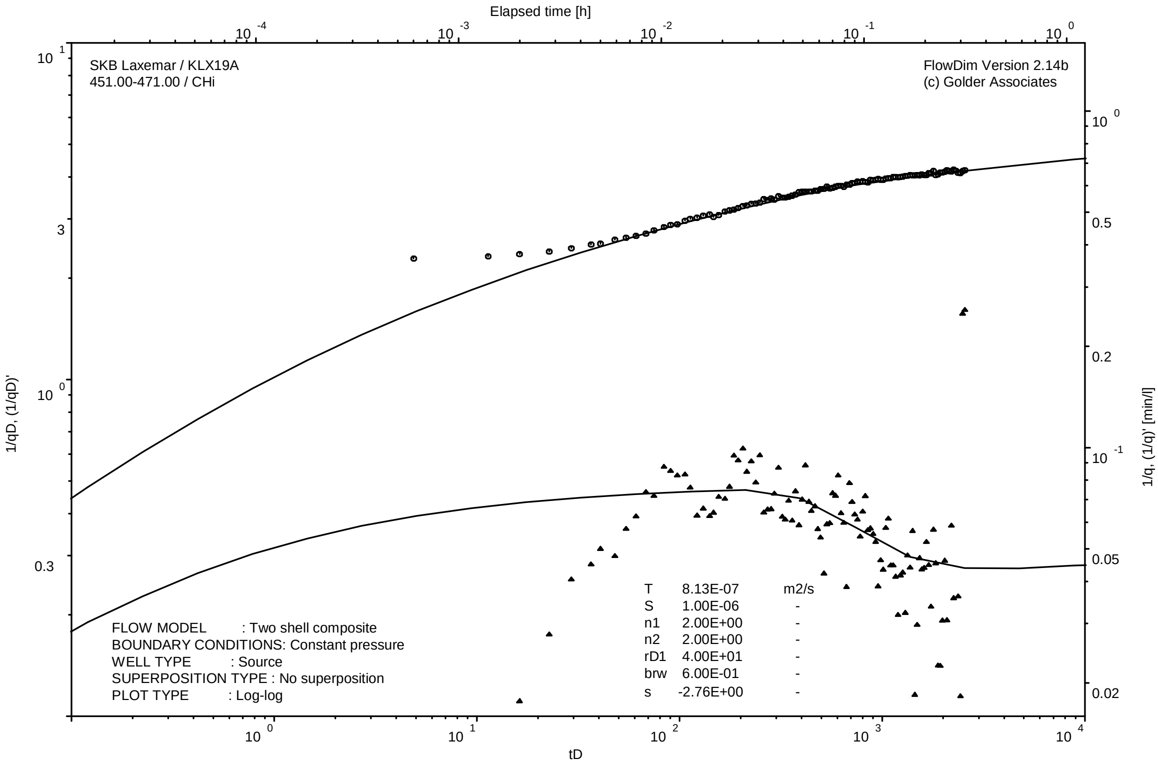
Analysis diagrams



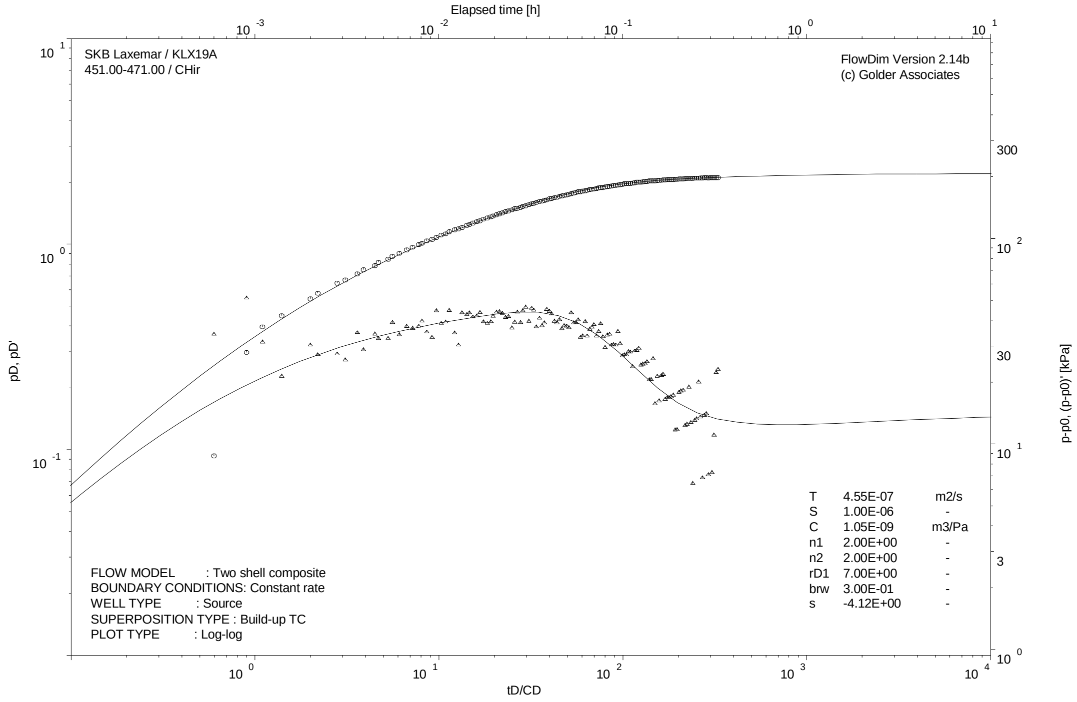
Pressure and flow rate vs. time; cartesian plot



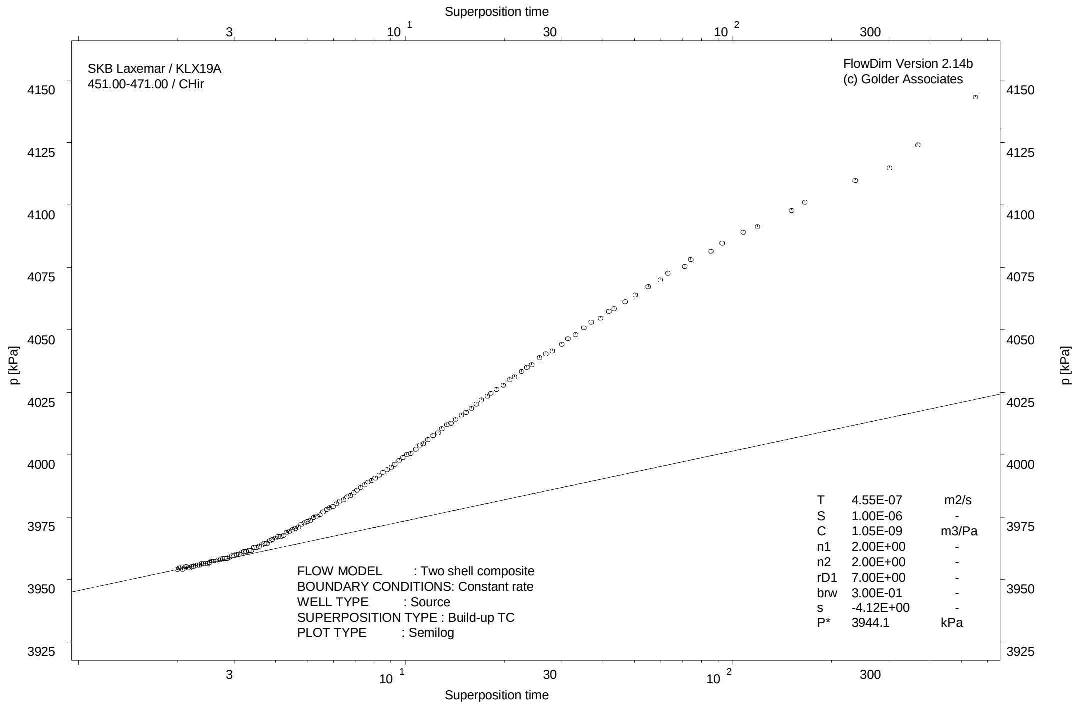
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

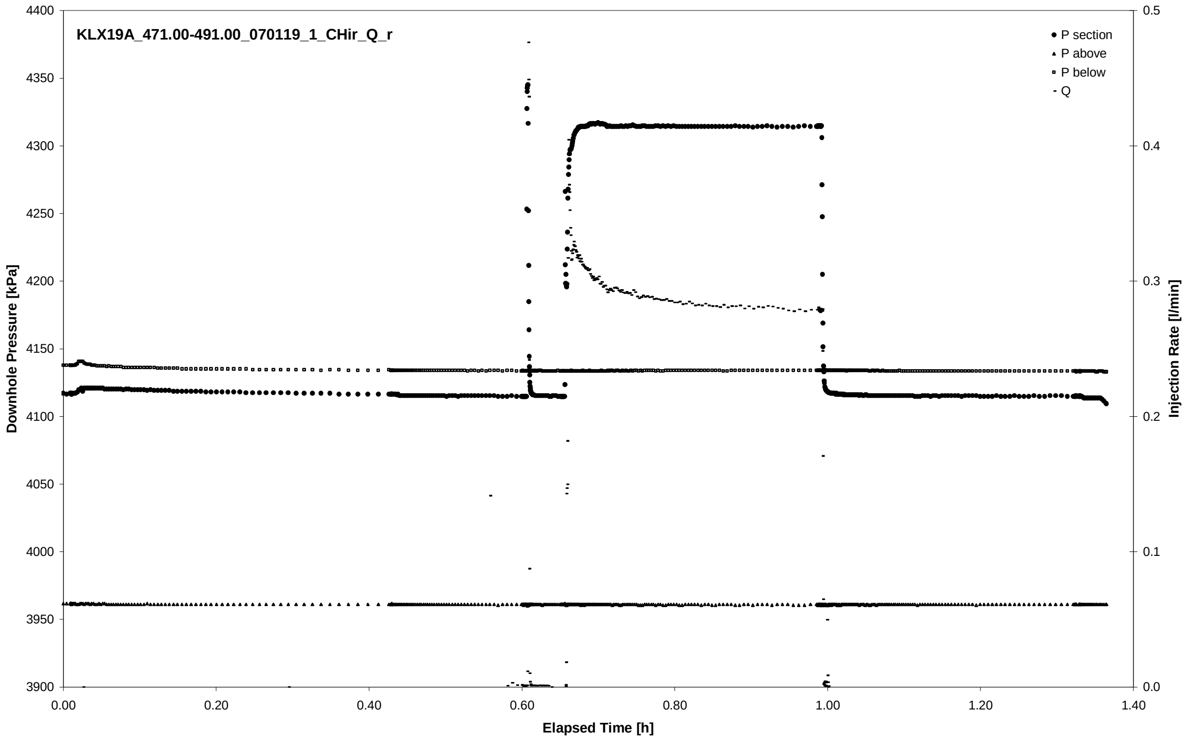


CHIR phase; HORNER match

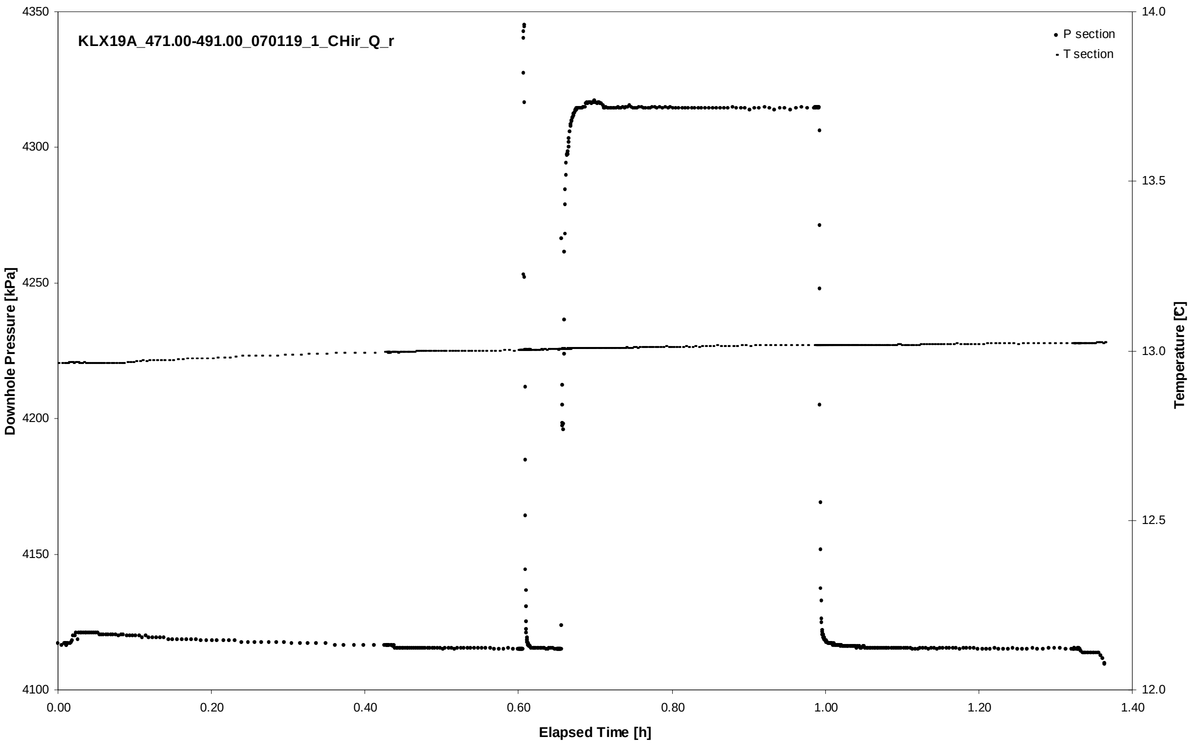
APPENDIX 2-21

Test 471.00 – 491.00 m

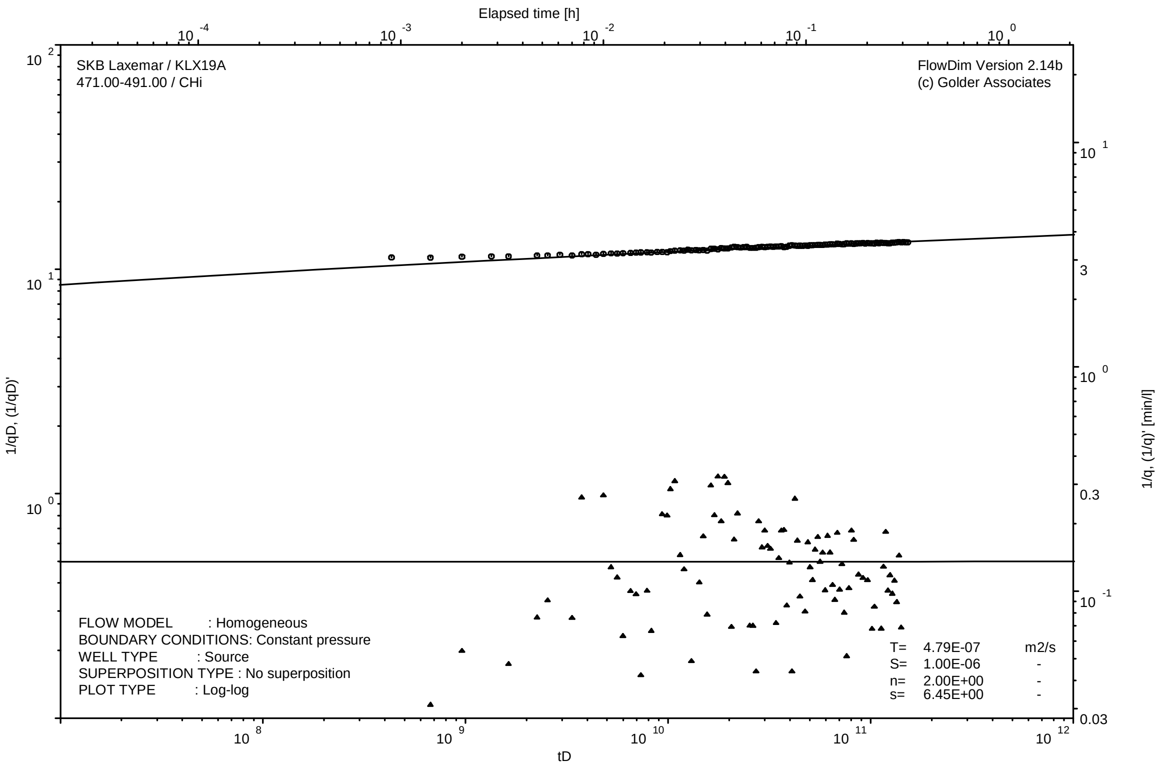
Analysis diagrams



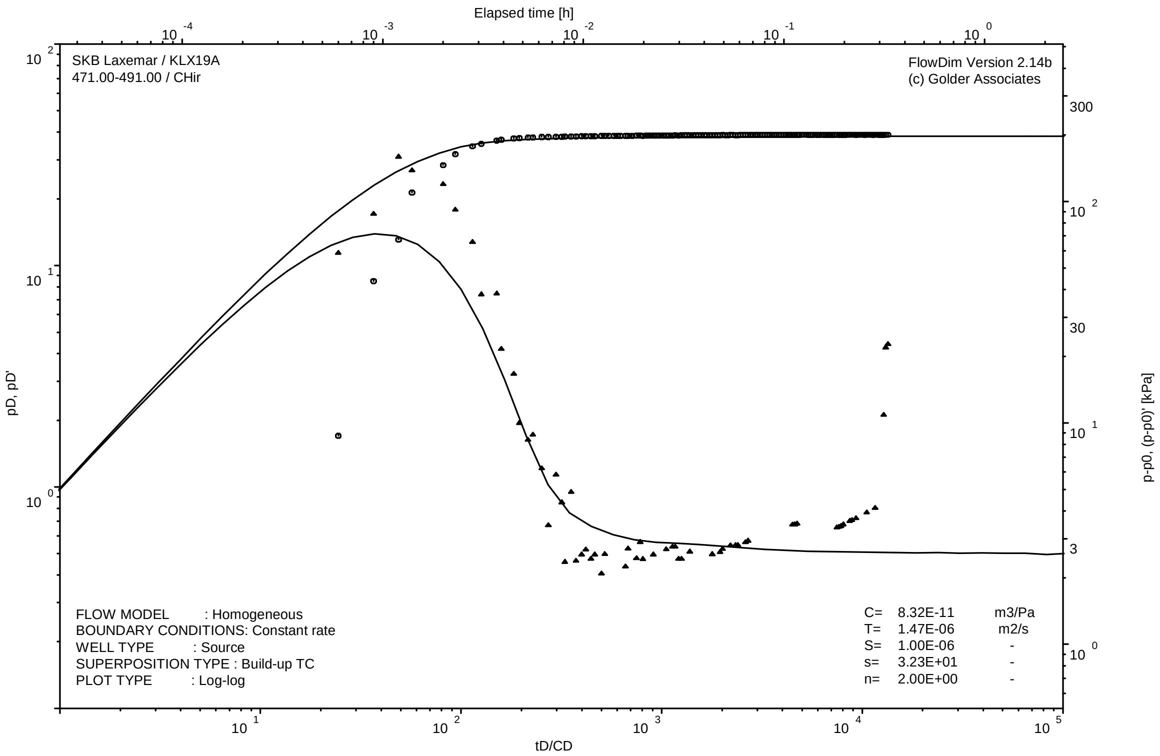
Pressure and flow rate vs. time; cartesian plot



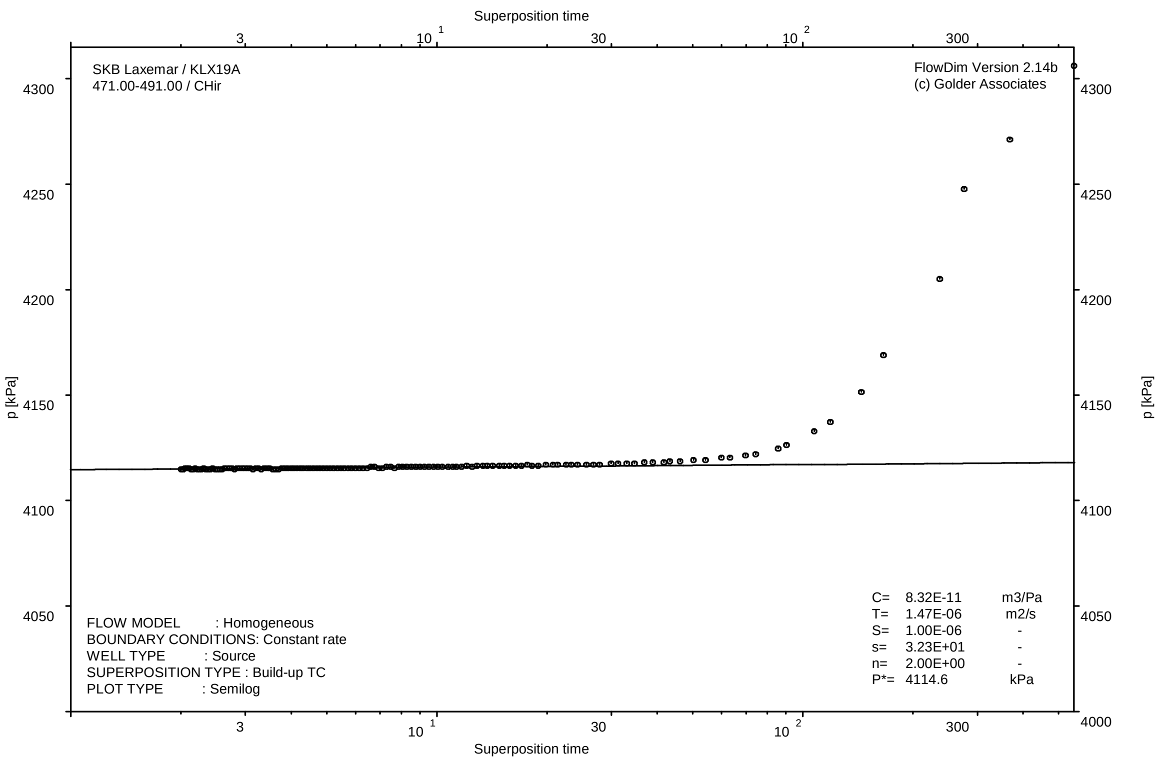
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

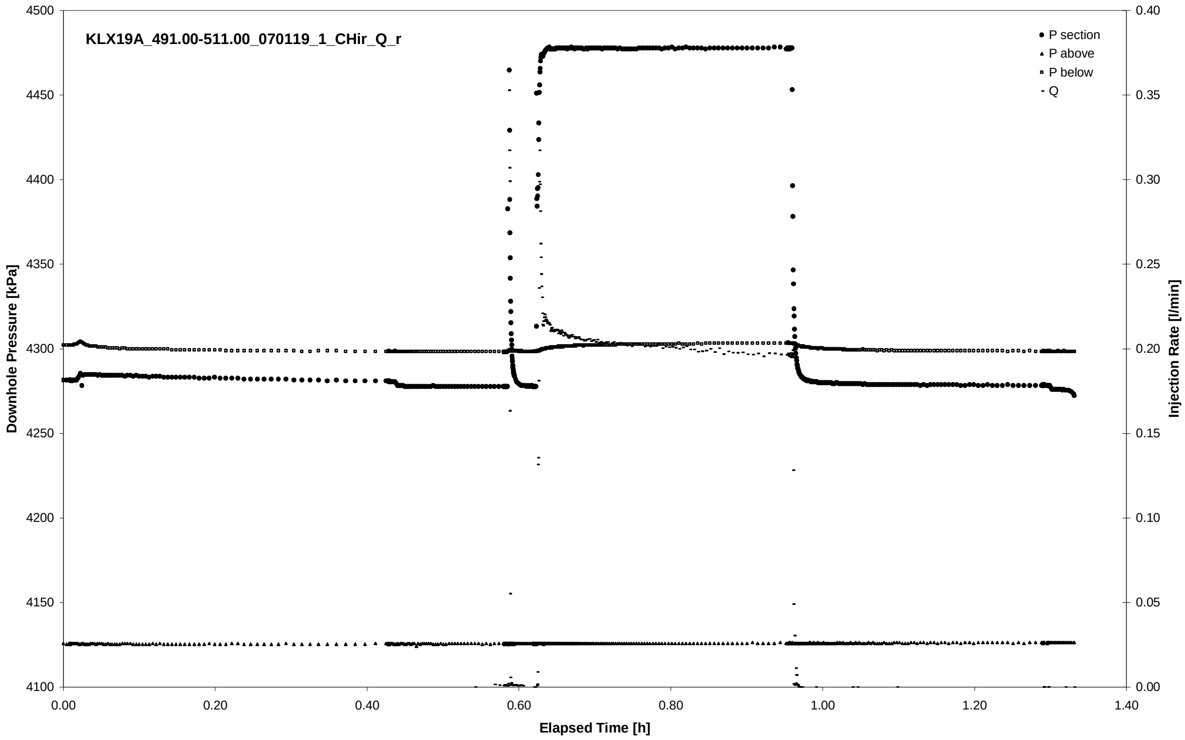


CHIR phase; HORNER match

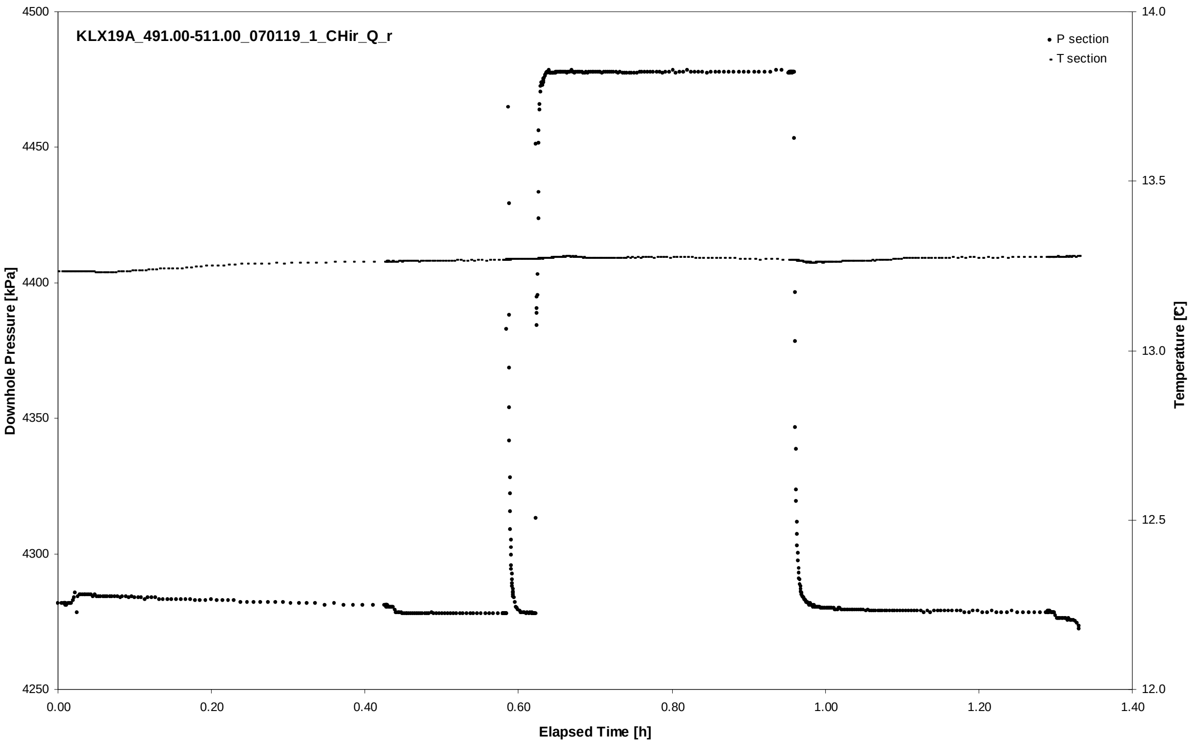
APPENDIX 2-22

Test 491.00 – 511.00 m

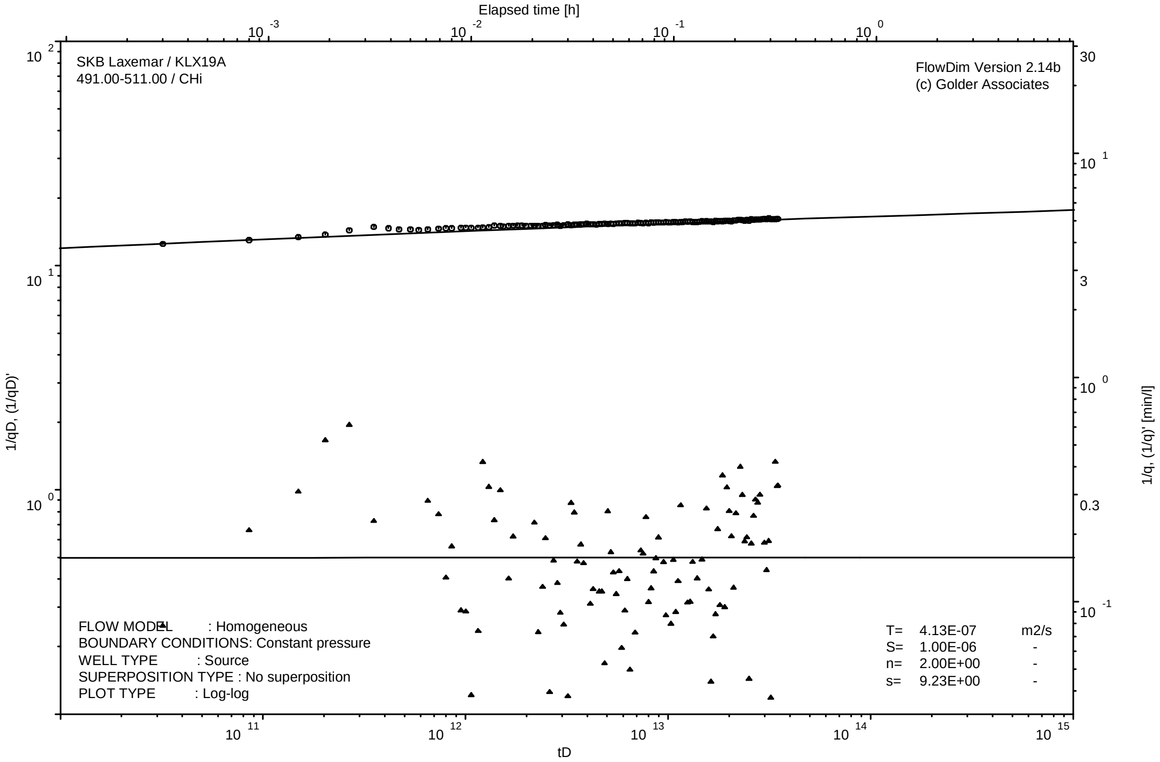
Analysis diagrams



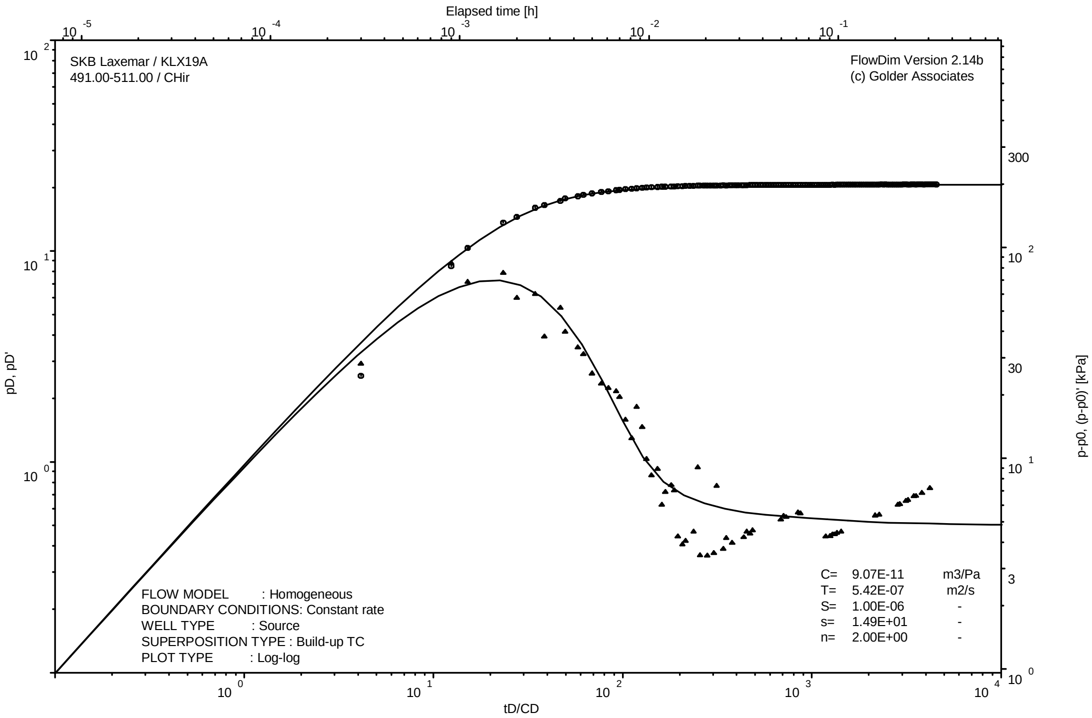
Pressure and flow rate vs. time; cartesian plot



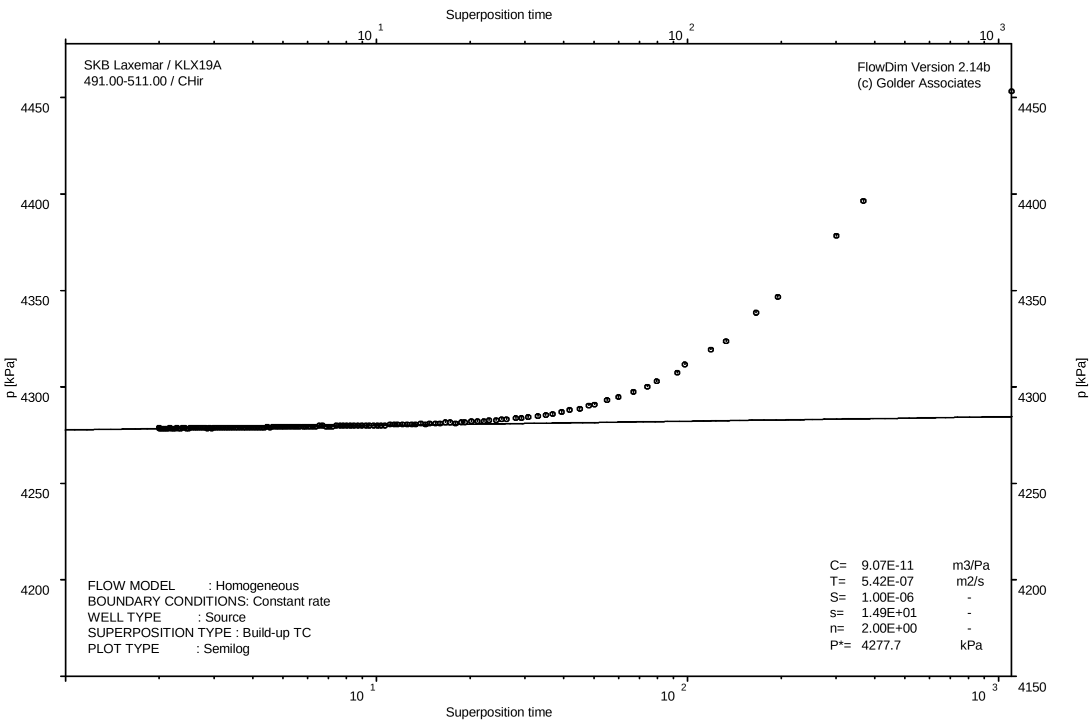
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

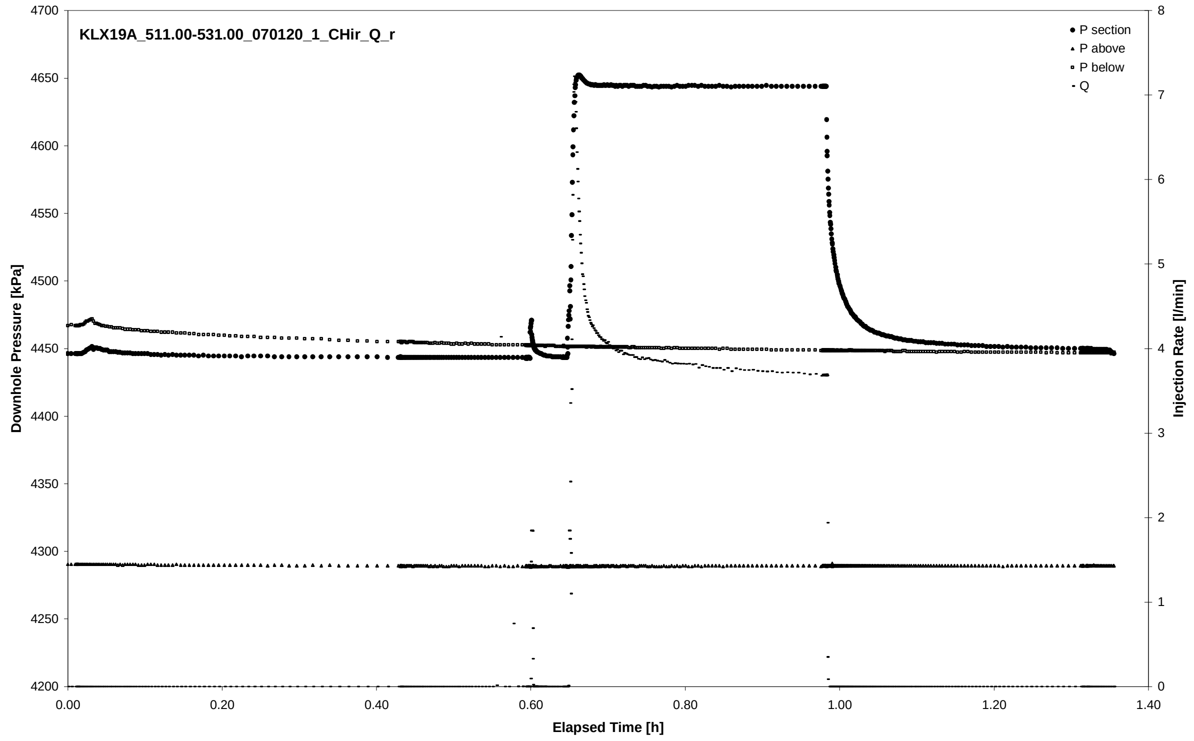


CHIR phase; HORNER match

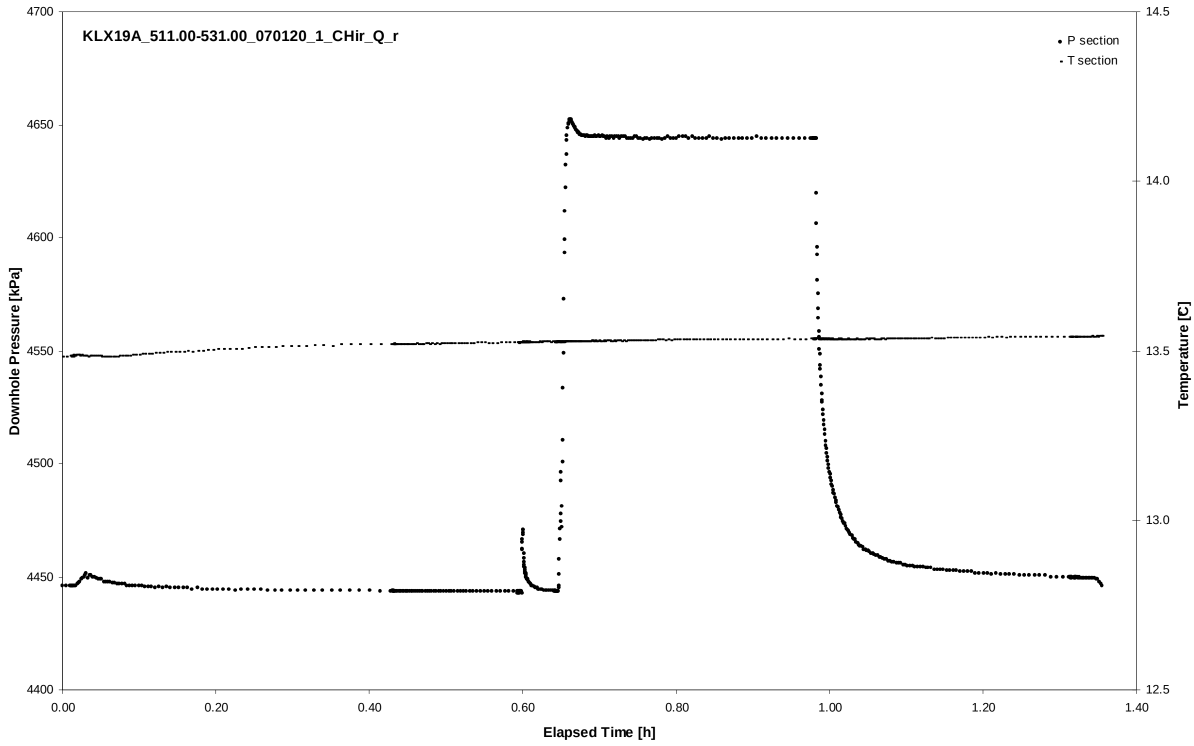
APPENDIX 2-23

Test 511.00 – 531.00 m

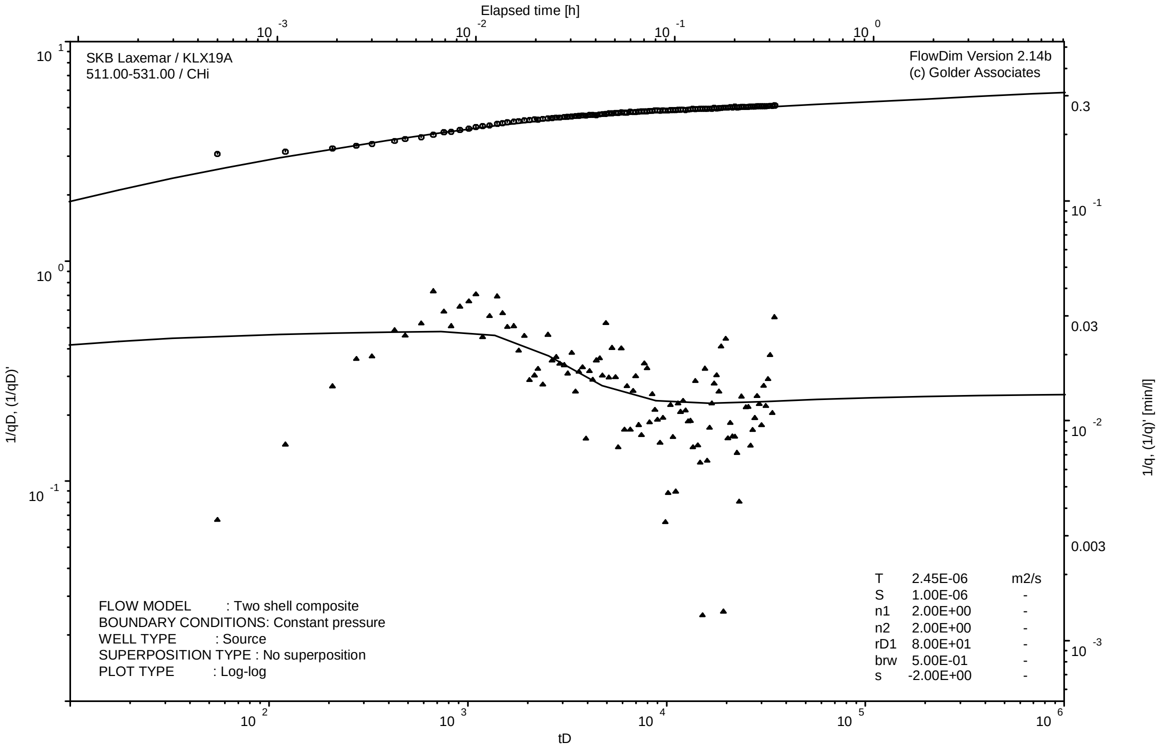
Analysis diagrams



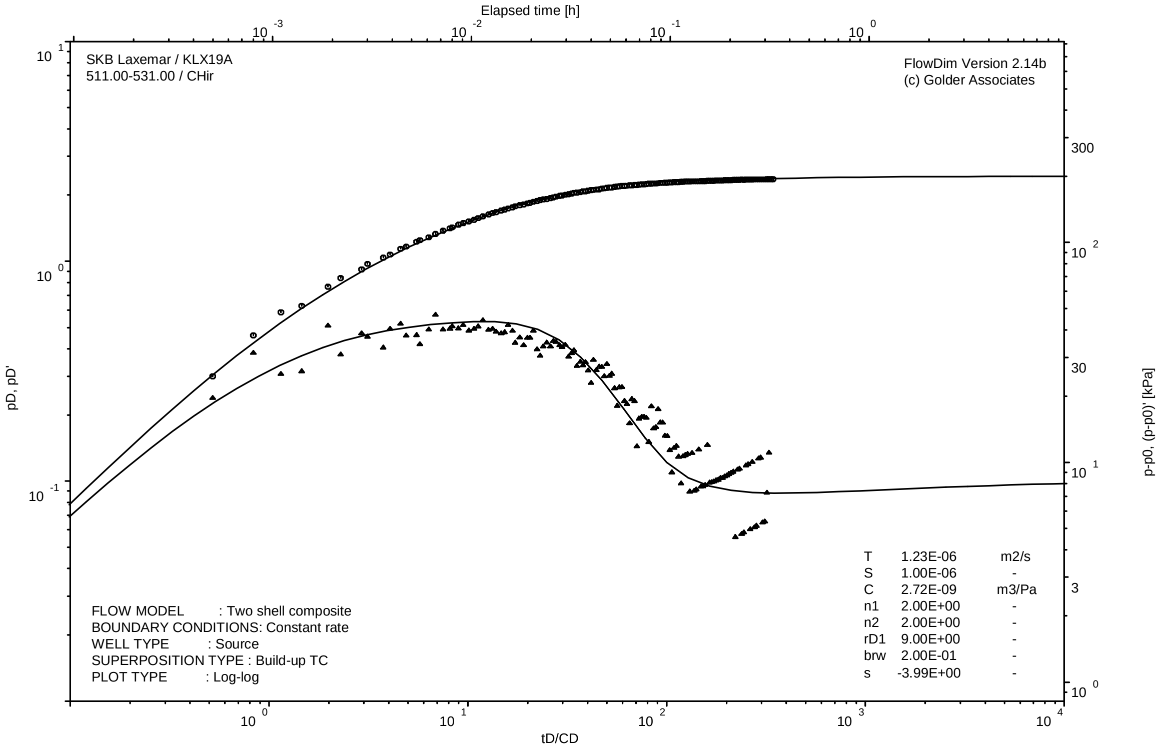
Pressure and flow rate vs. time; cartesian plot



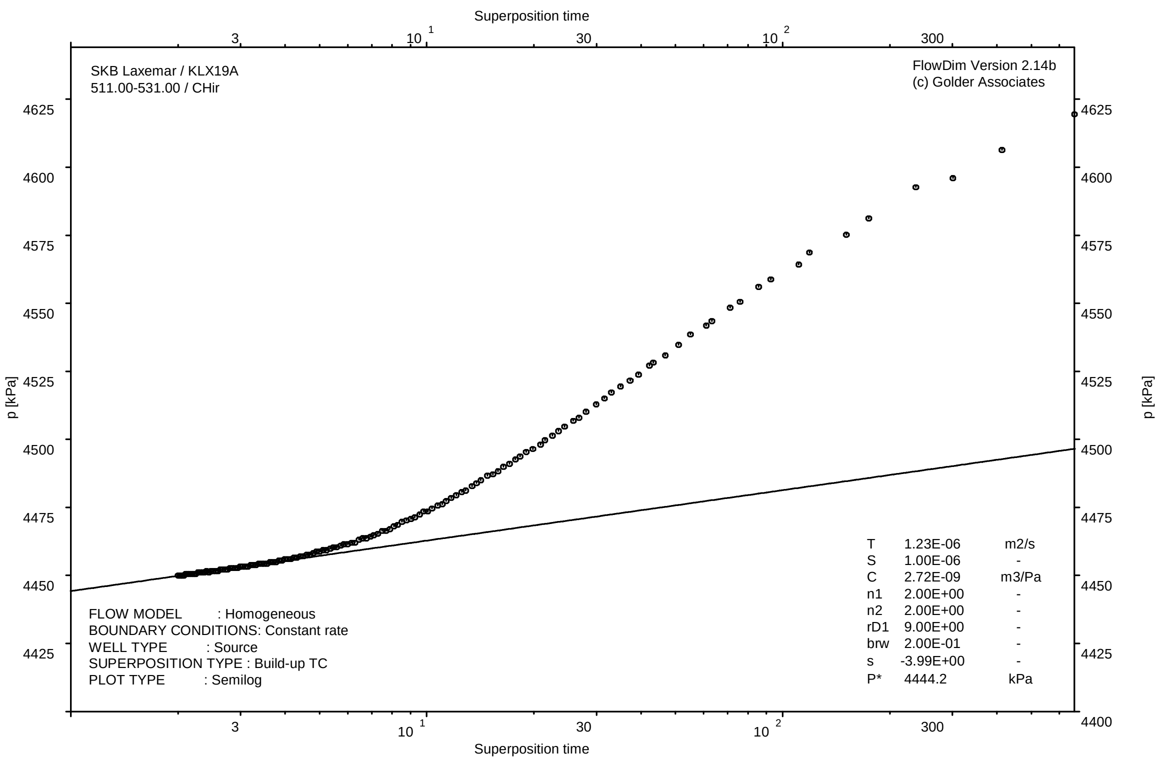
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

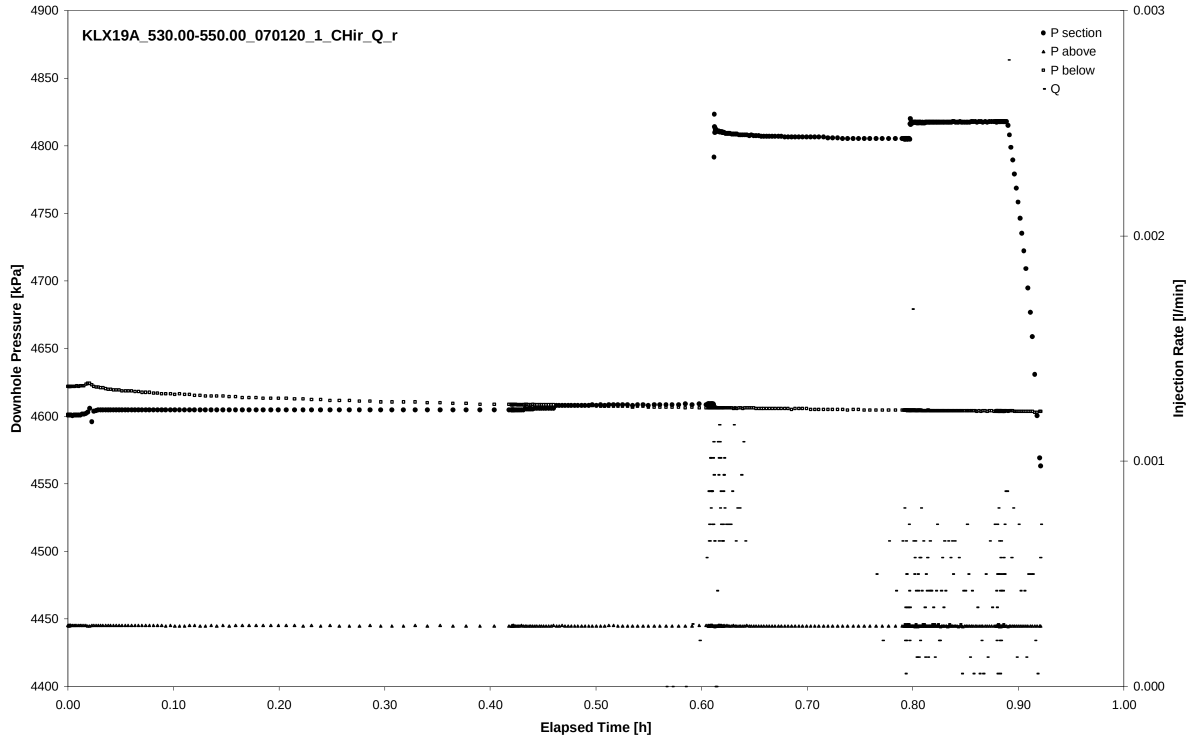


CHIR phase; HORNER match

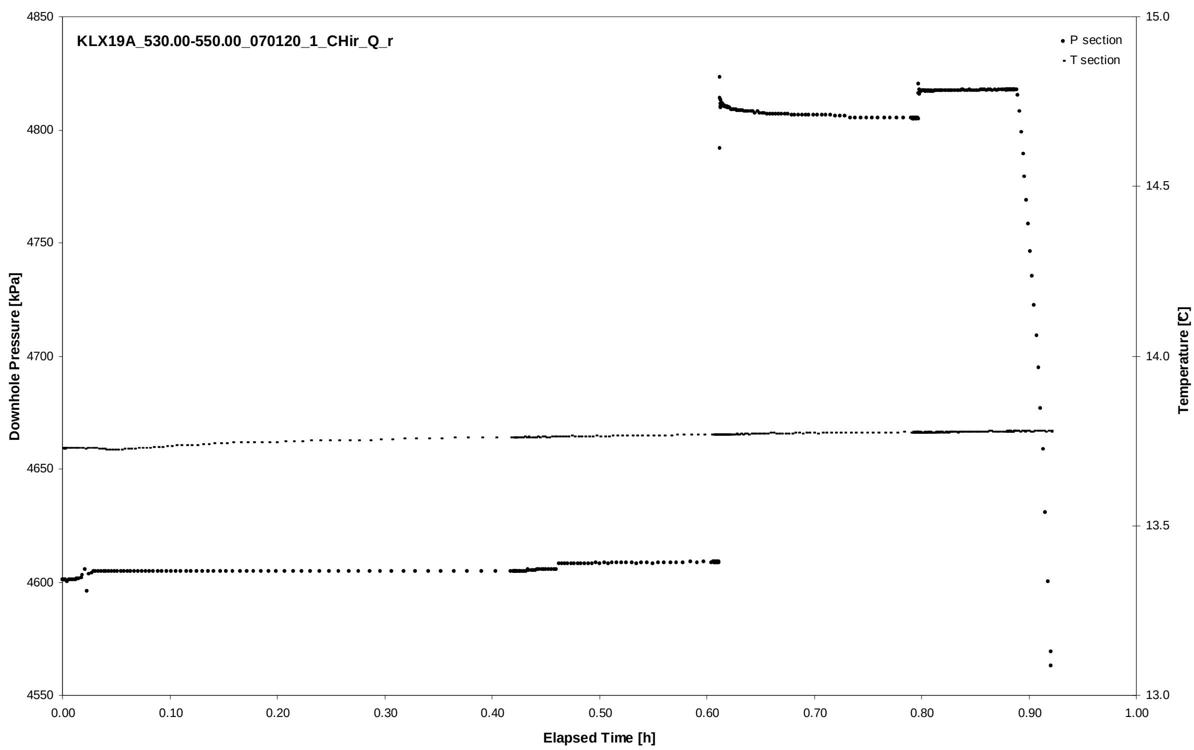
APPENDIX 2-24

Test 530.00 – 550.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

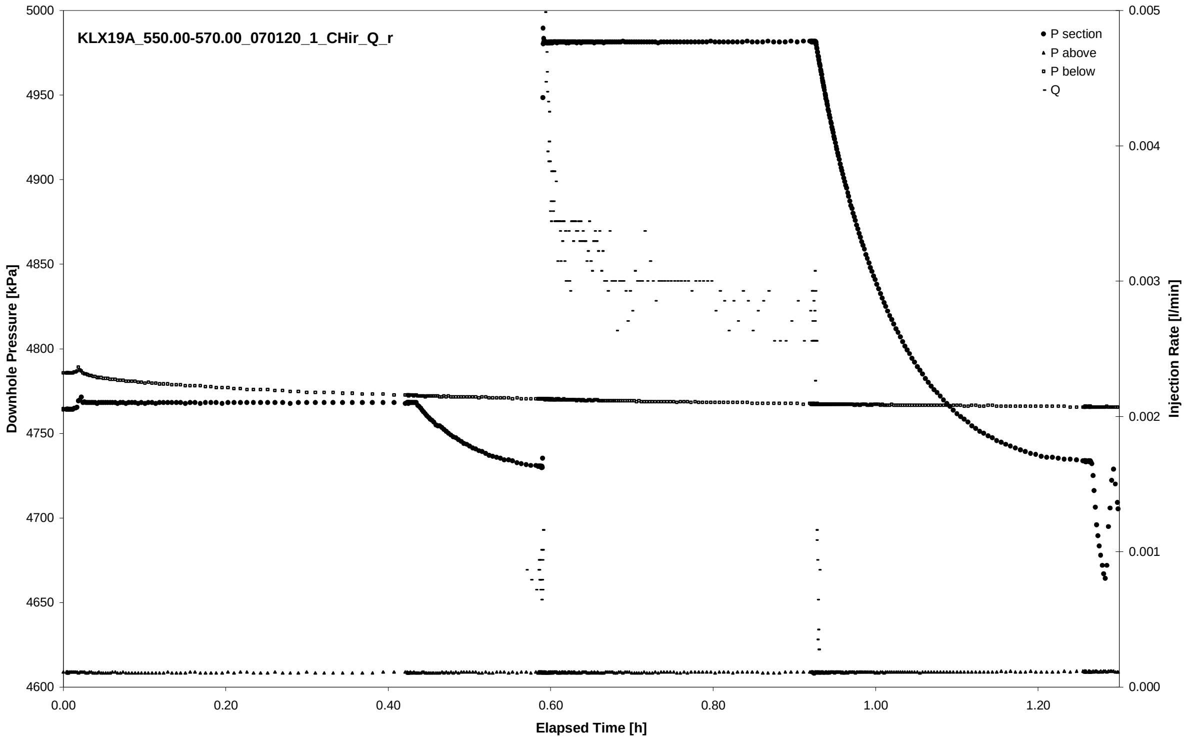
Not Analysed

CHIR phase; HORNER match

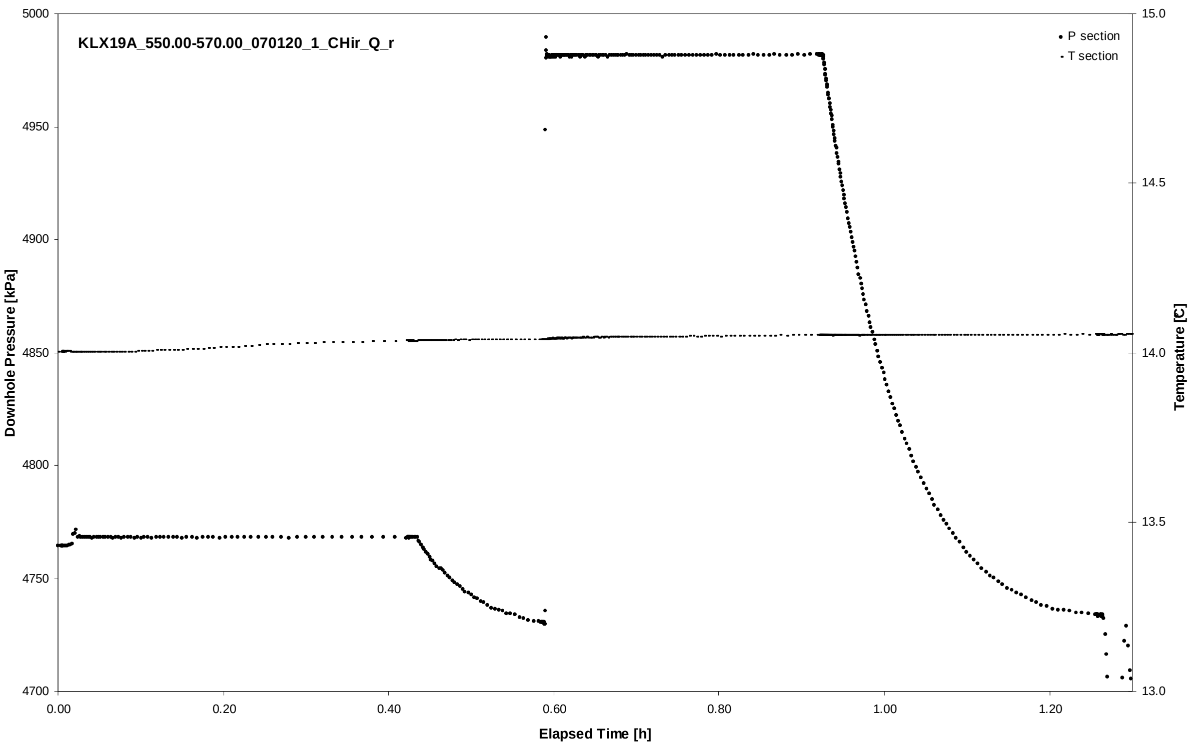
APPENDIX 2-25

Test 550.00 – 570.00 m

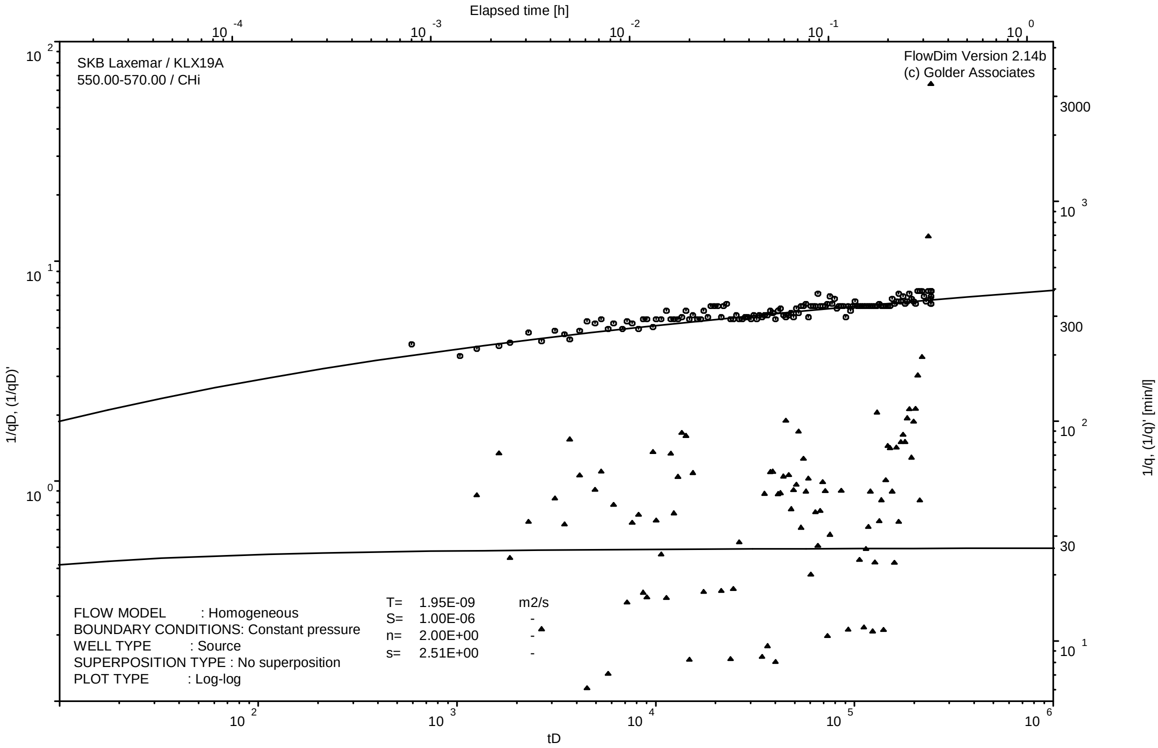
Analysis diagrams



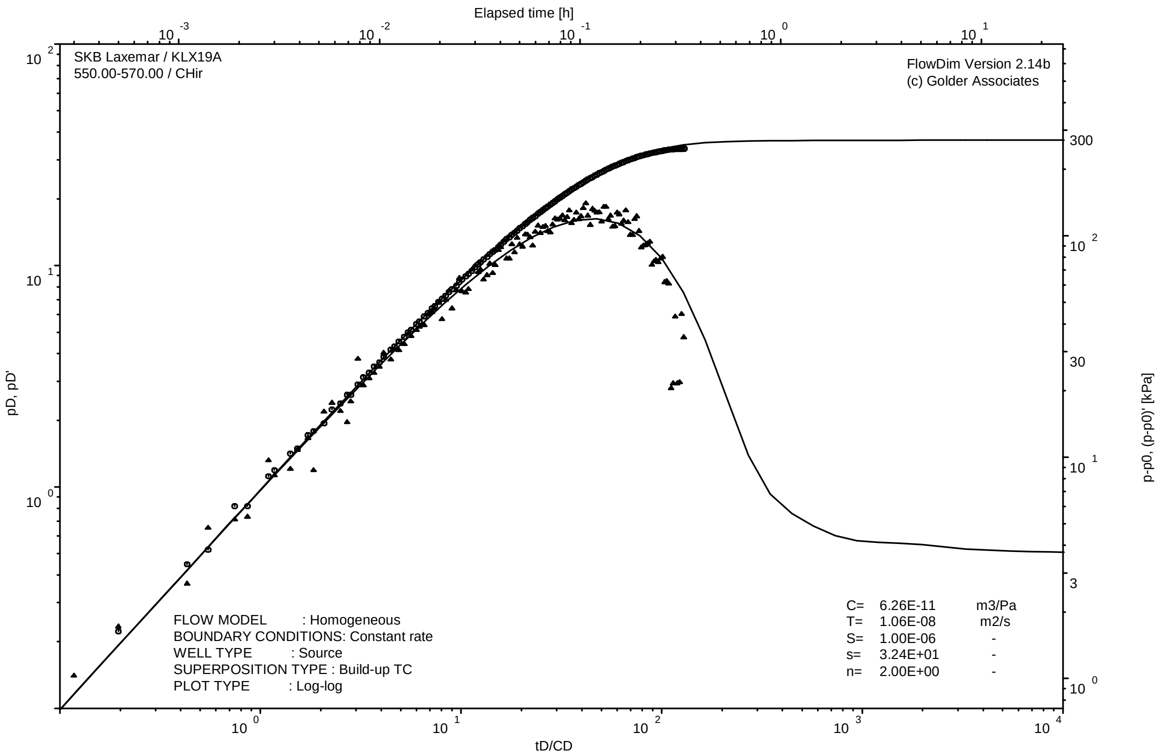
Pressure and flow rate vs. time; cartesian plot



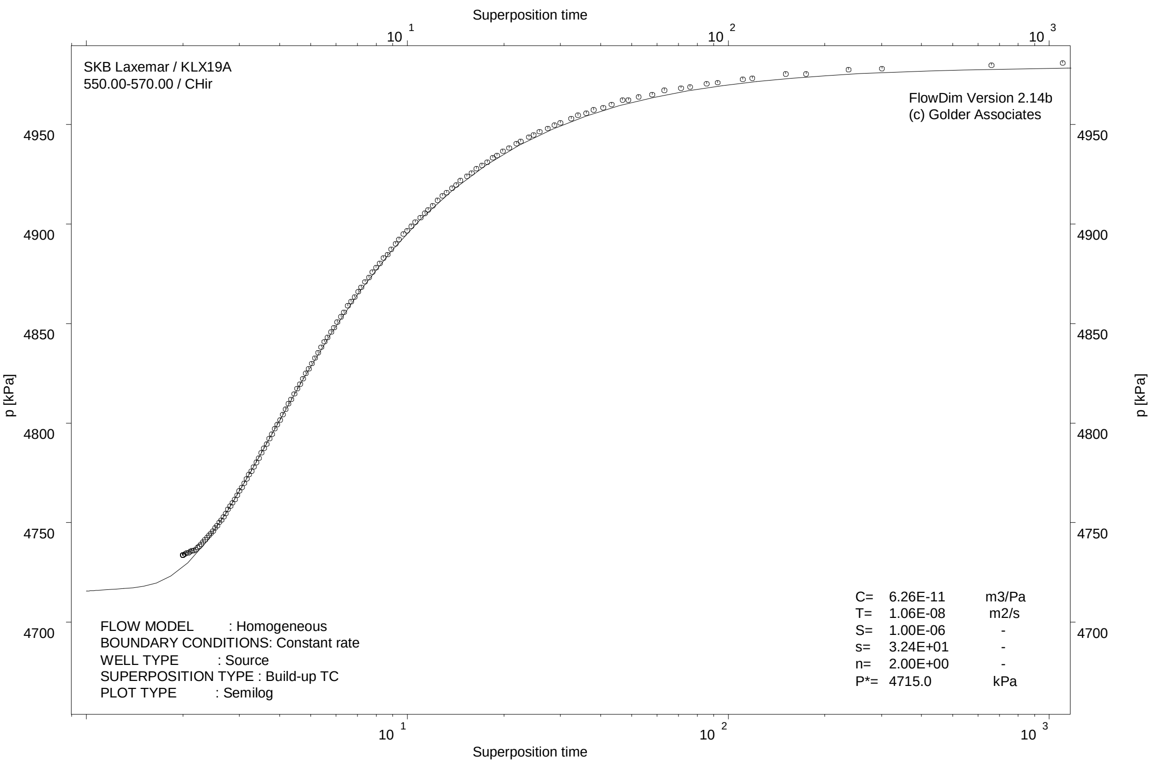
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

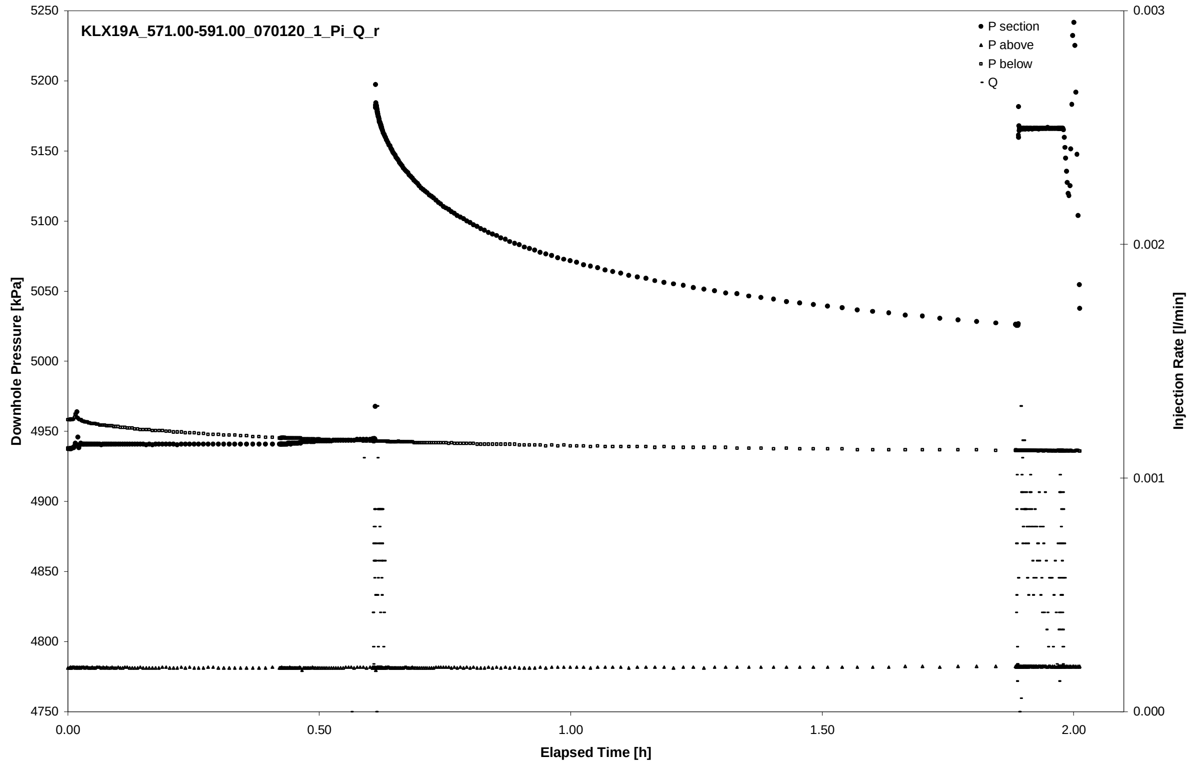


CHIR phase; HORNER match

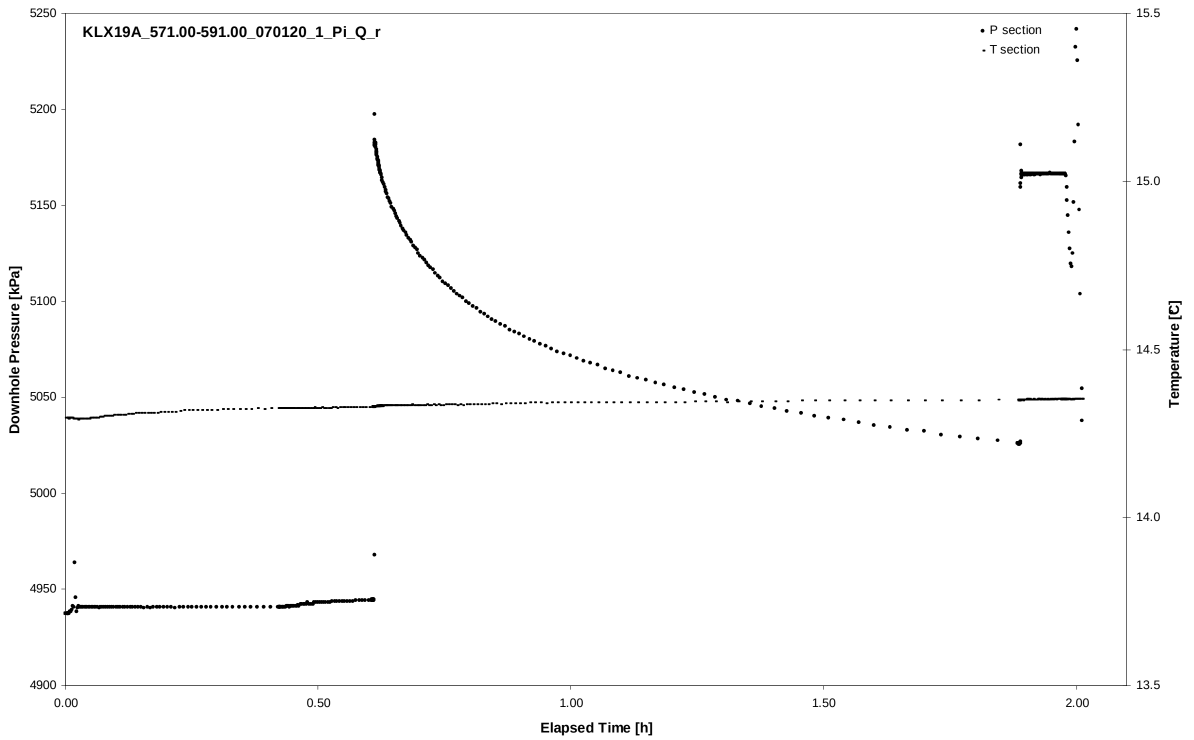
APPENDIX 2-26

Test 571.00 – 591.00 m

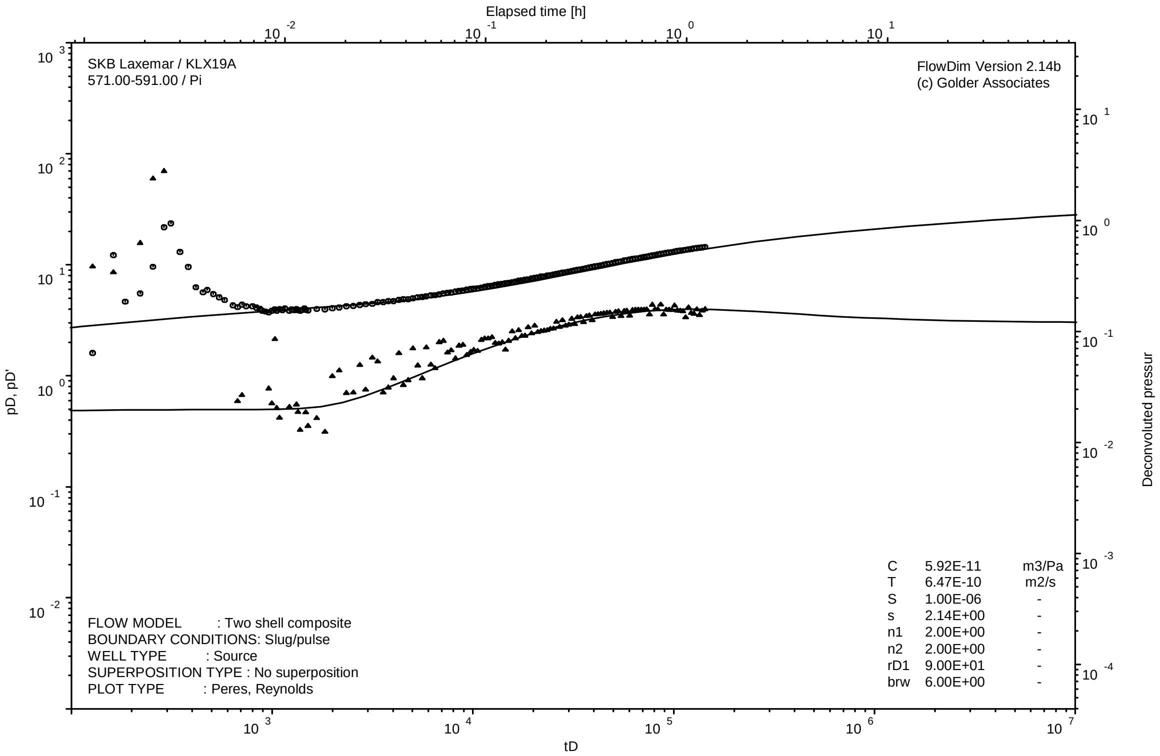
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

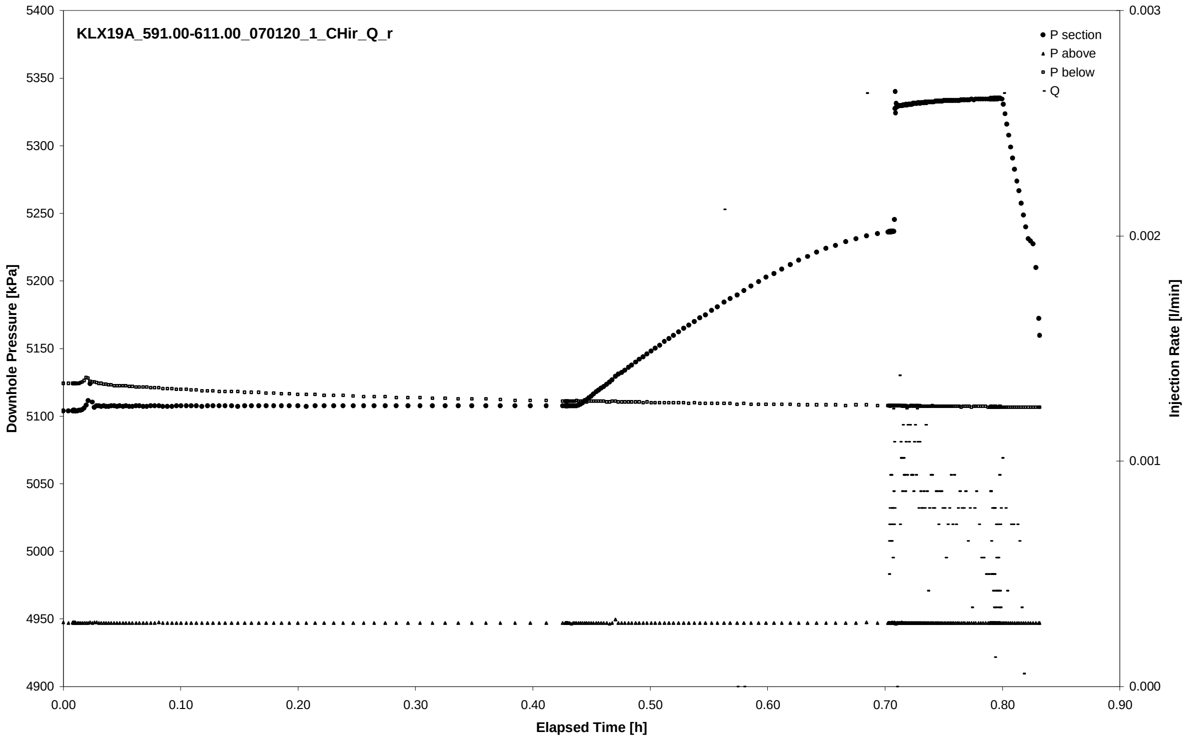


Pulse injection; deconvolution match

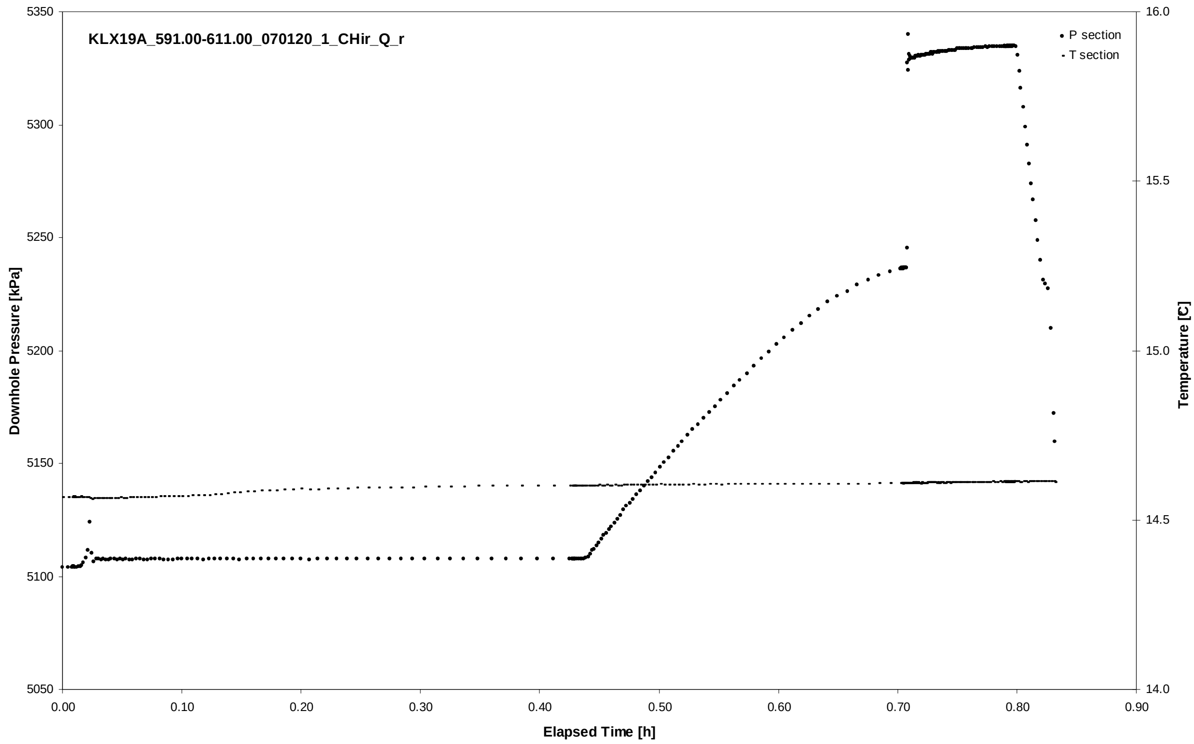
APPENDIX 2-27

Test 591.00 – 611.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

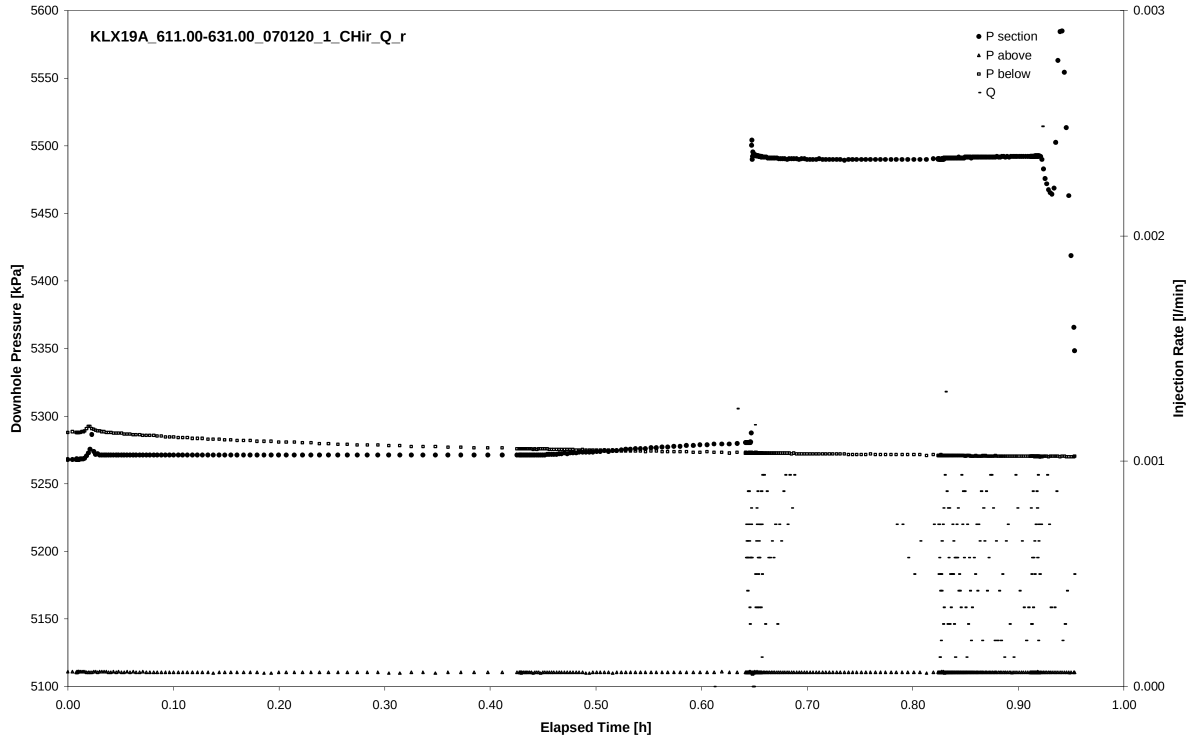
Not Analysed

CHIR phase; HORNER match

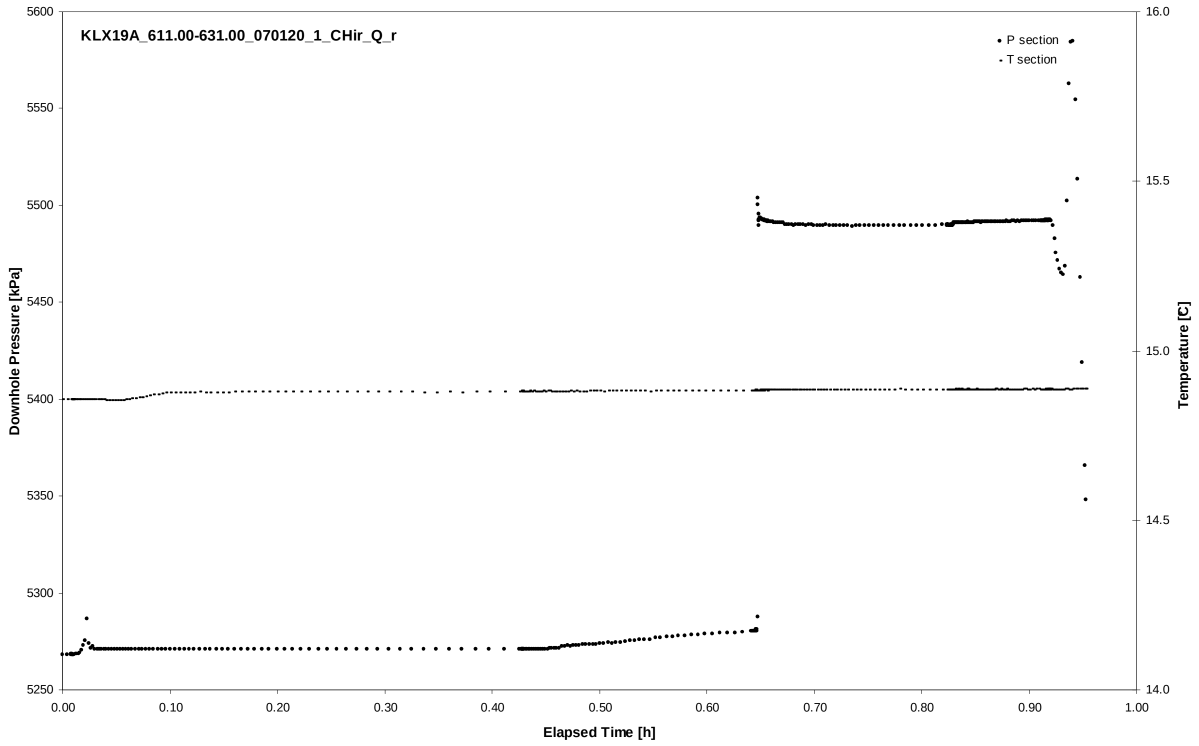
APPENDIX 2-28

Test 611.00 – 631.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

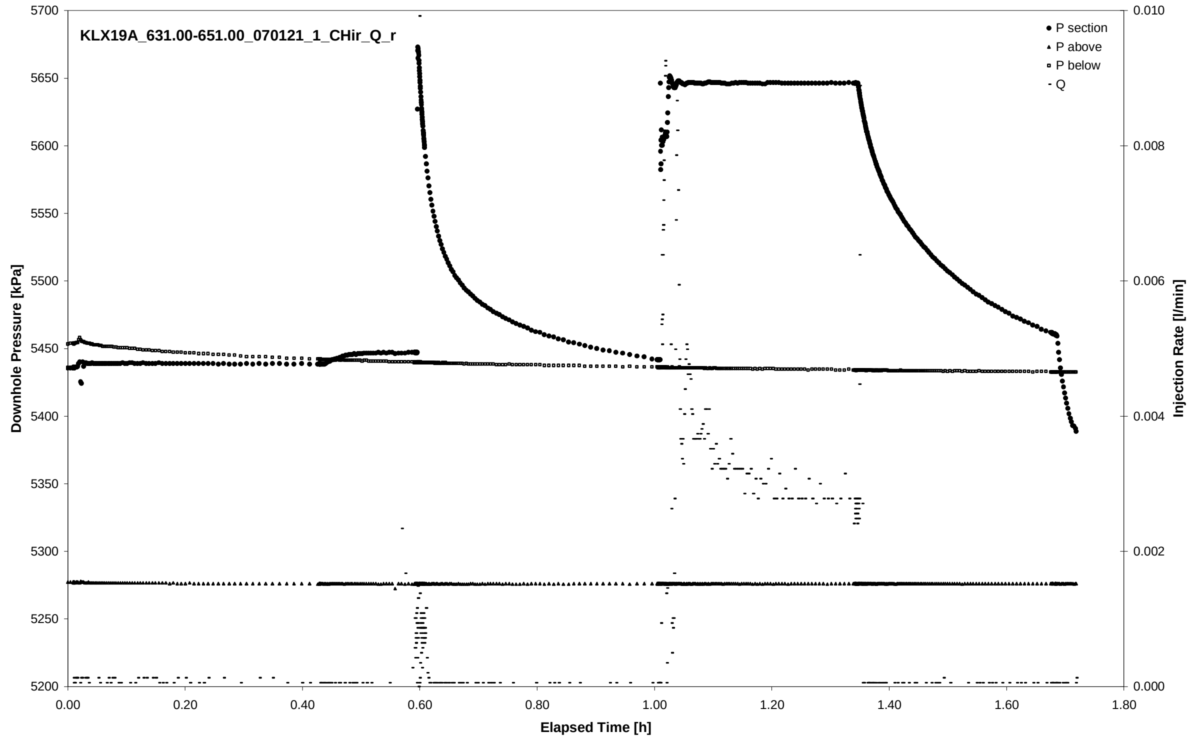
Not Analysed

CHIR phase; HORNER match

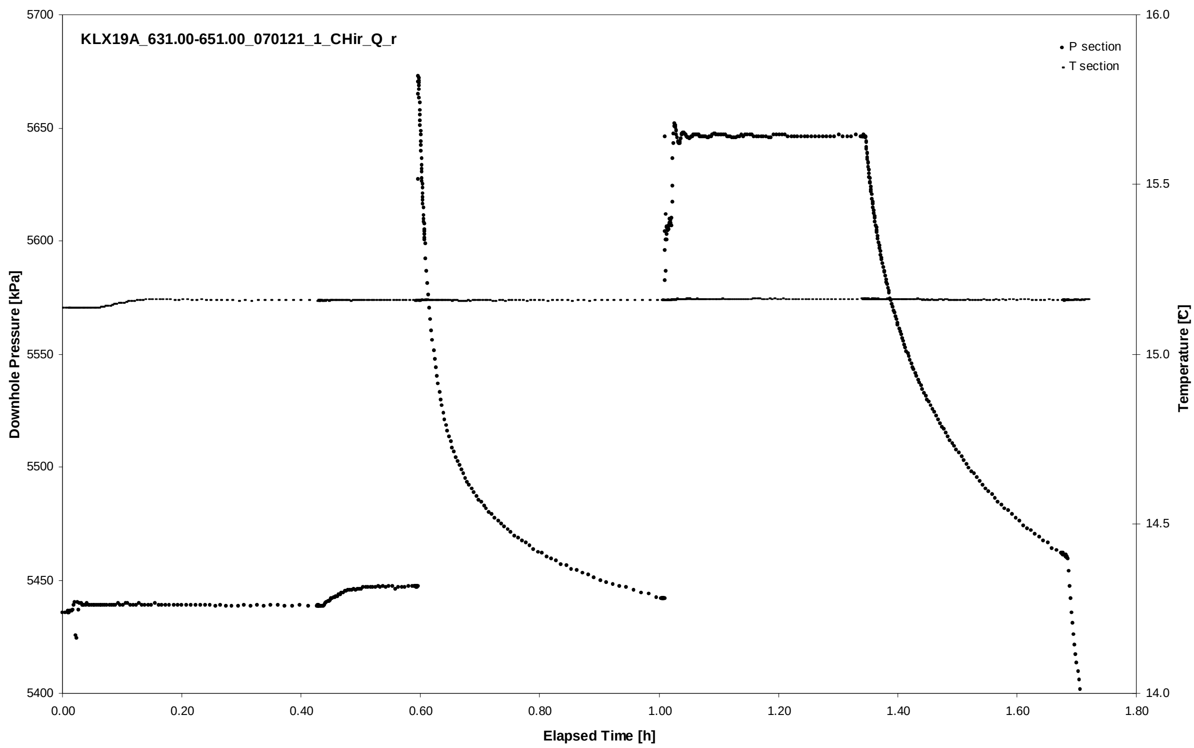
APPENDIX 2-29

Test 631.00 – 651.00 m

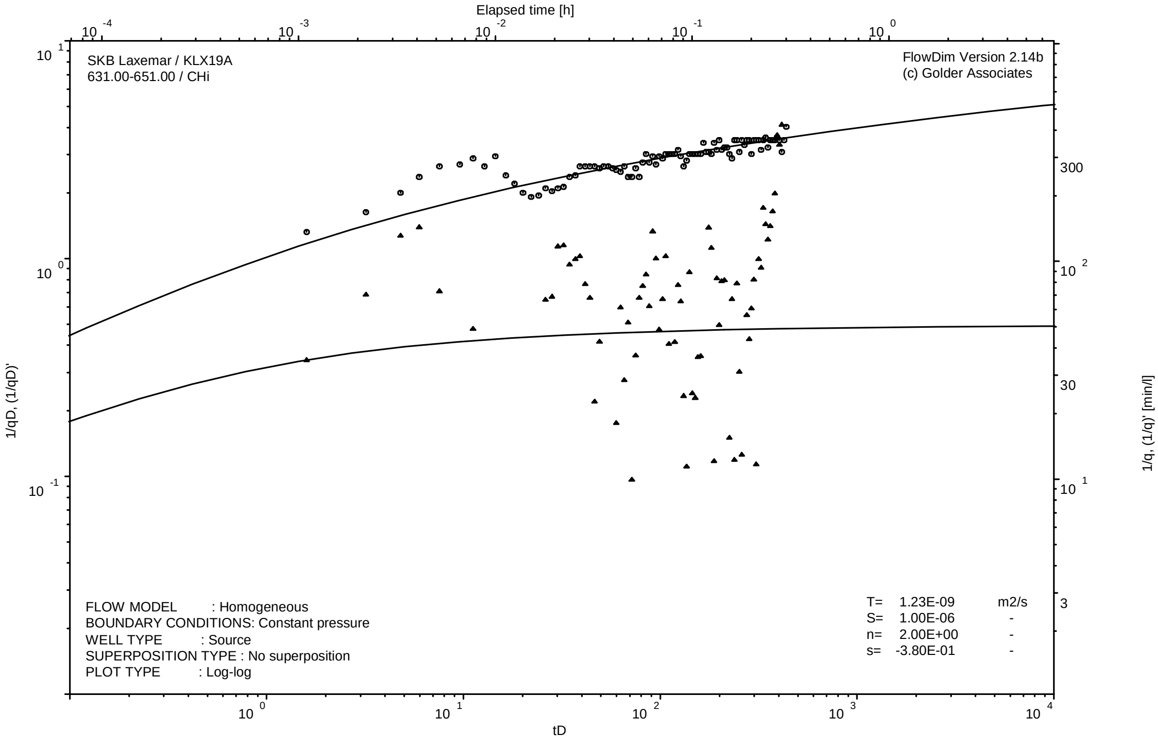
Analysis diagrams



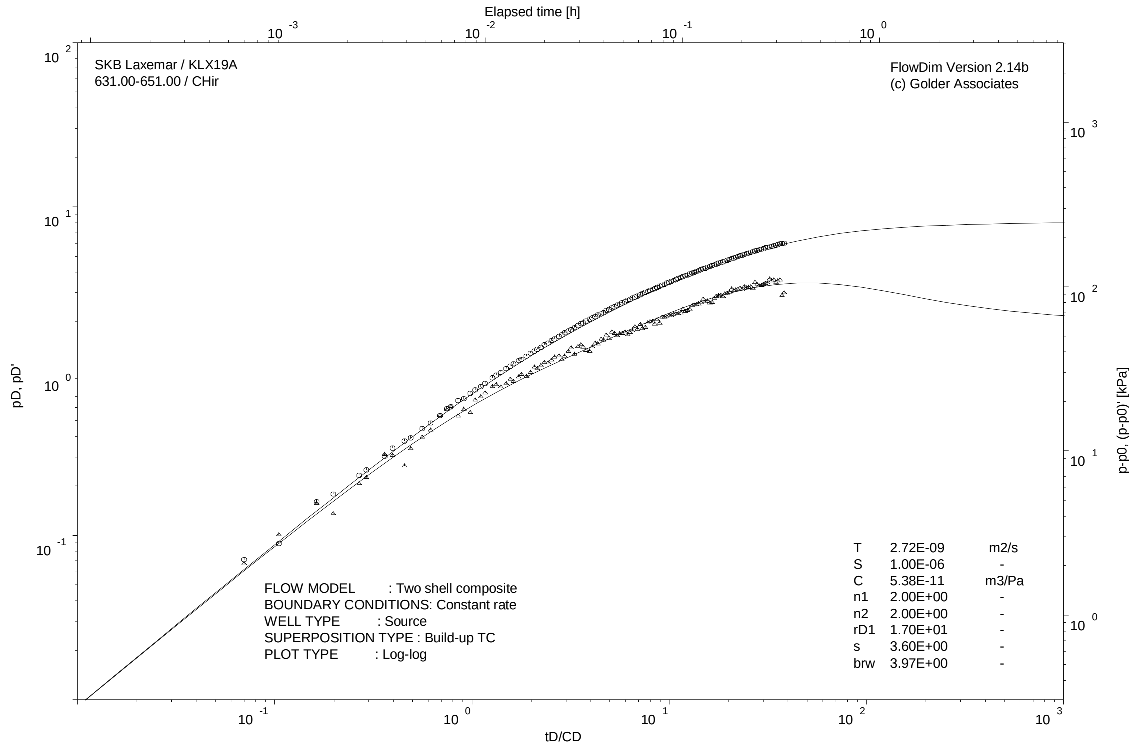
Pressure and flow rate vs. time; cartesian plot



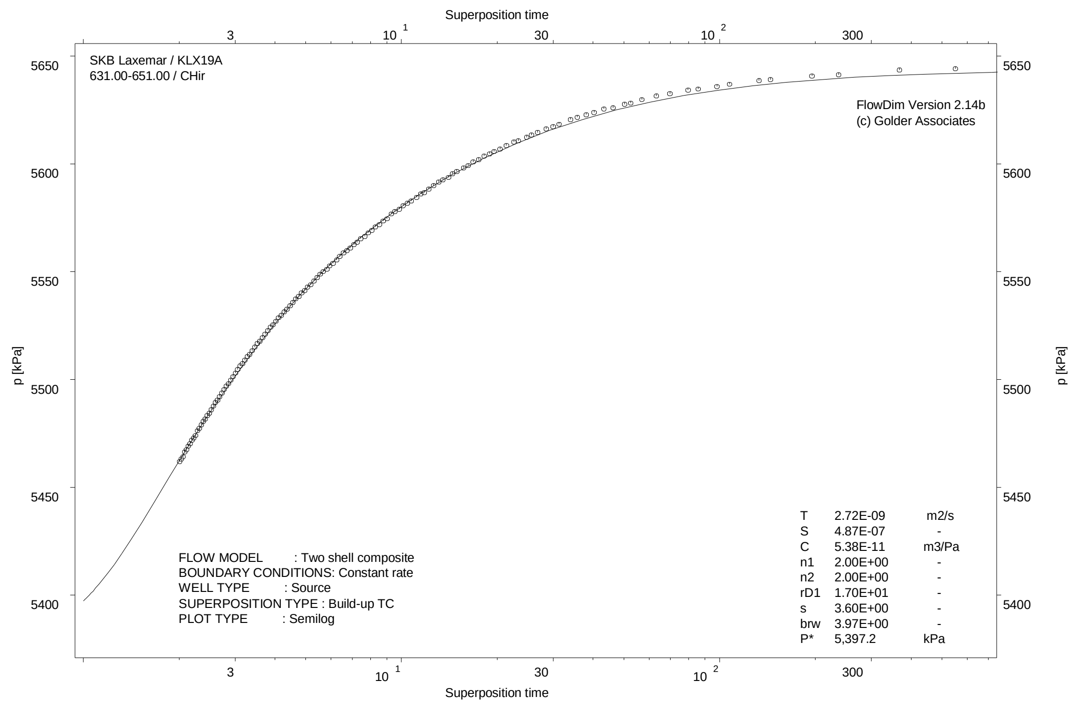
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

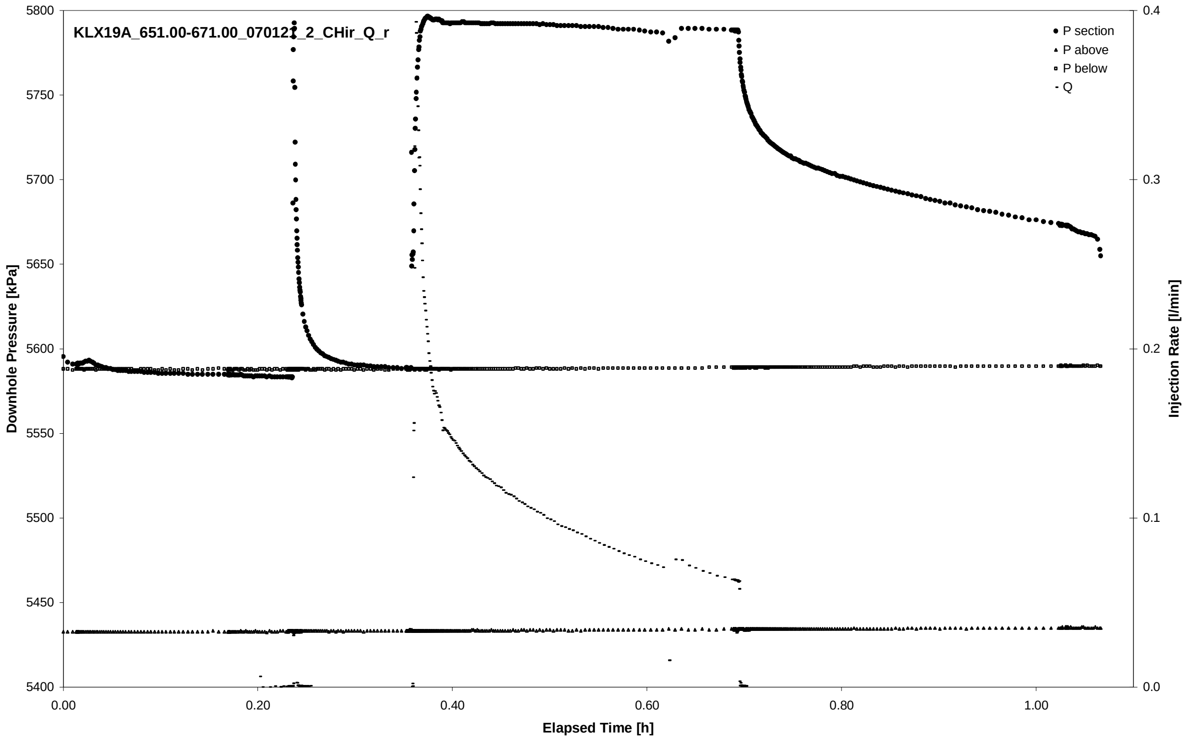


CHIR phase; HORNER match

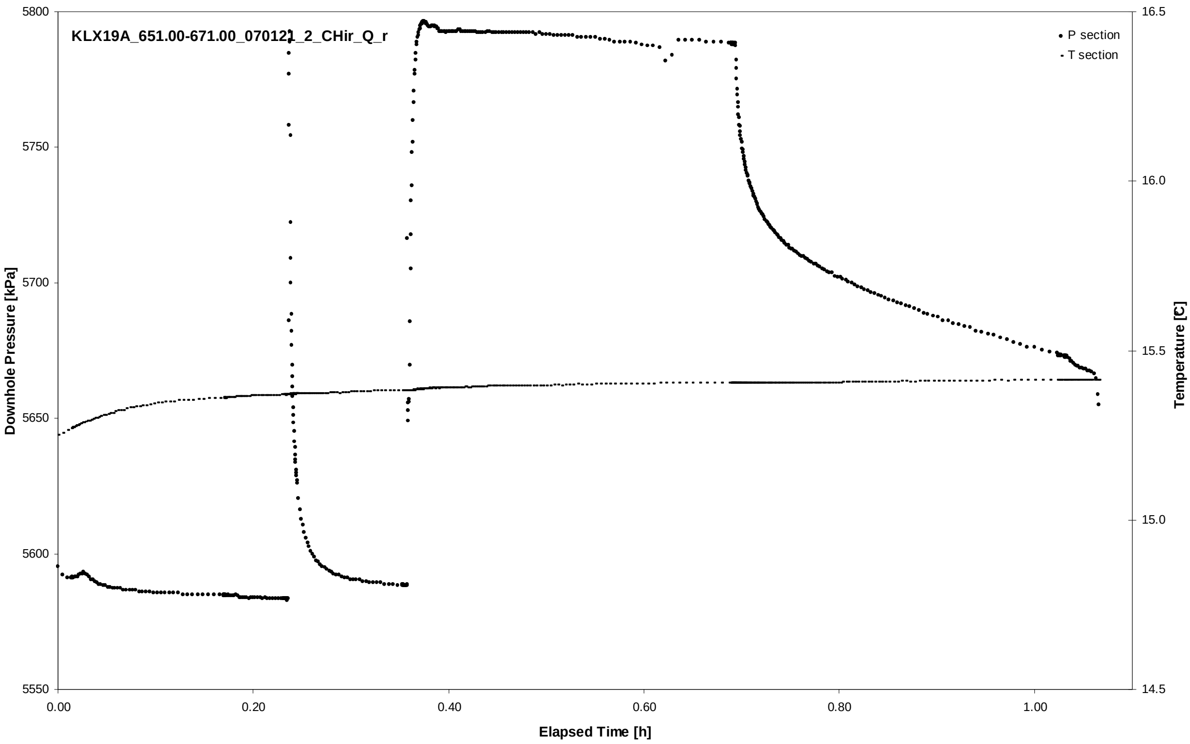
APPENDIX 2-30

Test 651.00 – 671.00 m

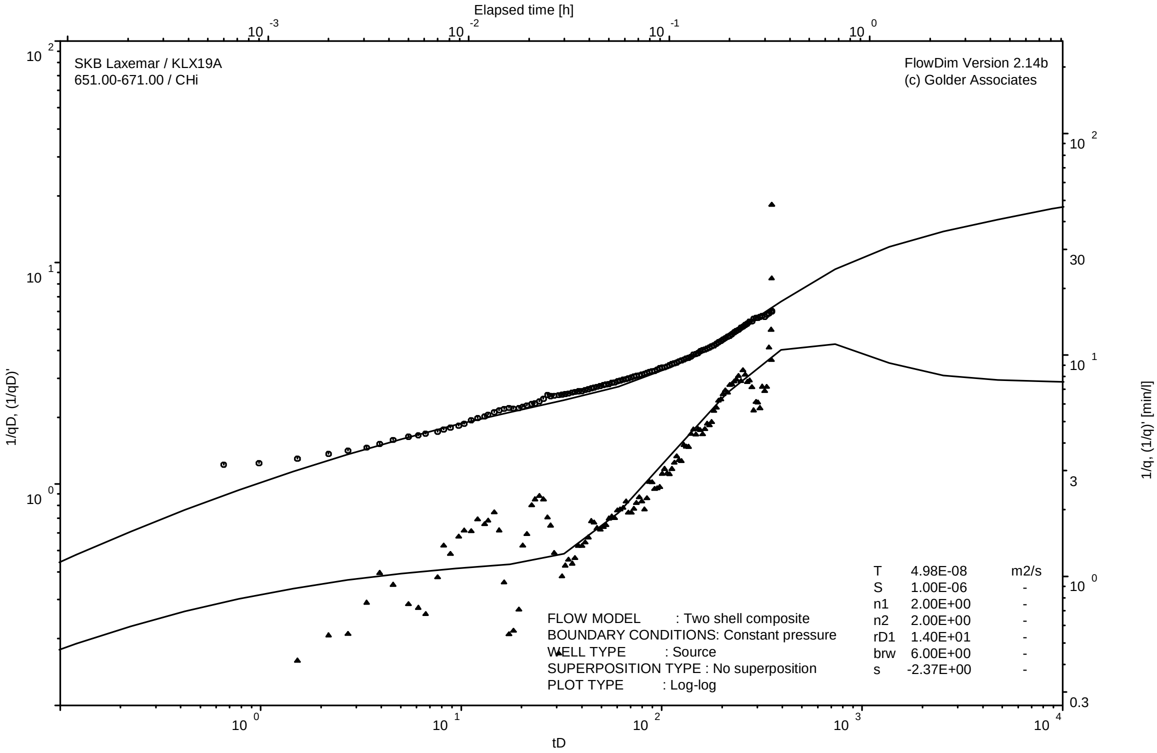
Analysis diagrams



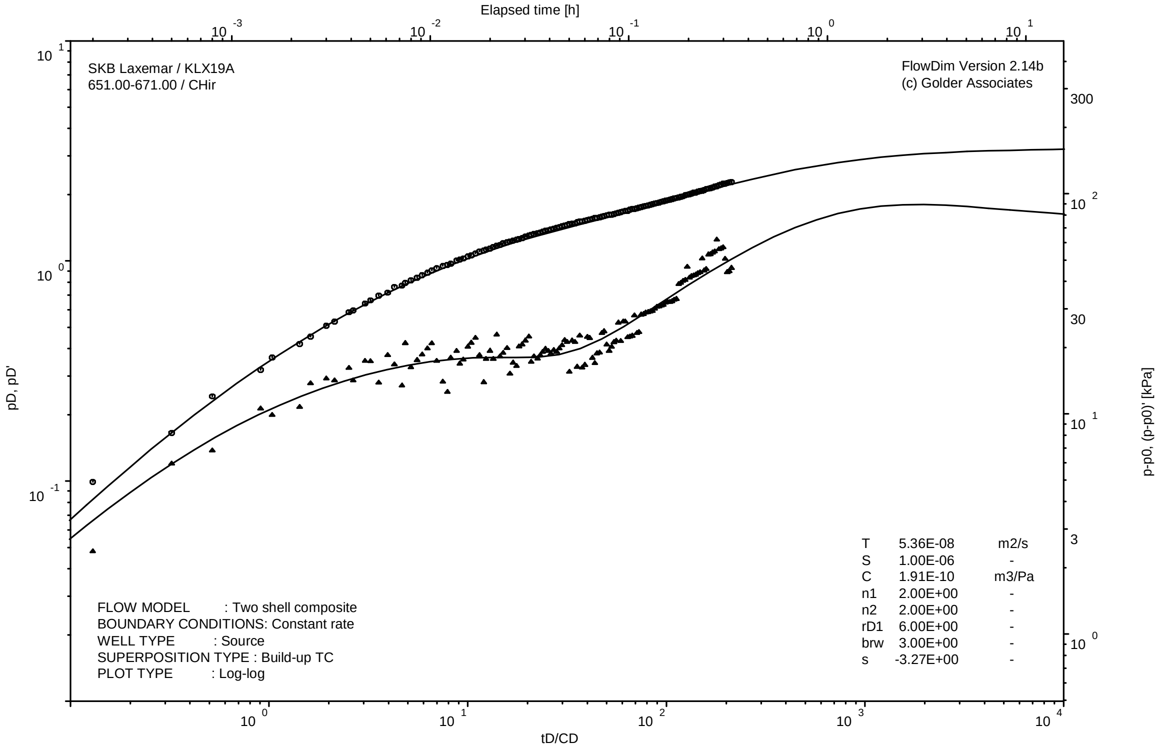
Pressure and flow rate vs. time; cartesian plot



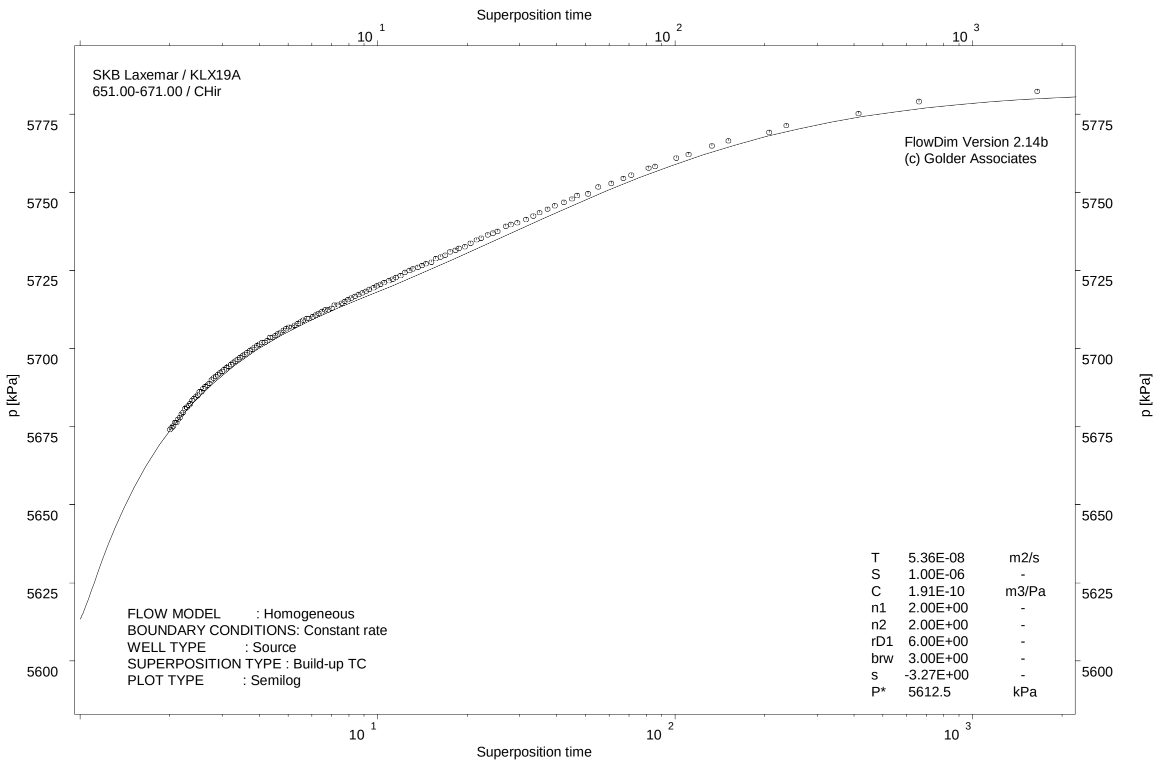
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

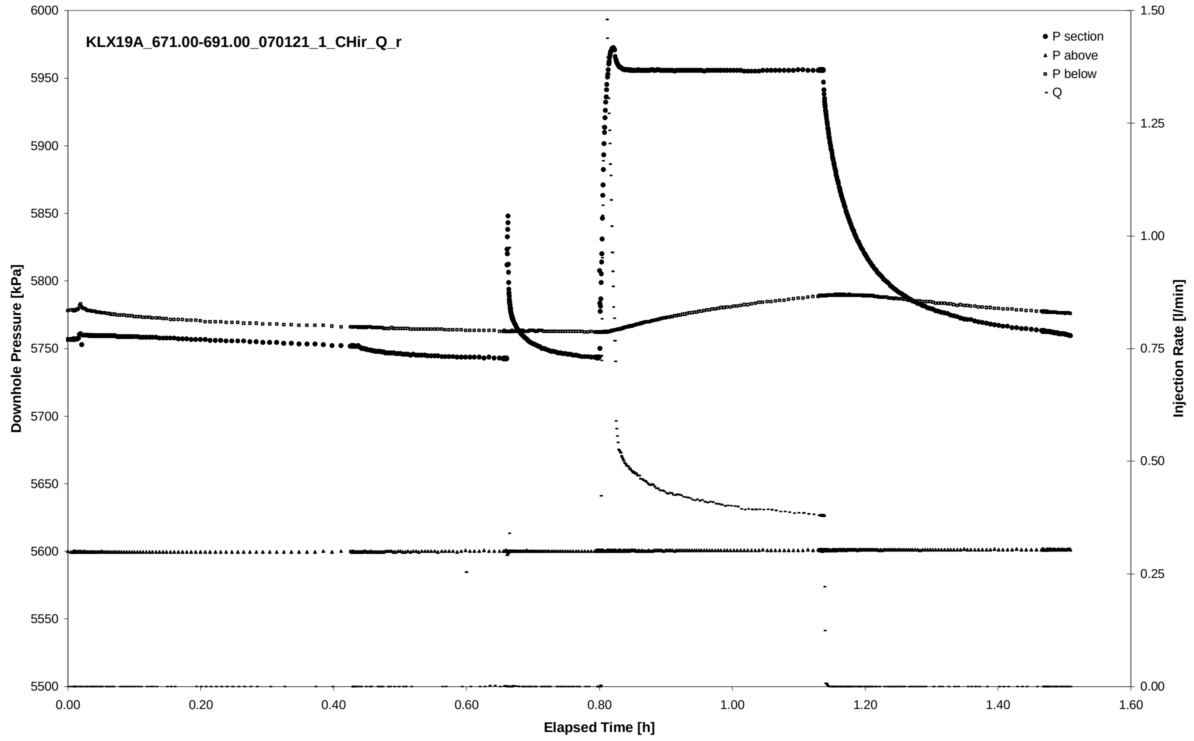


CHIR phase; HORNER match

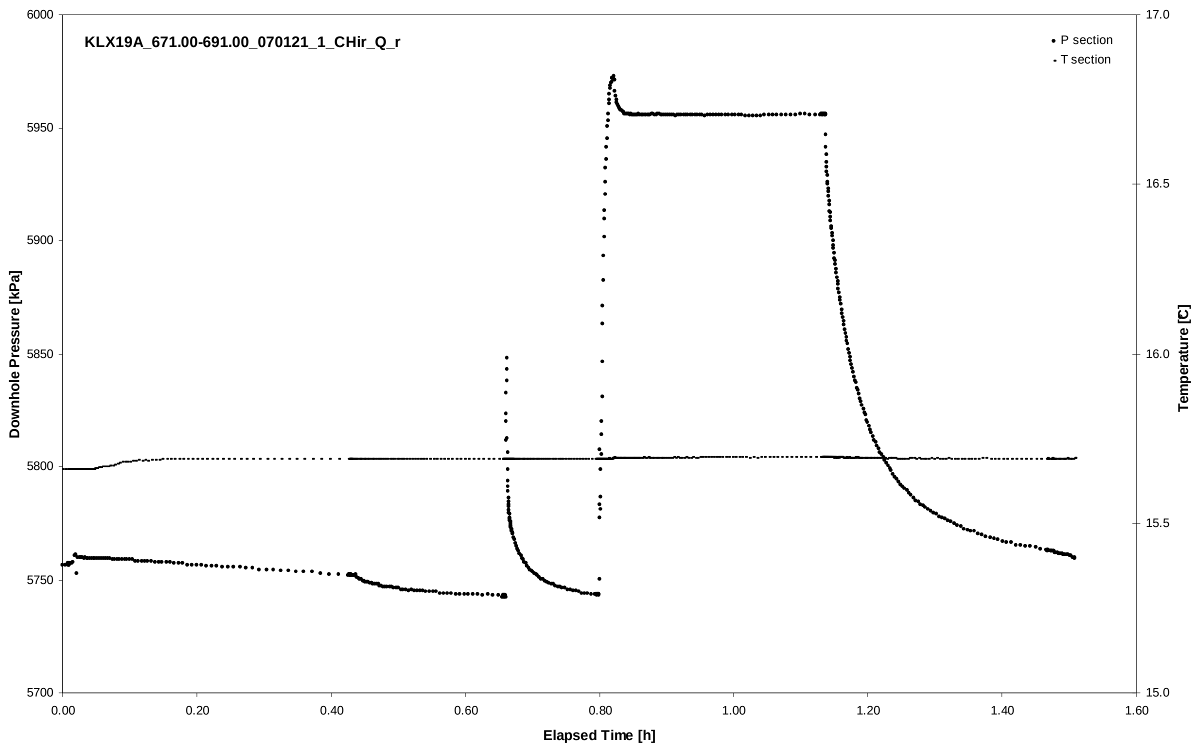
APPENDIX 2-31

Test 671.00 – 691.00 m

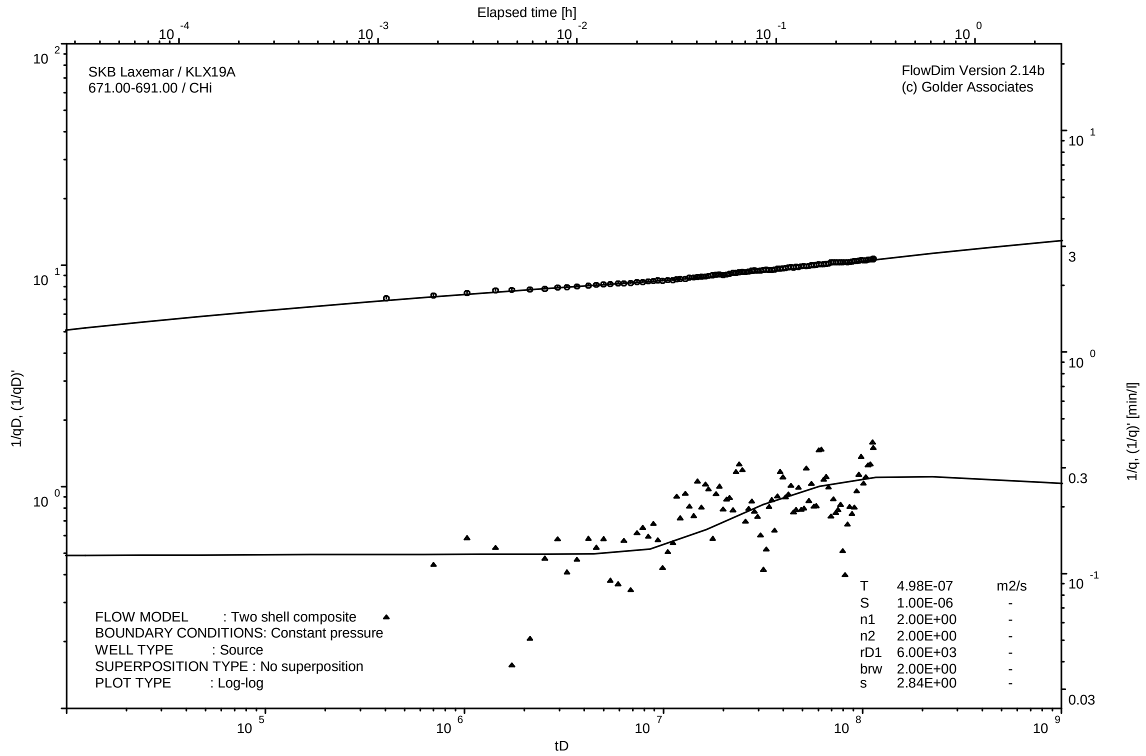
Analysis diagrams



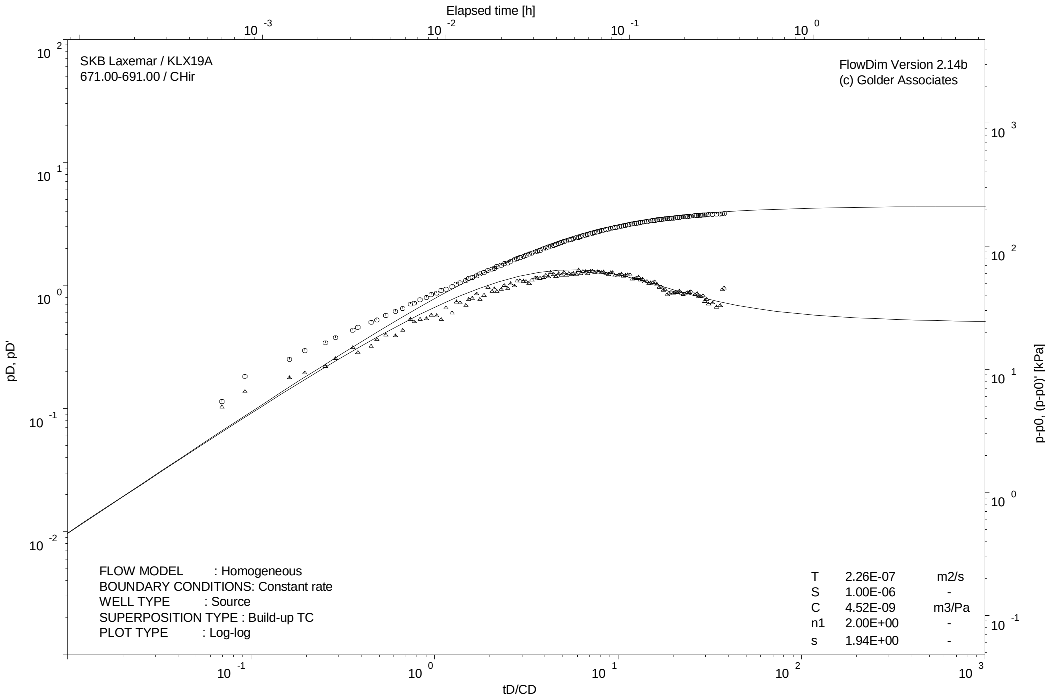
Pressure and flow rate vs. time; cartesian plot



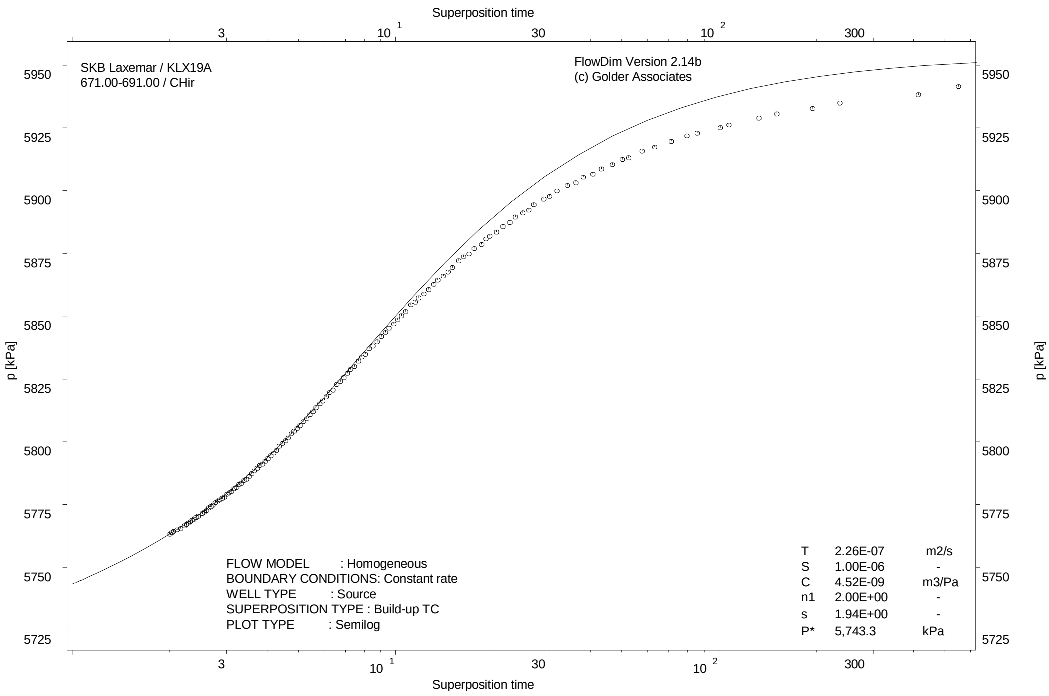
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

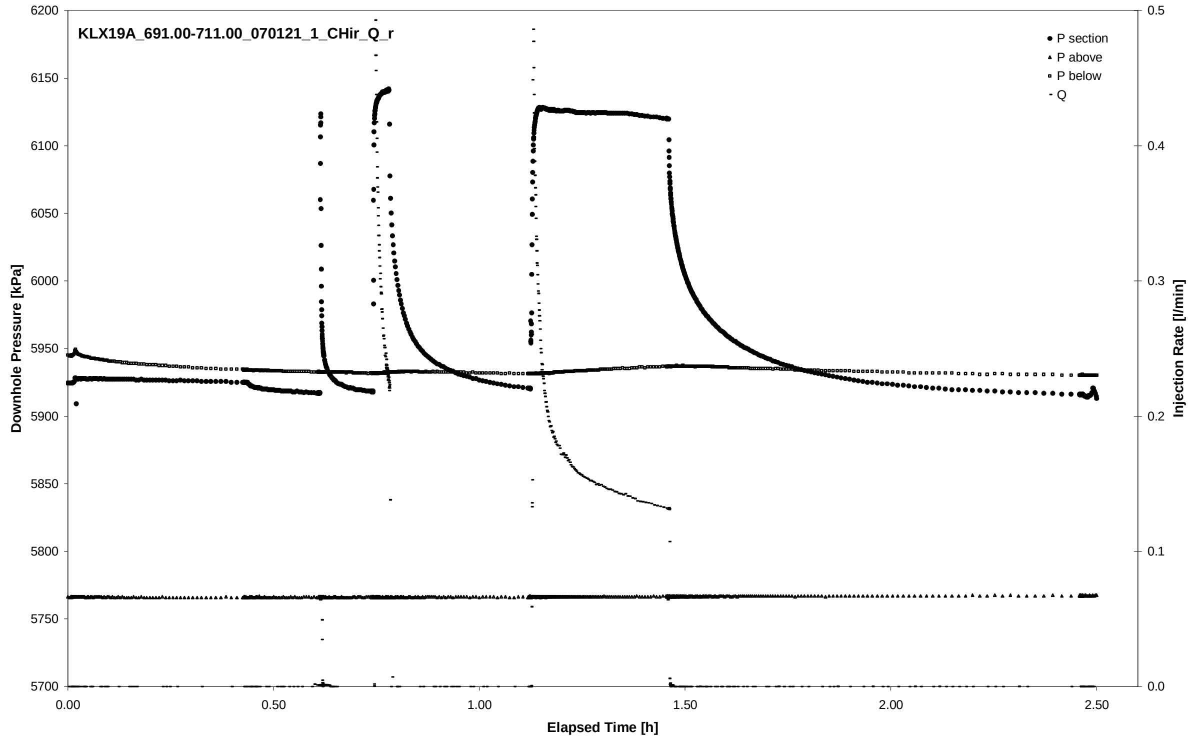


CHIR phase; HORNER match

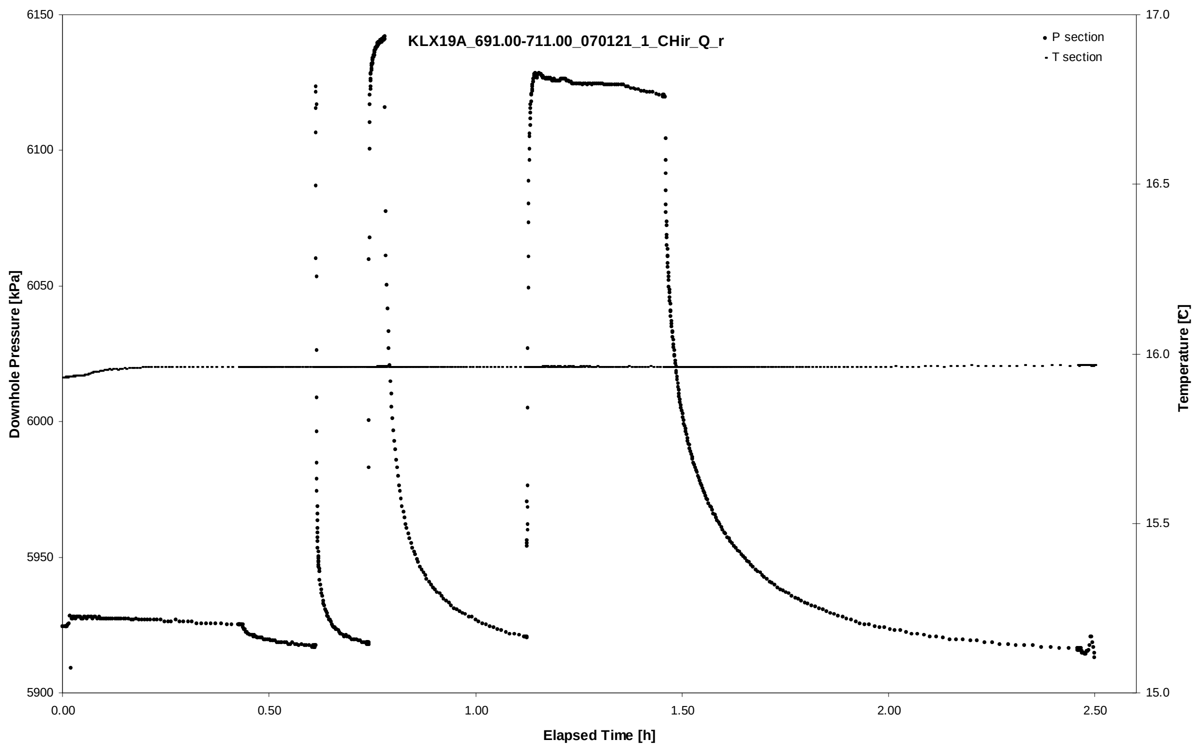
APPENDIX 2-32

Test 691.00 – 711.00 m

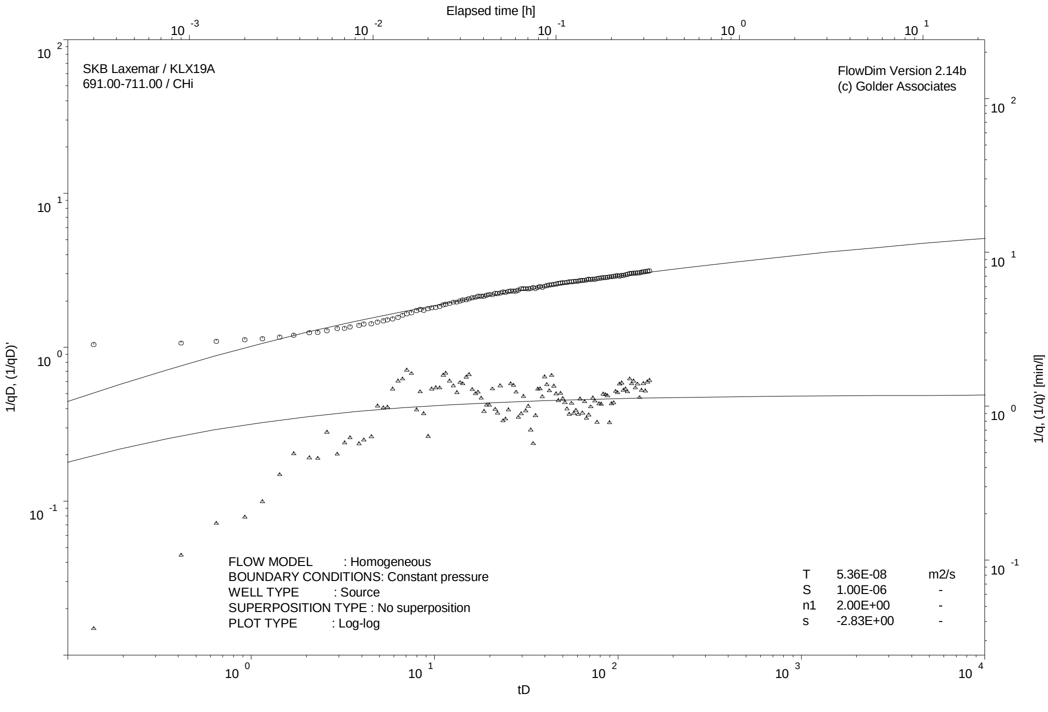
Analysis diagrams



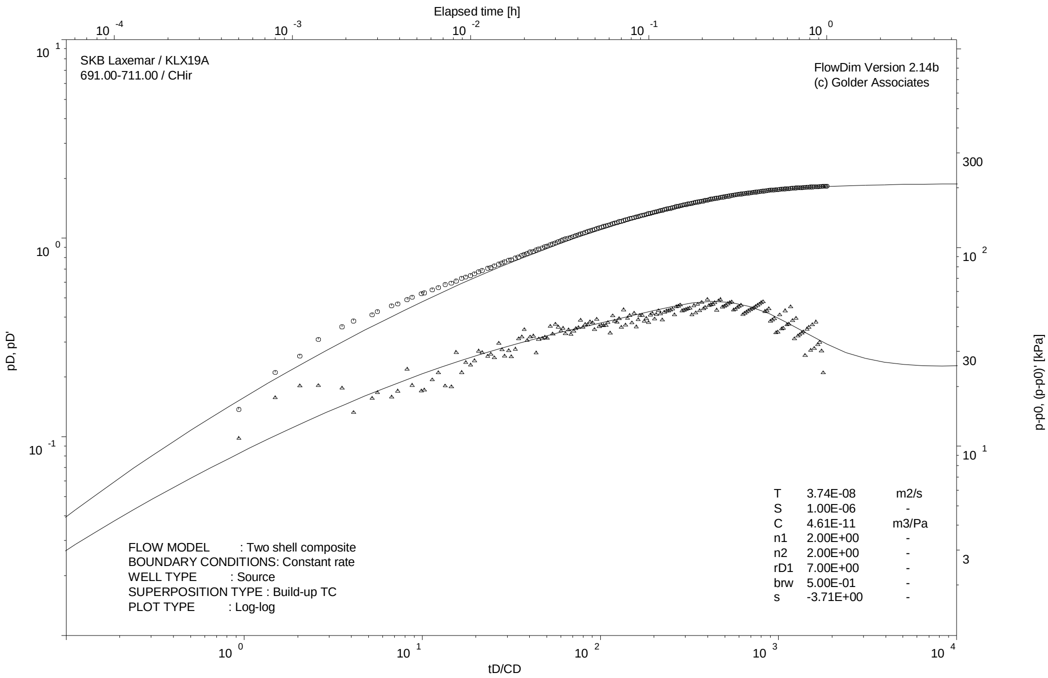
Pressure and flow rate vs. time; cartesian plot



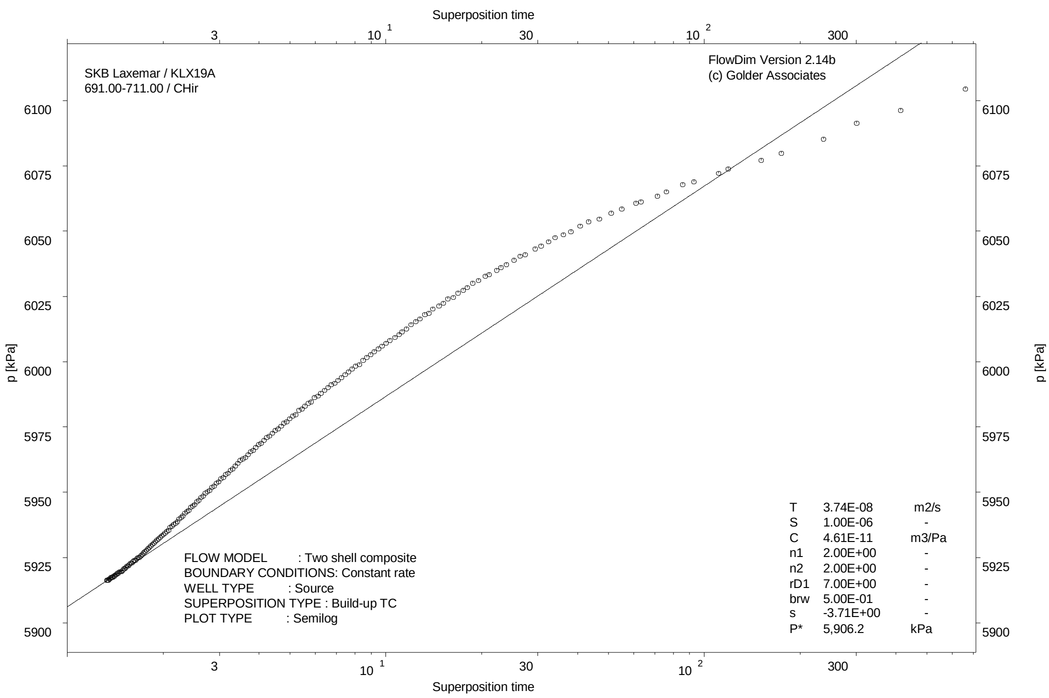
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

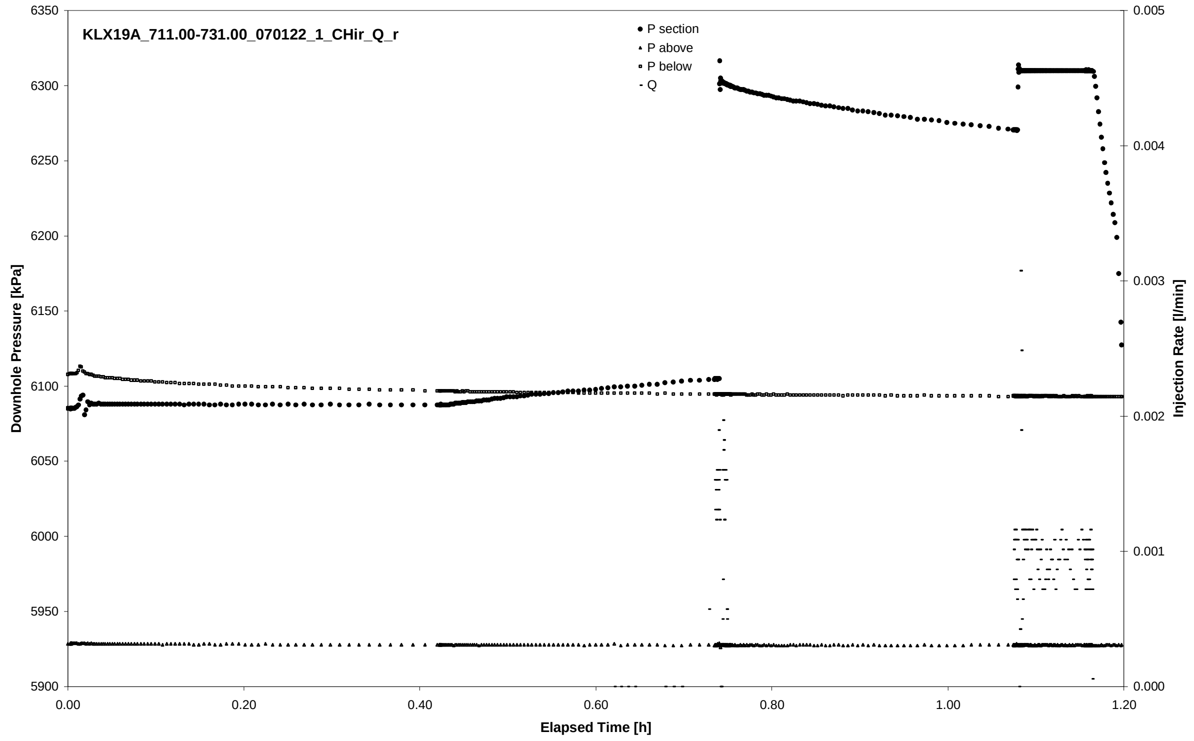


CHIR phase; HORNER match

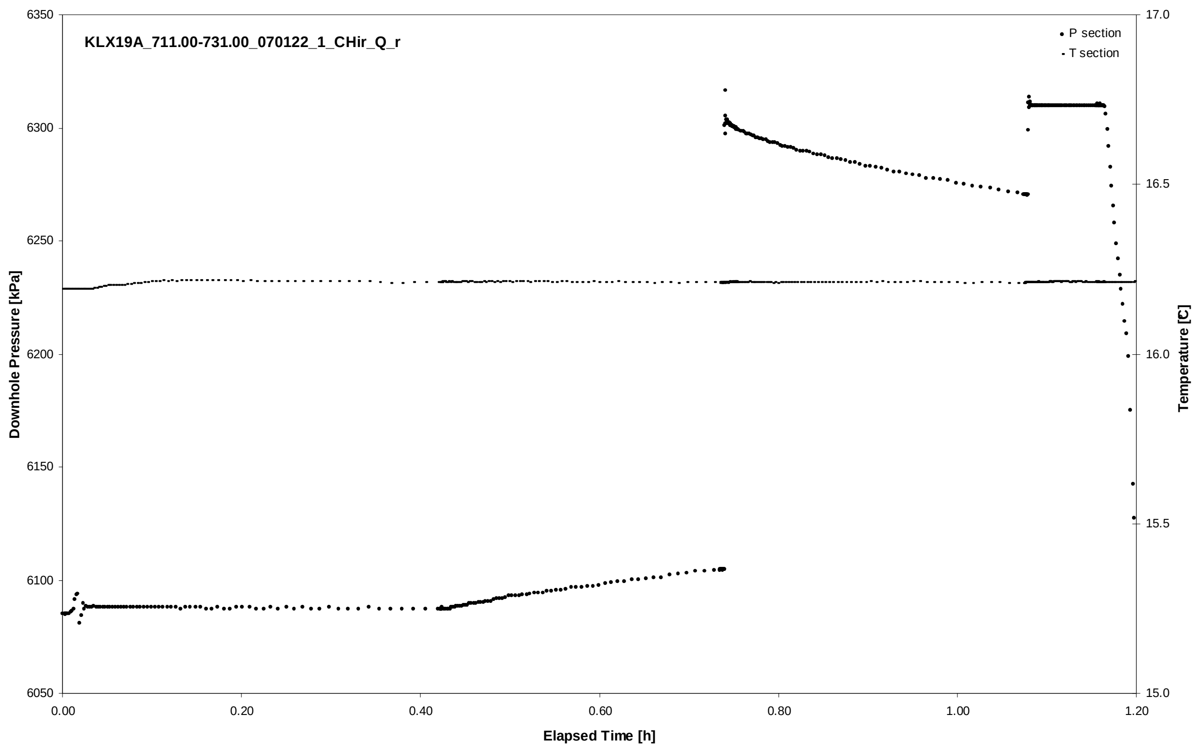
APPENDIX 2-33

Test 711.00 – 731.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

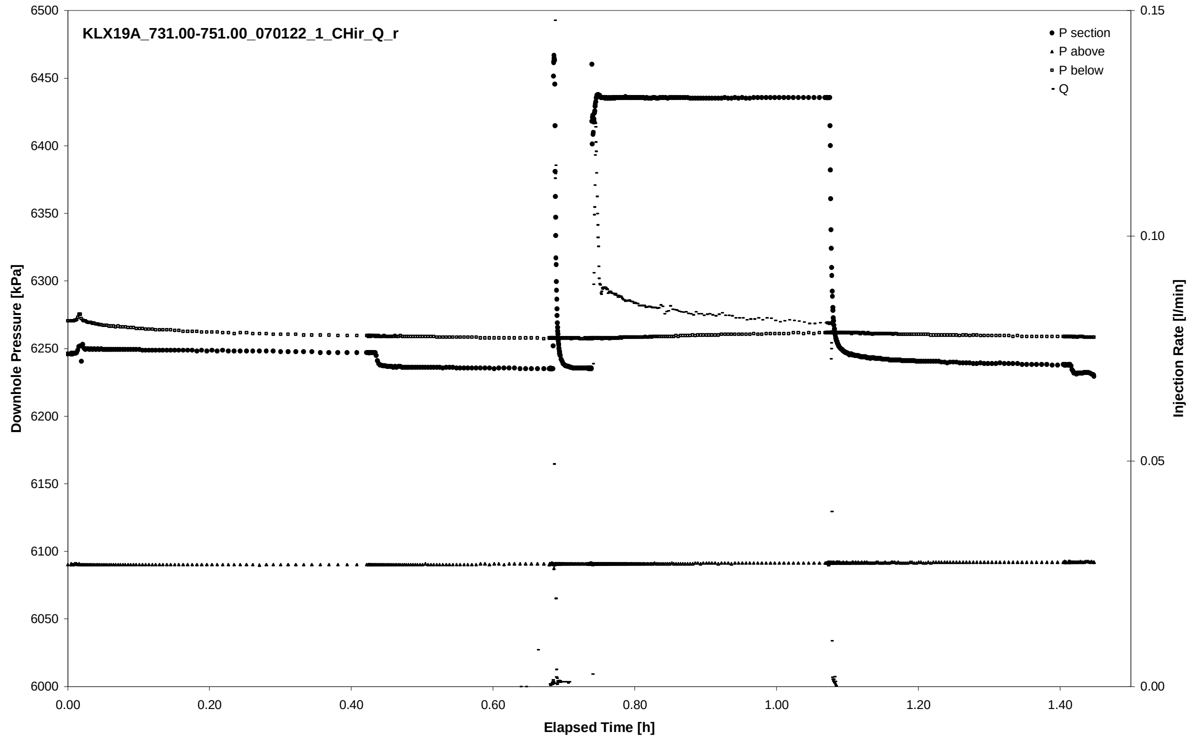
Not Analysed

CHIR phase; HORNER match

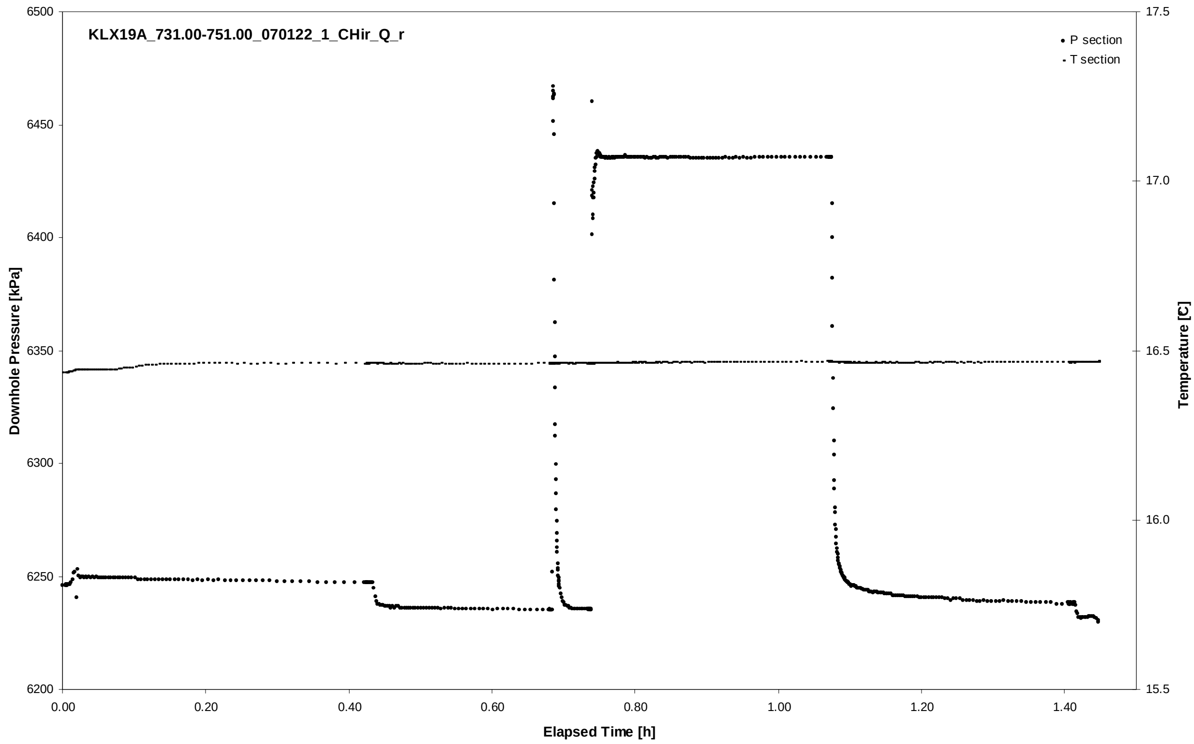
APPENDIX 2-34

Test 731.00 – 751.00 m

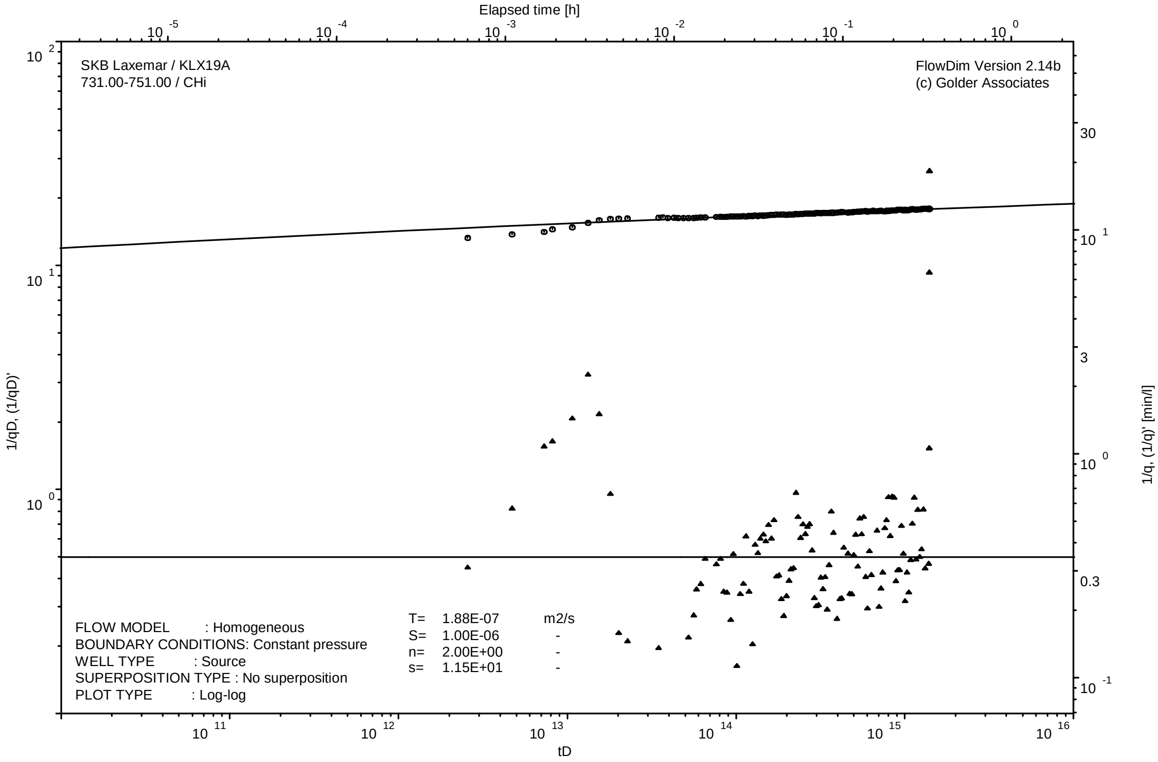
Analysis diagrams



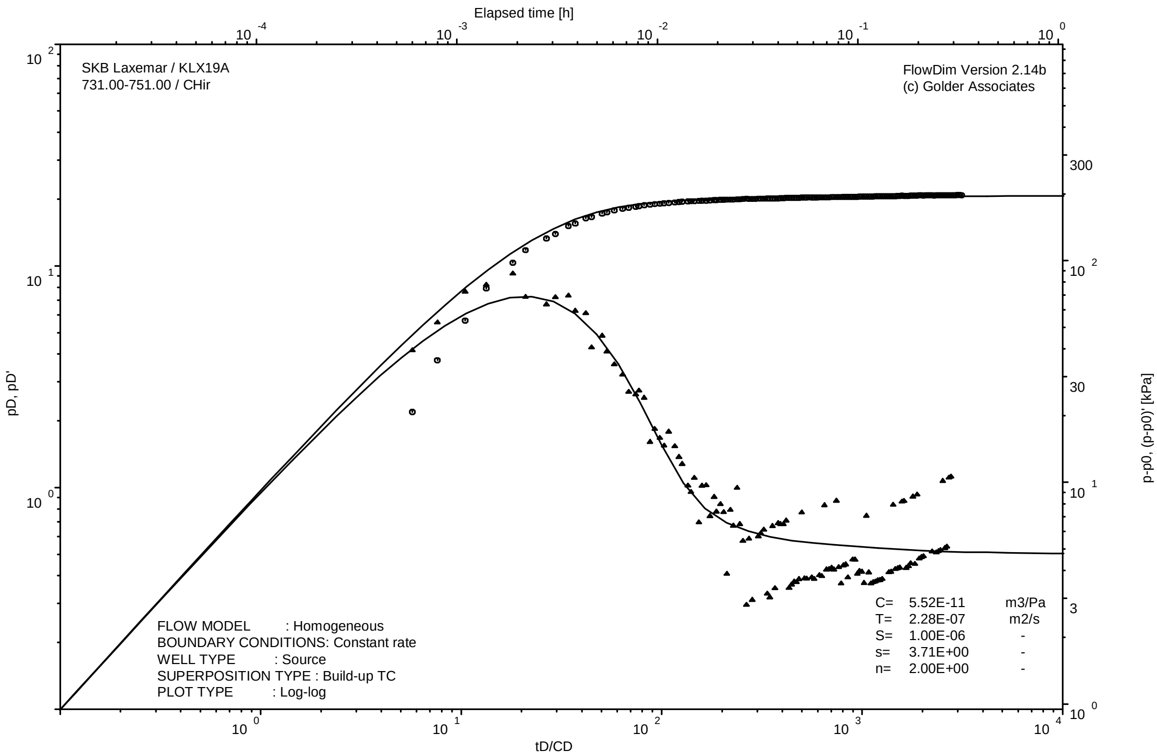
Pressure and flow rate vs. time; cartesian plot



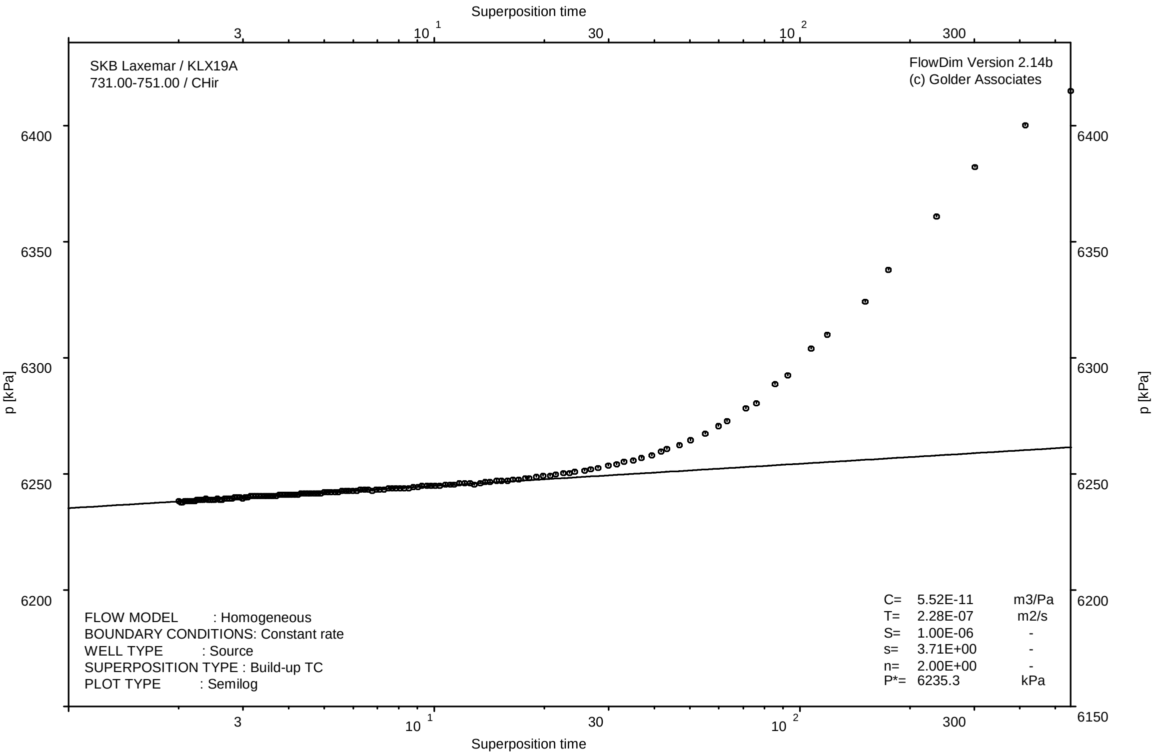
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

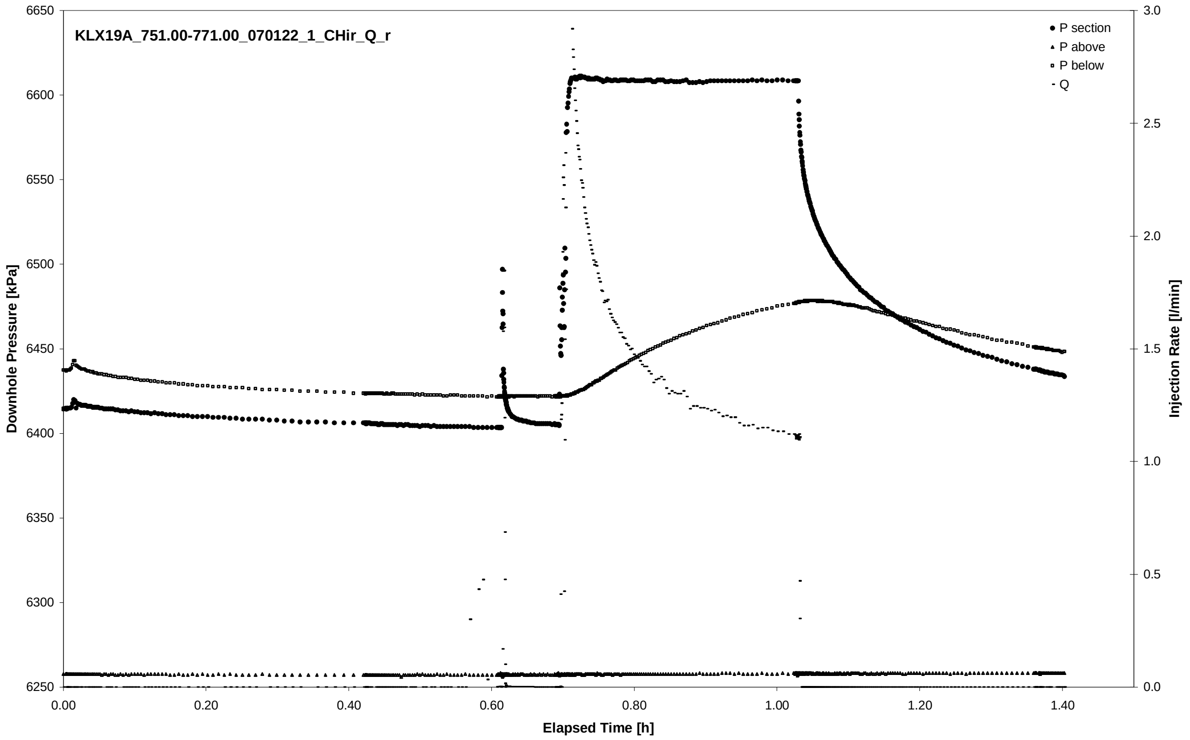


CHIR phase; HORNER match

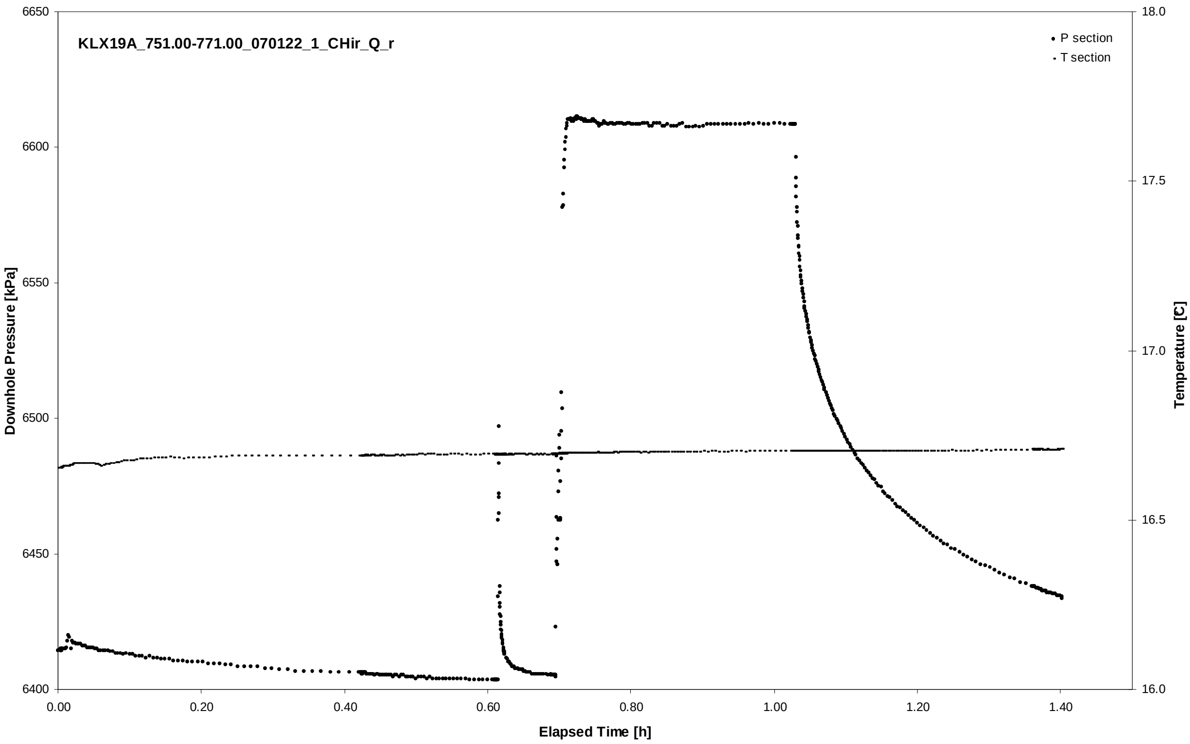
APPENDIX 2-35

Test 751.00 – 771.00 m

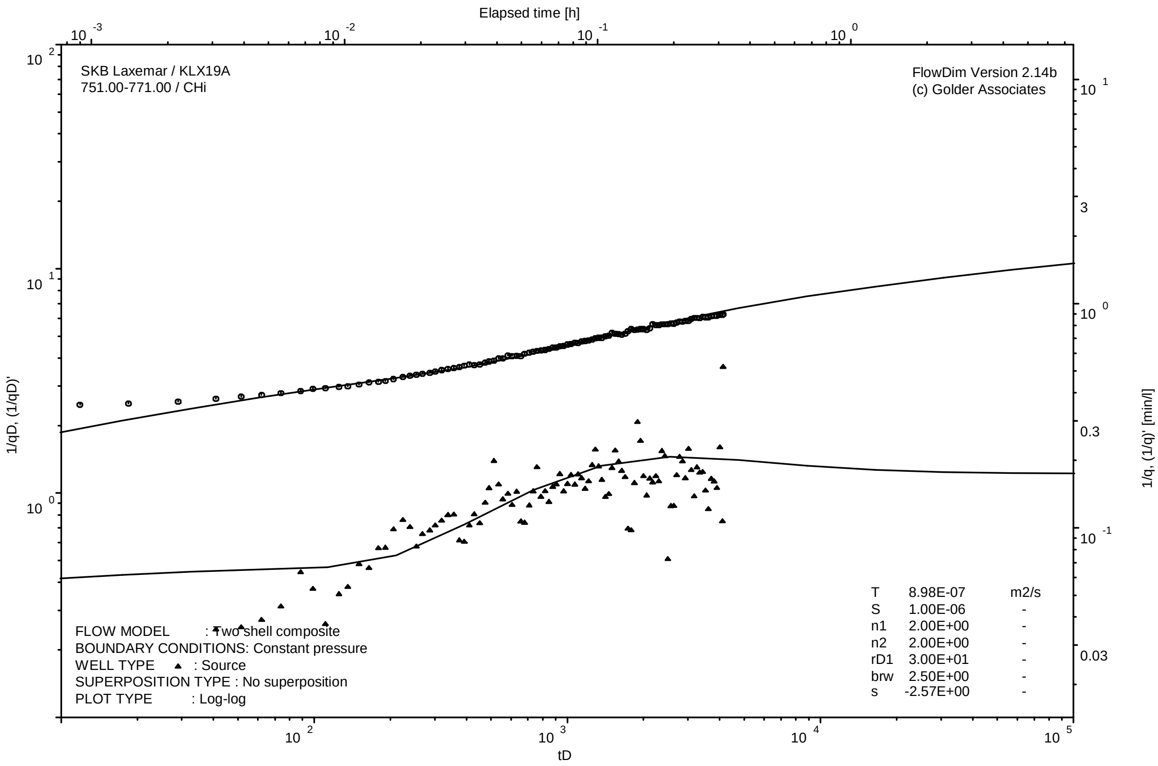
Analysis diagrams



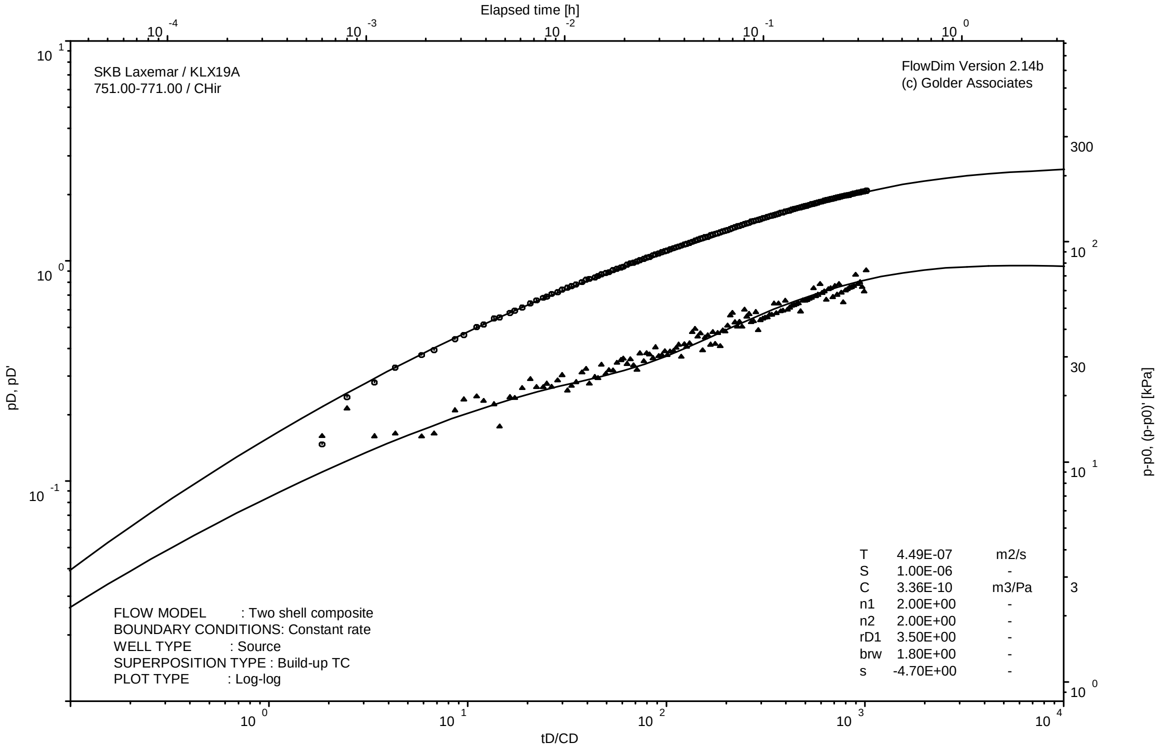
Pressure and flow rate vs. time; cartesian plot



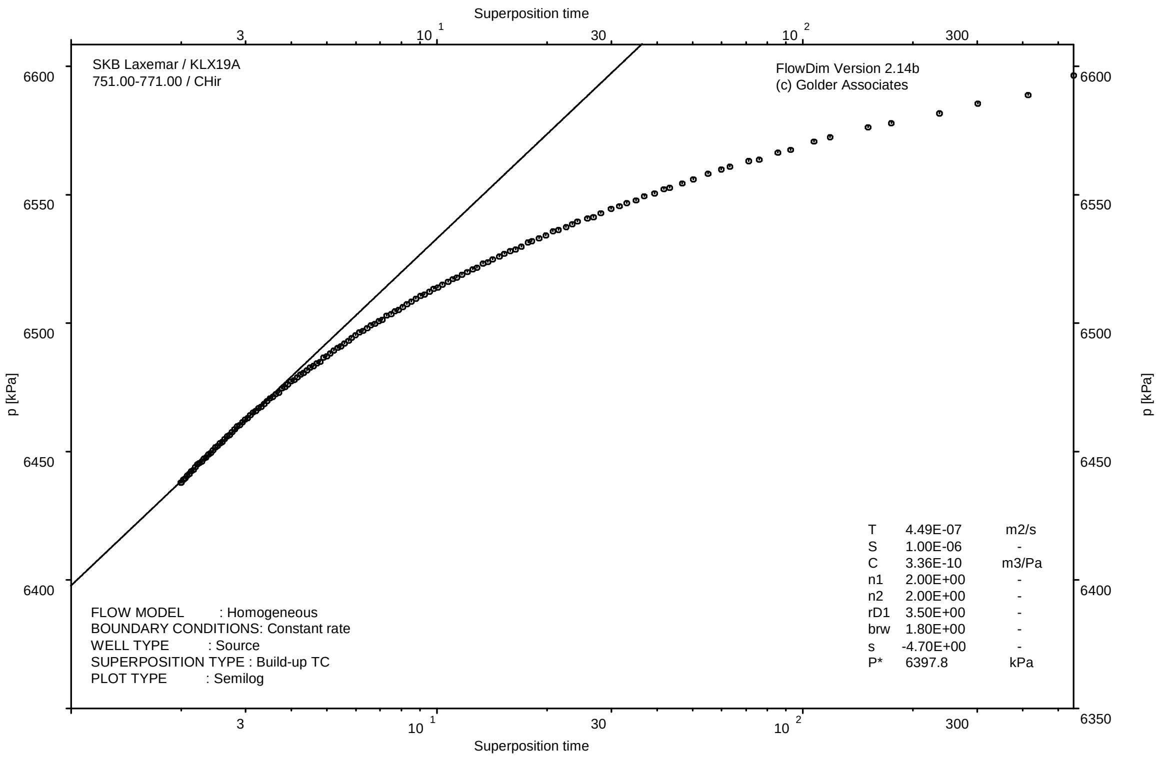
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

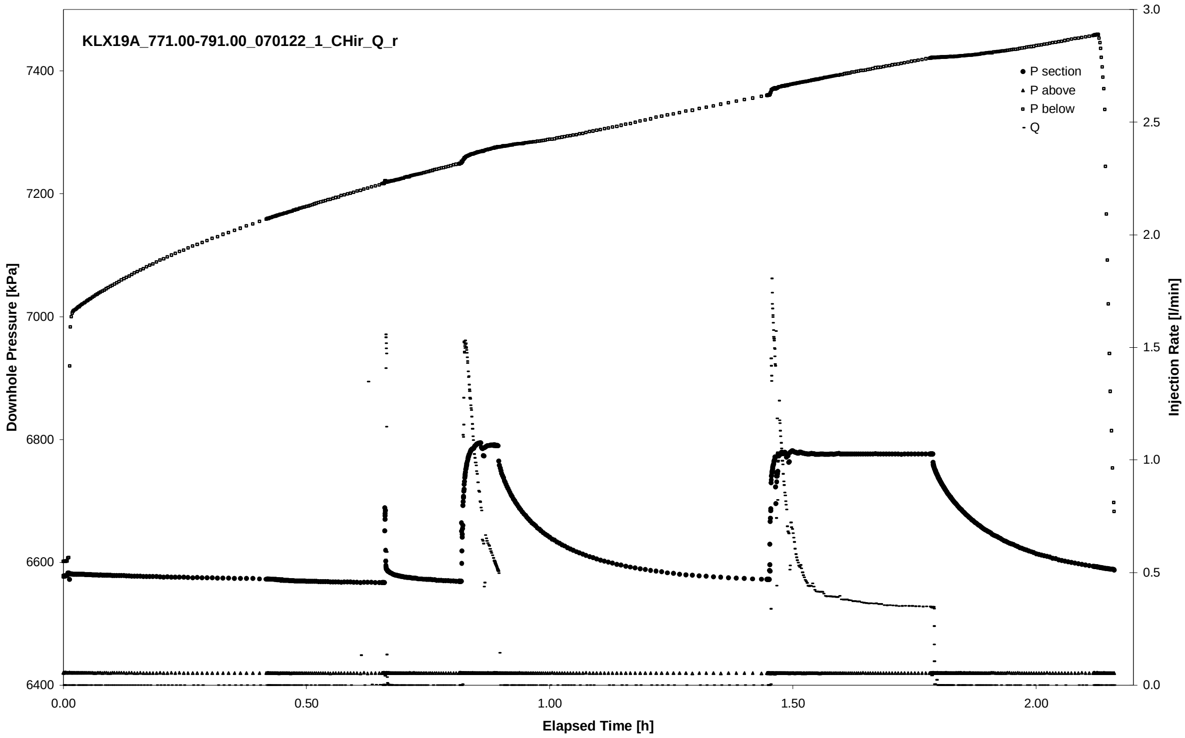


CHIR phase; HORNER match

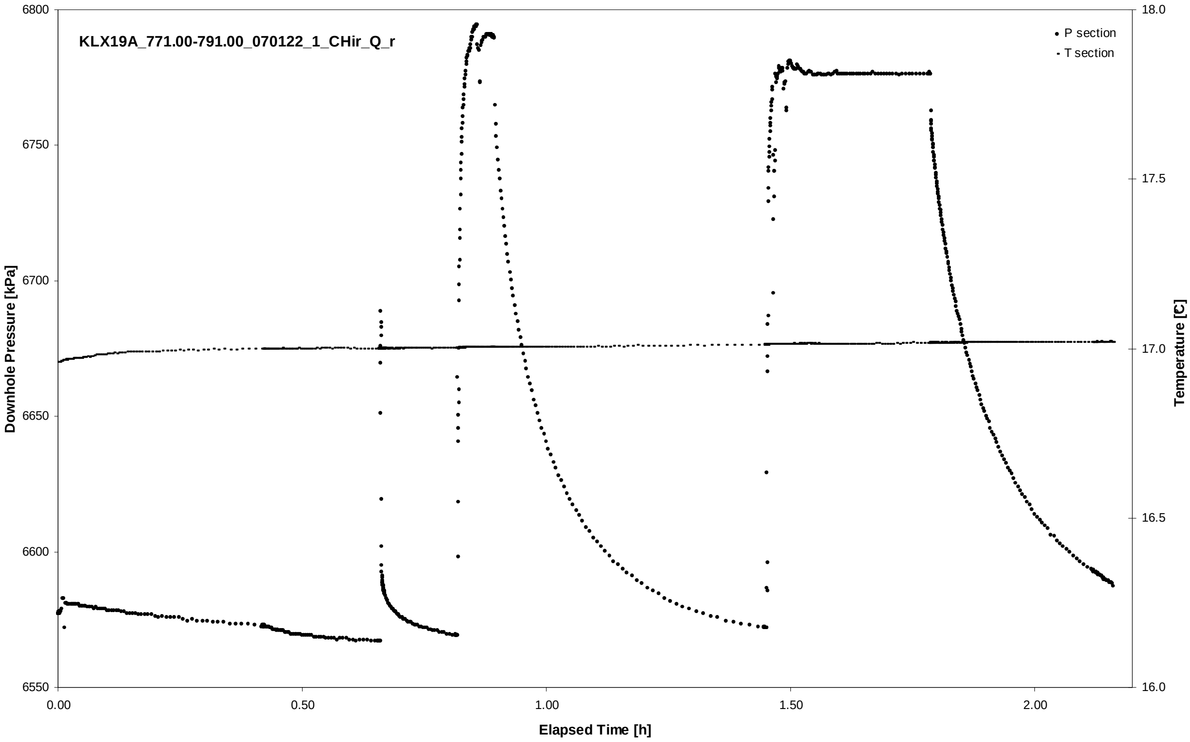
APPENDIX 2-36

Test 771.00 – 791.00 m

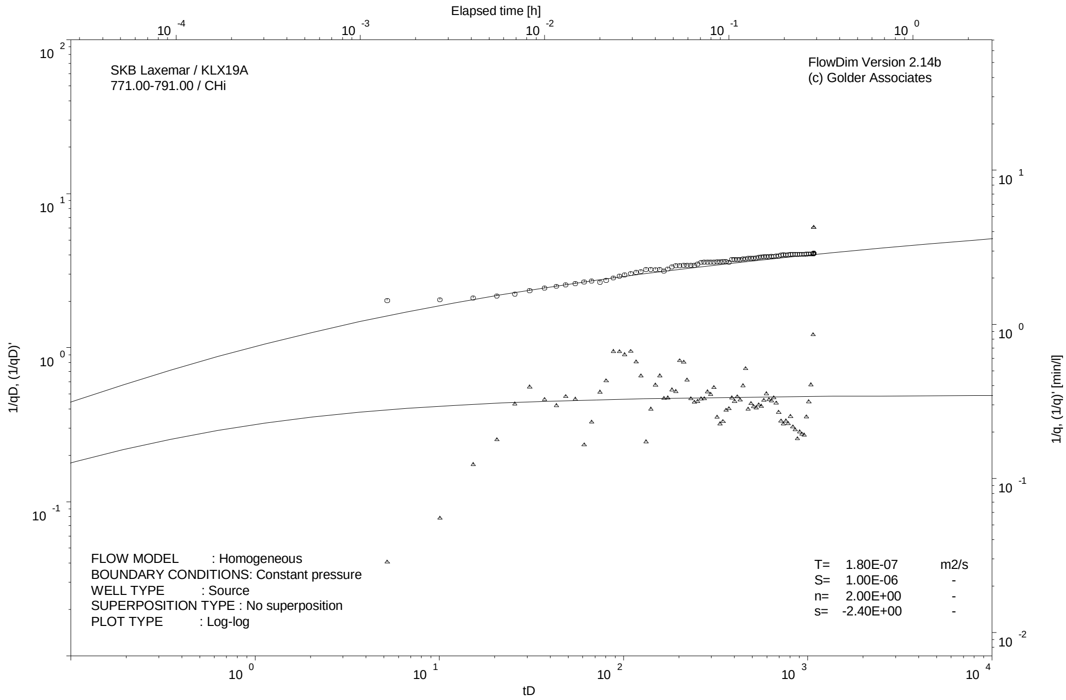
Analysis diagrams



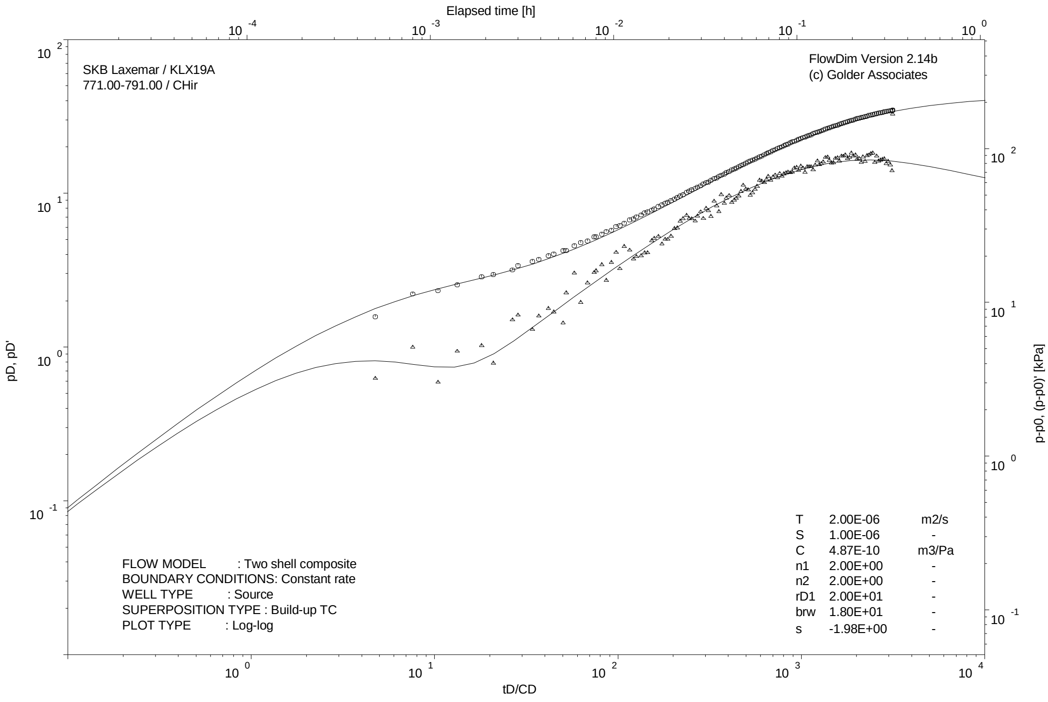
Pressure and flow rate vs. time; cartesian plot



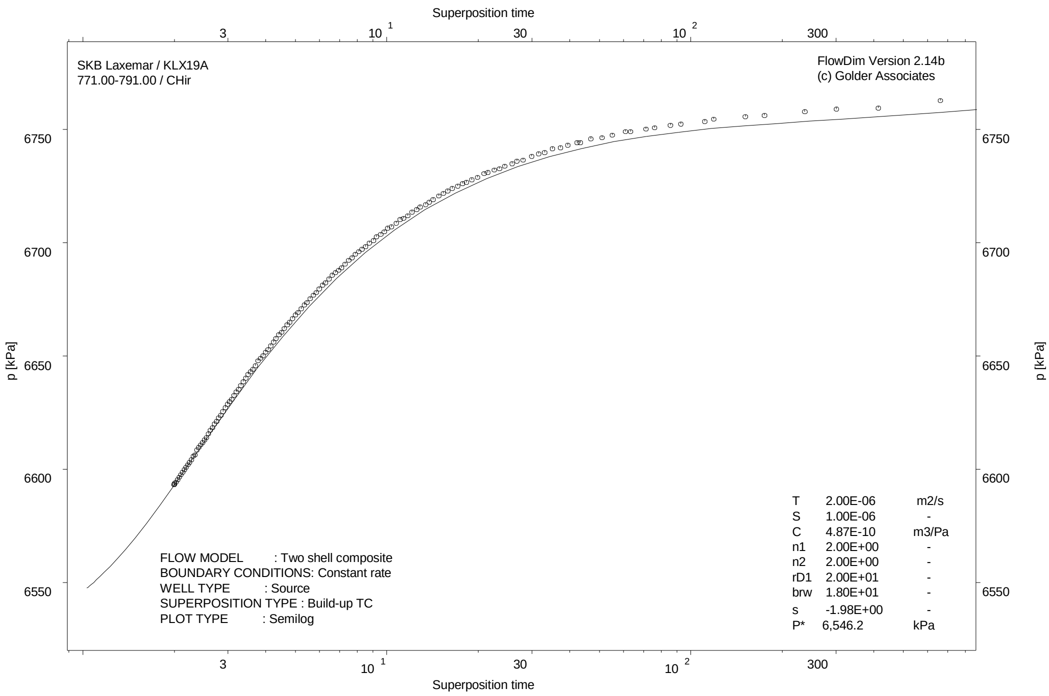
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

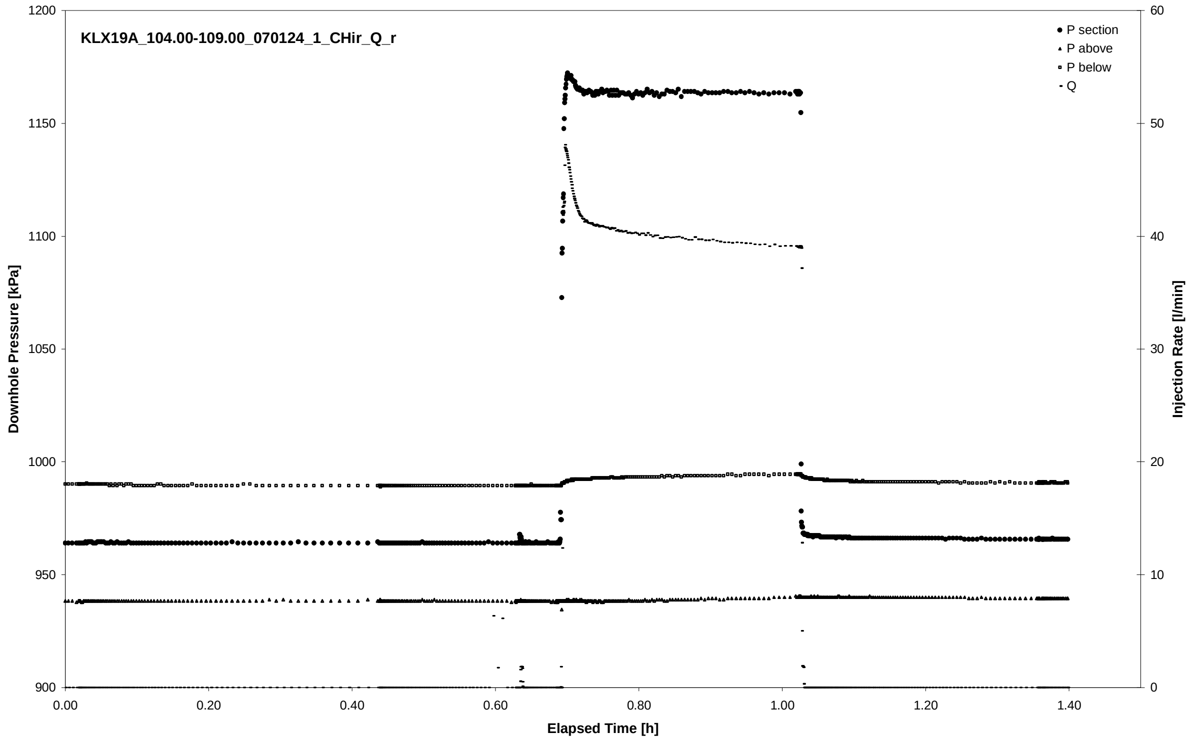


CHIR phase; HORNER match

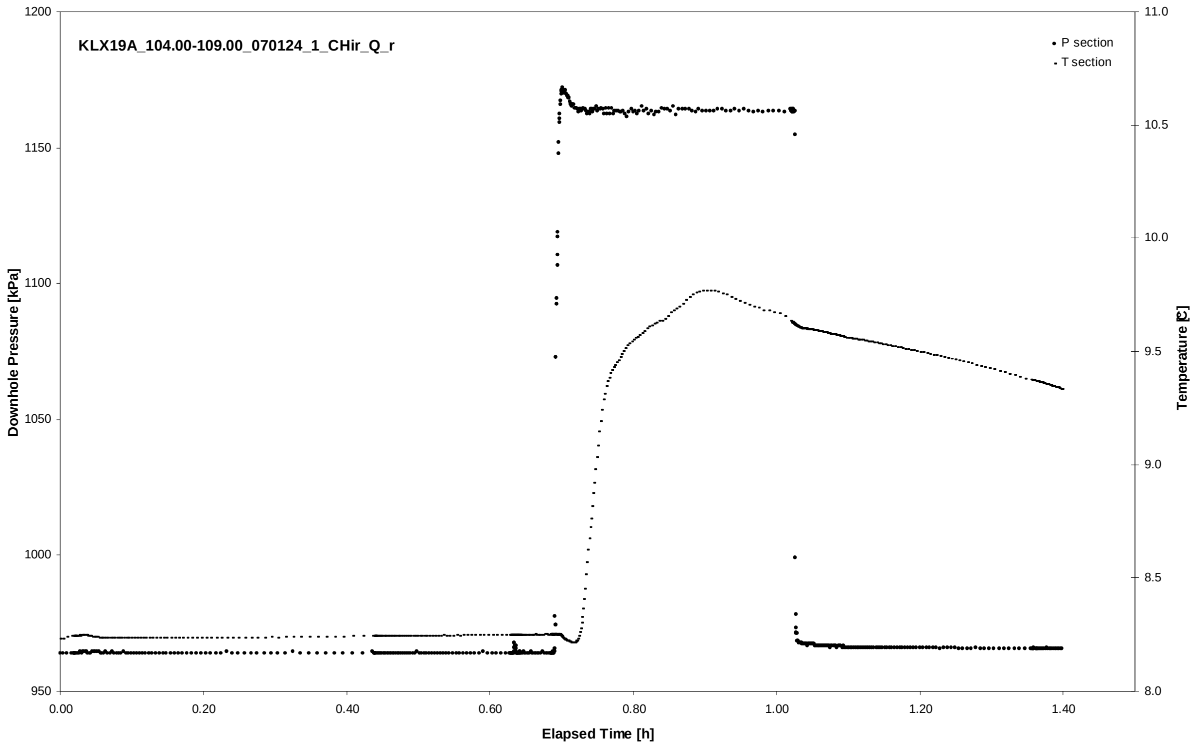
APPENDIX 2-37

Test 104.00 – 109.00 m

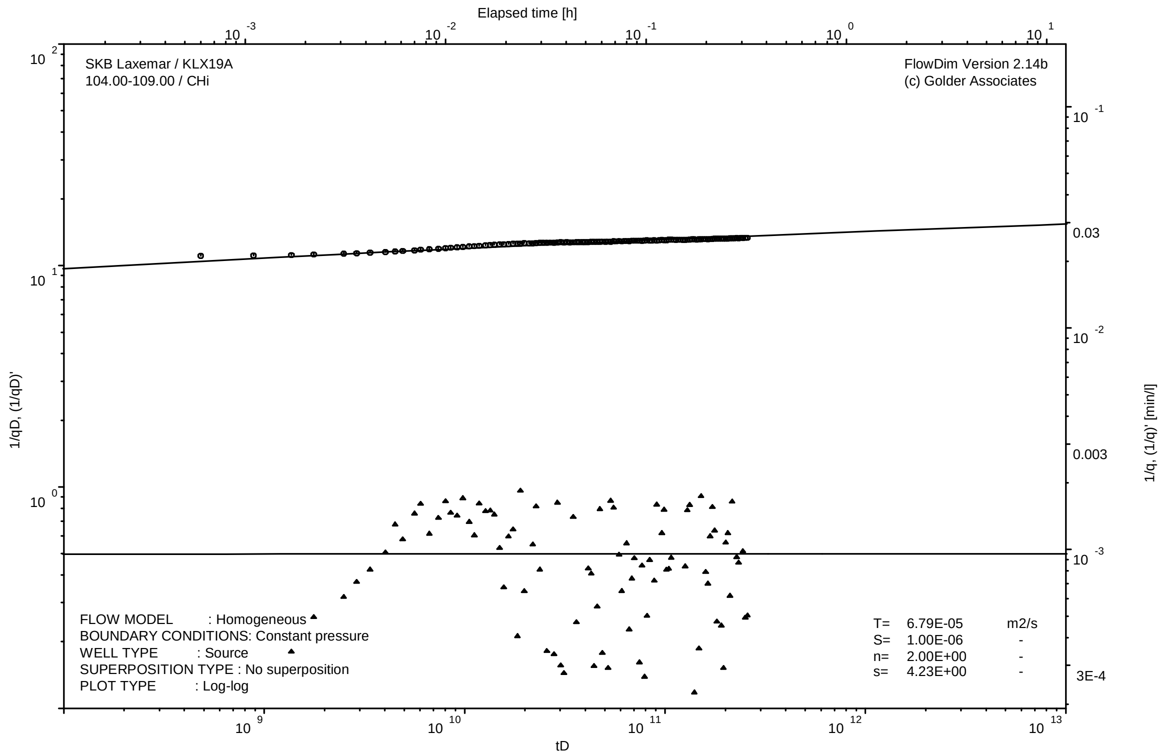
Analysis diagrams



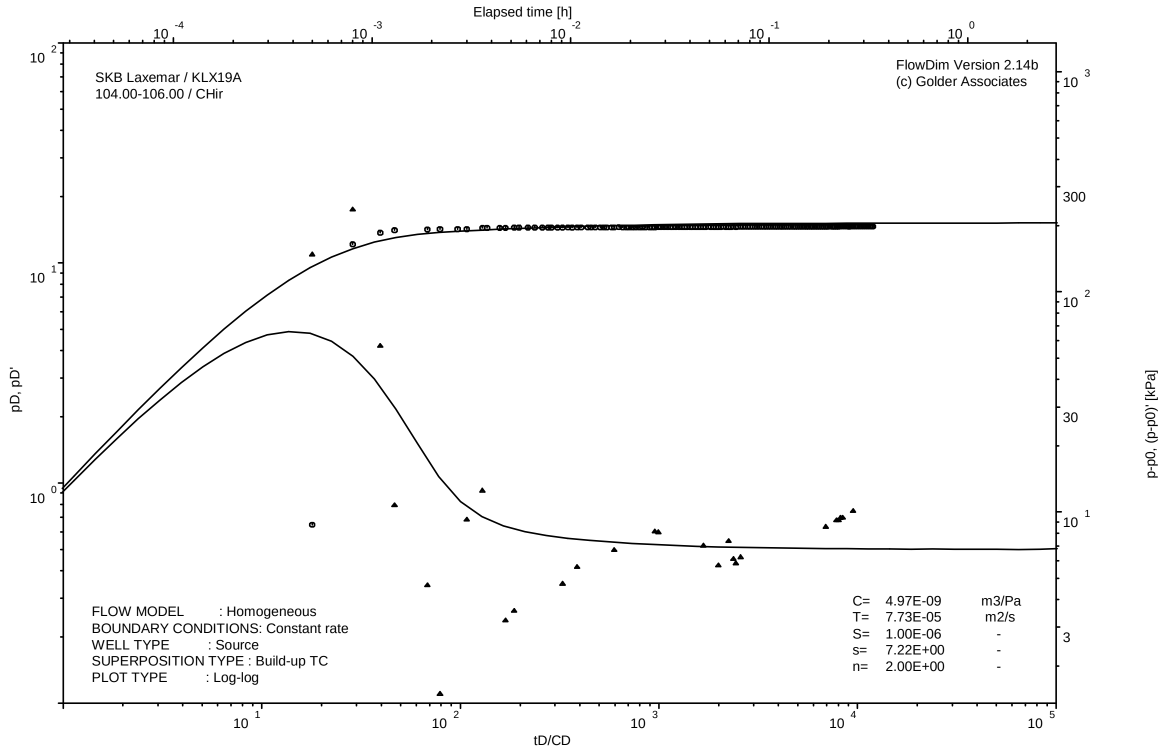
Pressure and flow rate vs. time; cartesian plot



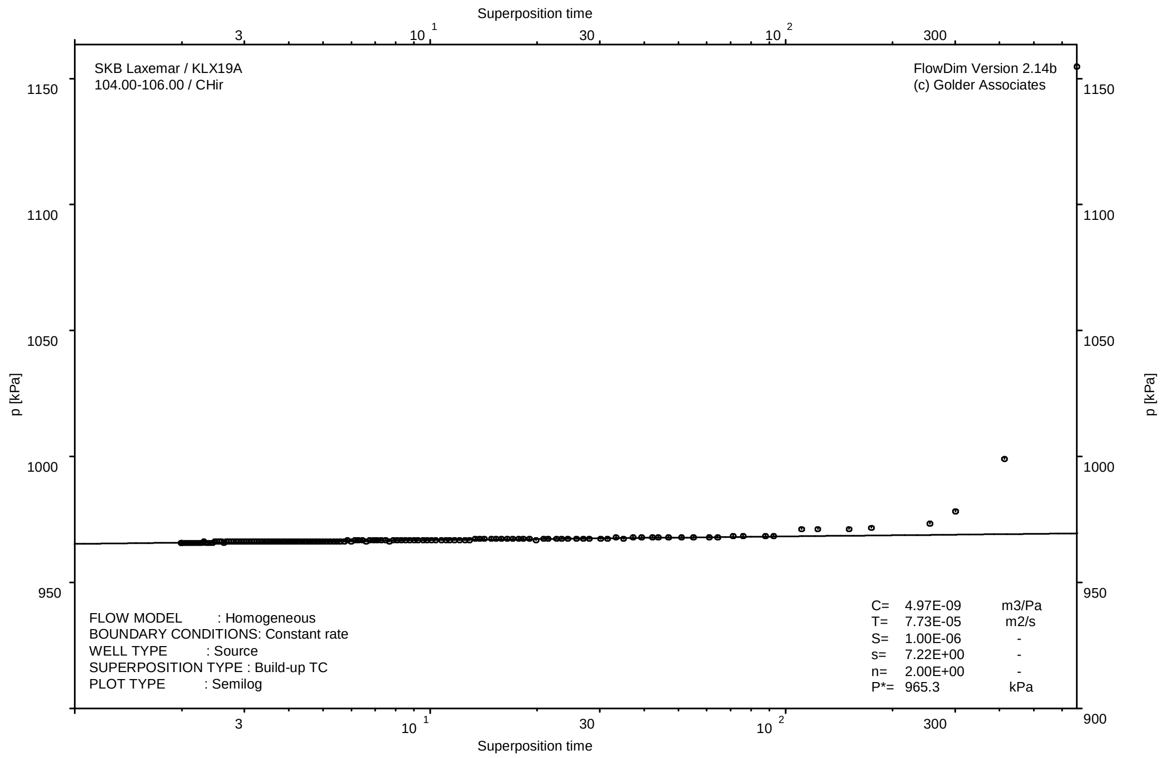
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

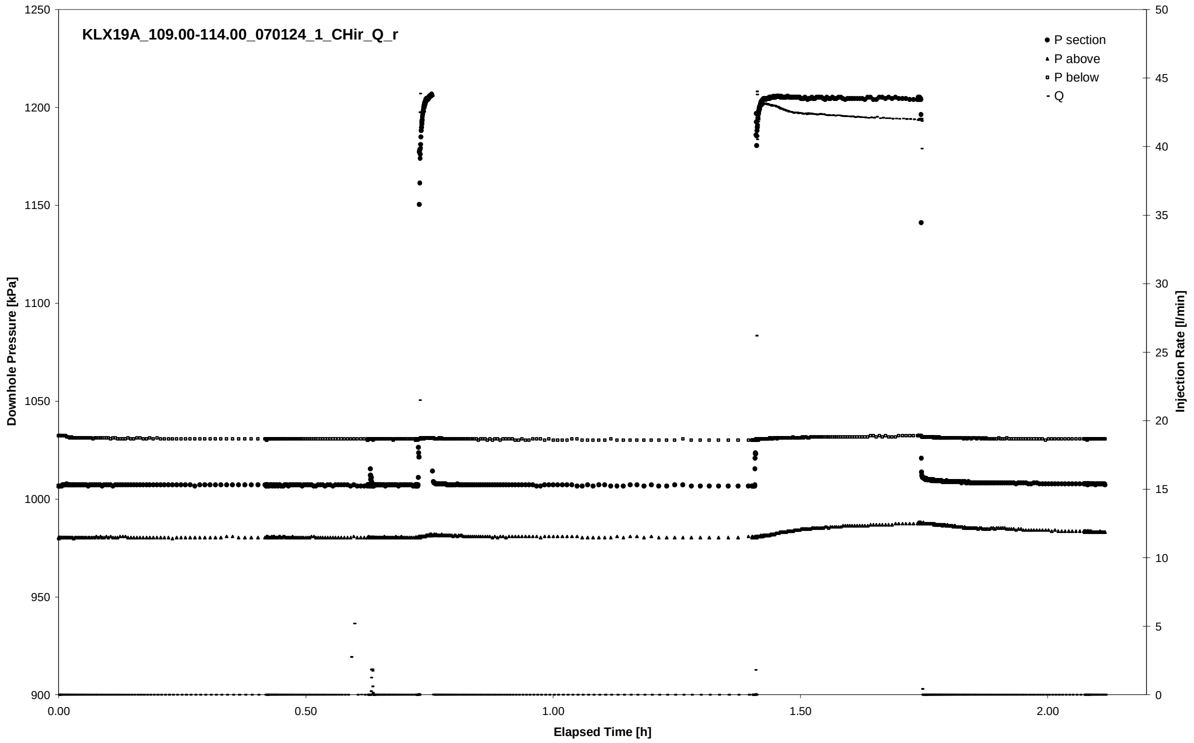


CHIR phase; HORNER match

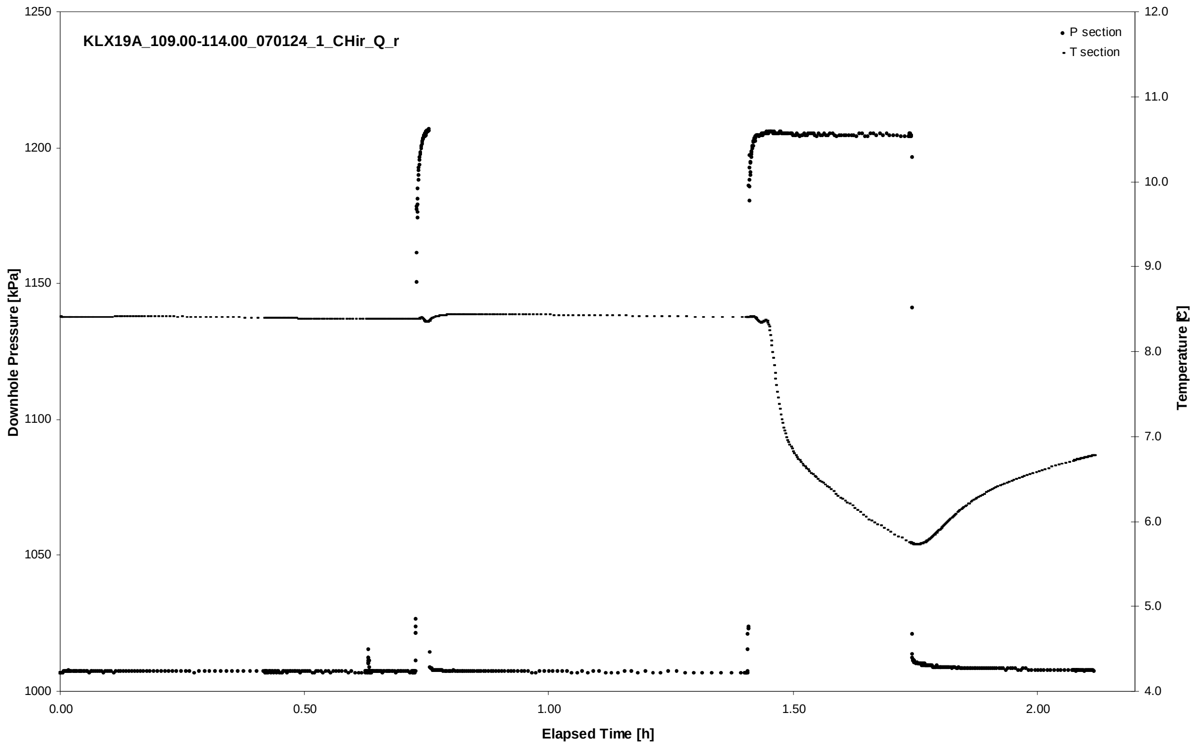
APPENDIX 2-38

Test 109.00 – 114.00 m

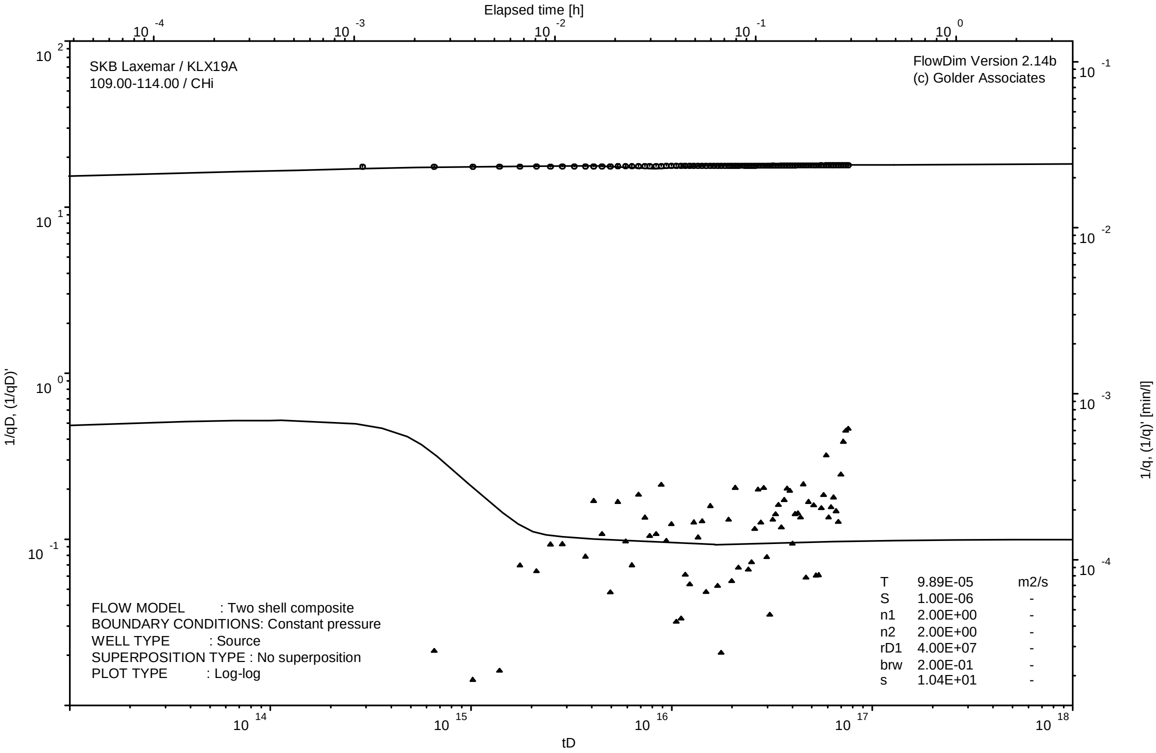
Analysis diagrams



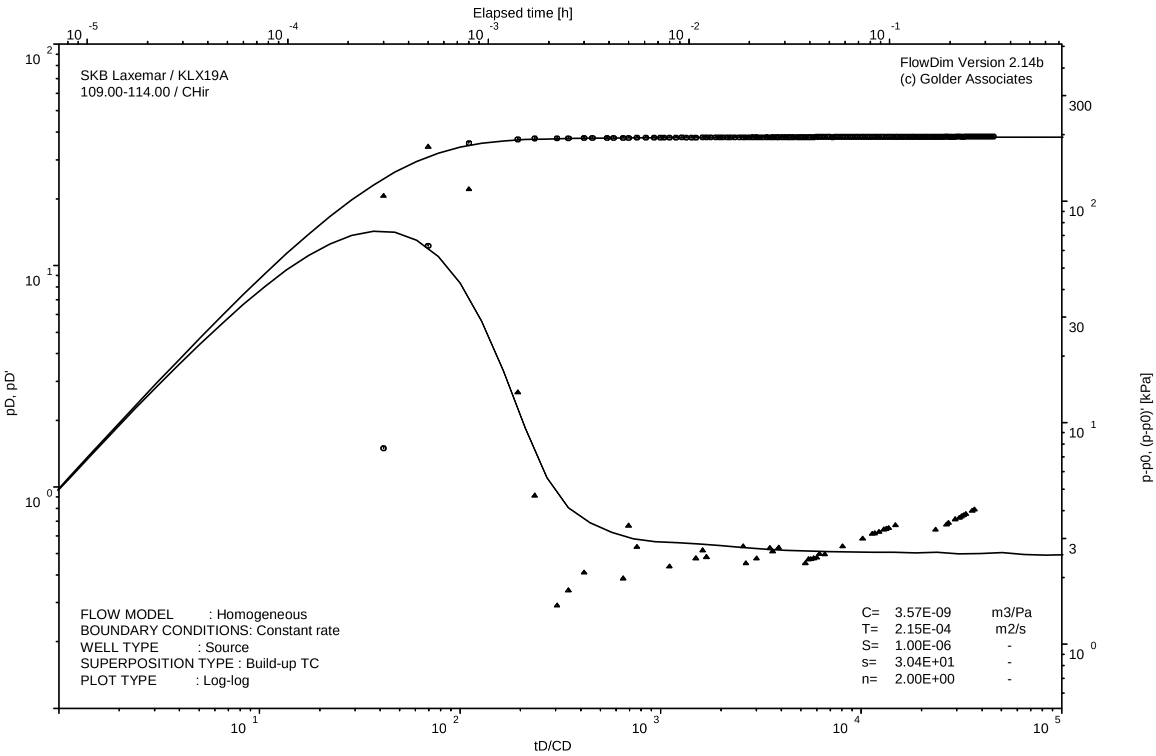
Pressure and flow rate vs. time; cartesian plot



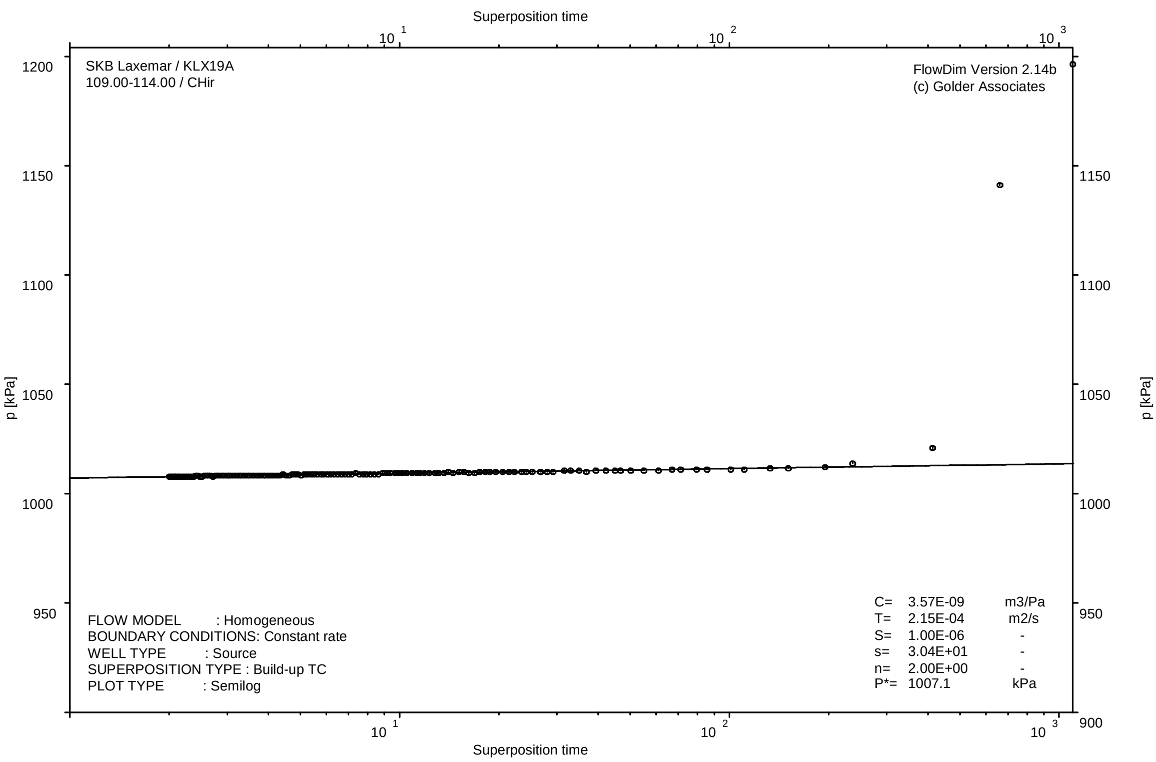
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

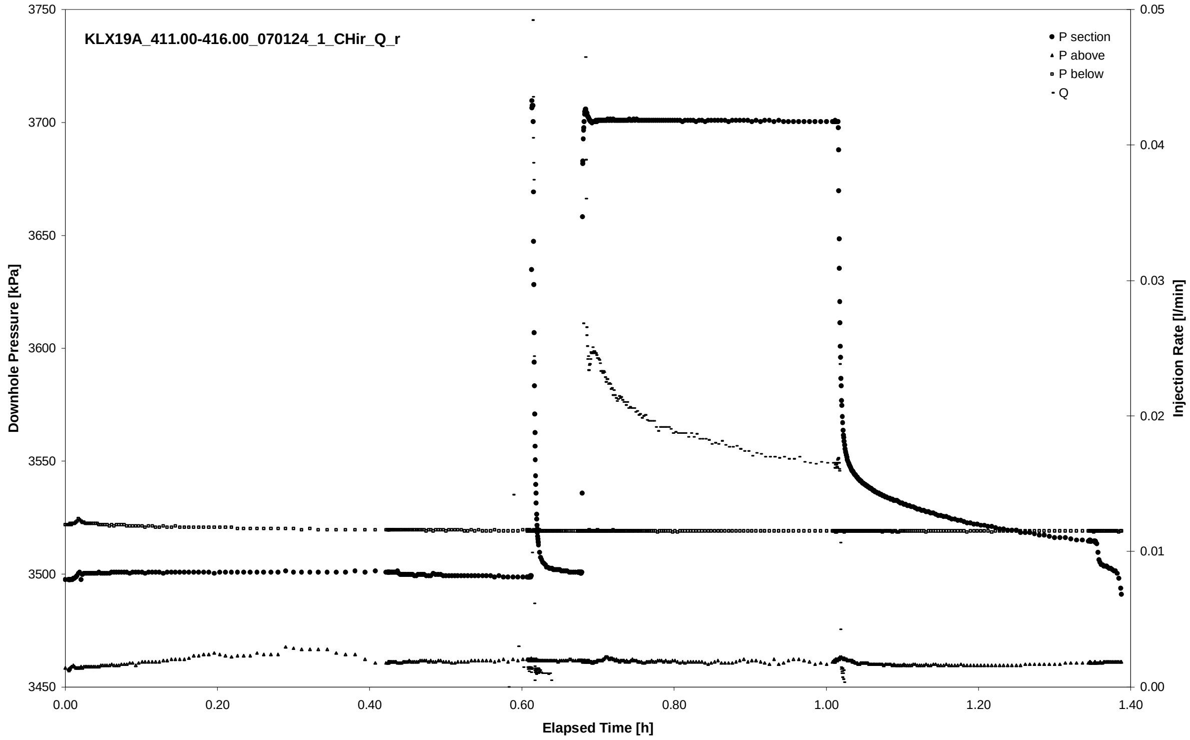


CHIR phase; HORNER match

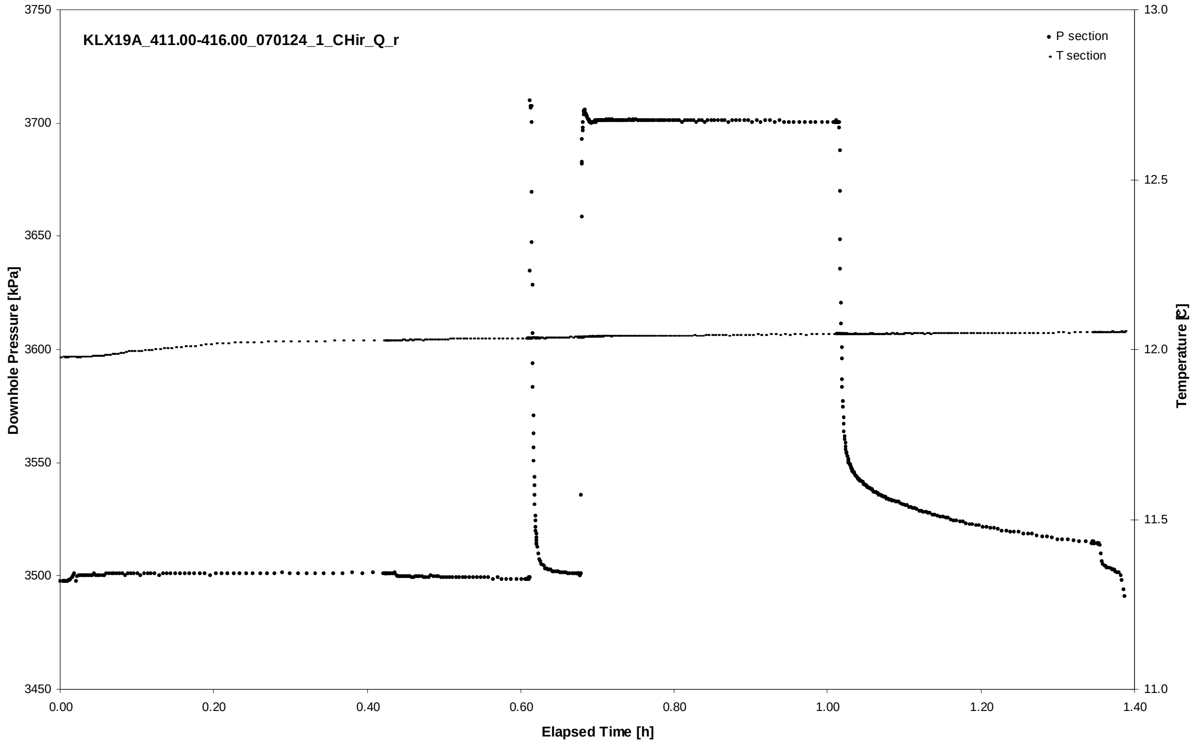
APPENDIX 2-39

Test 411.00 – 416.00 m

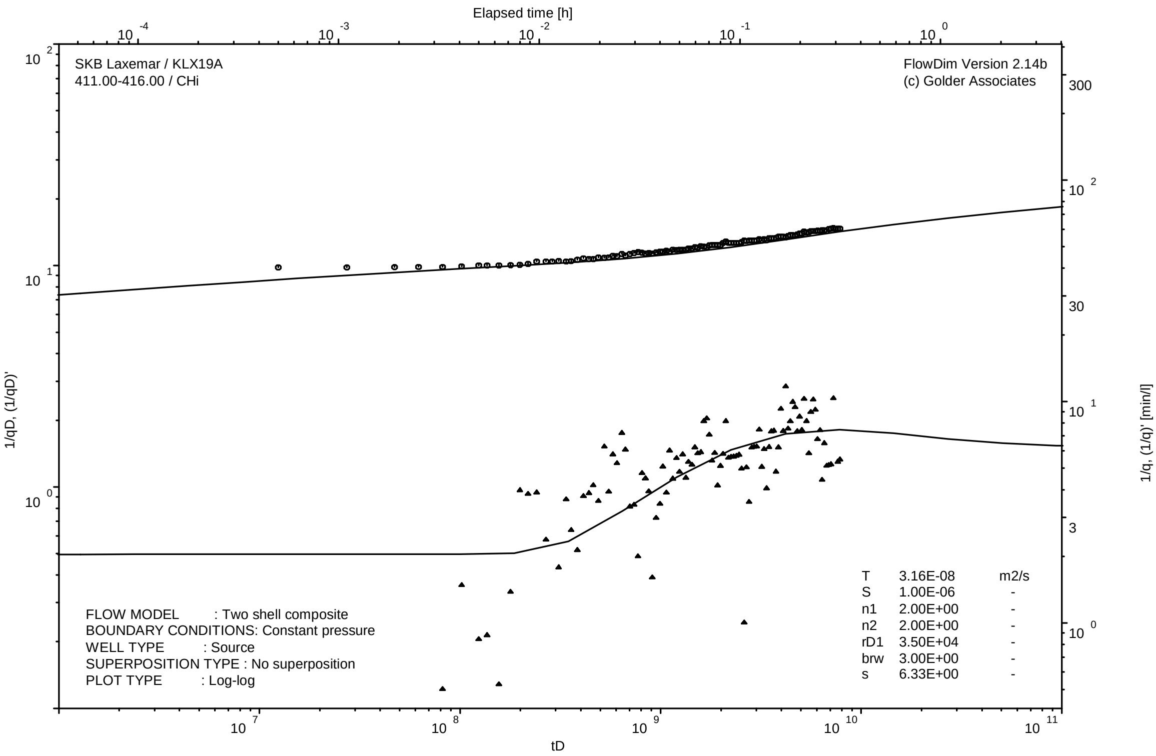
Analysis diagrams



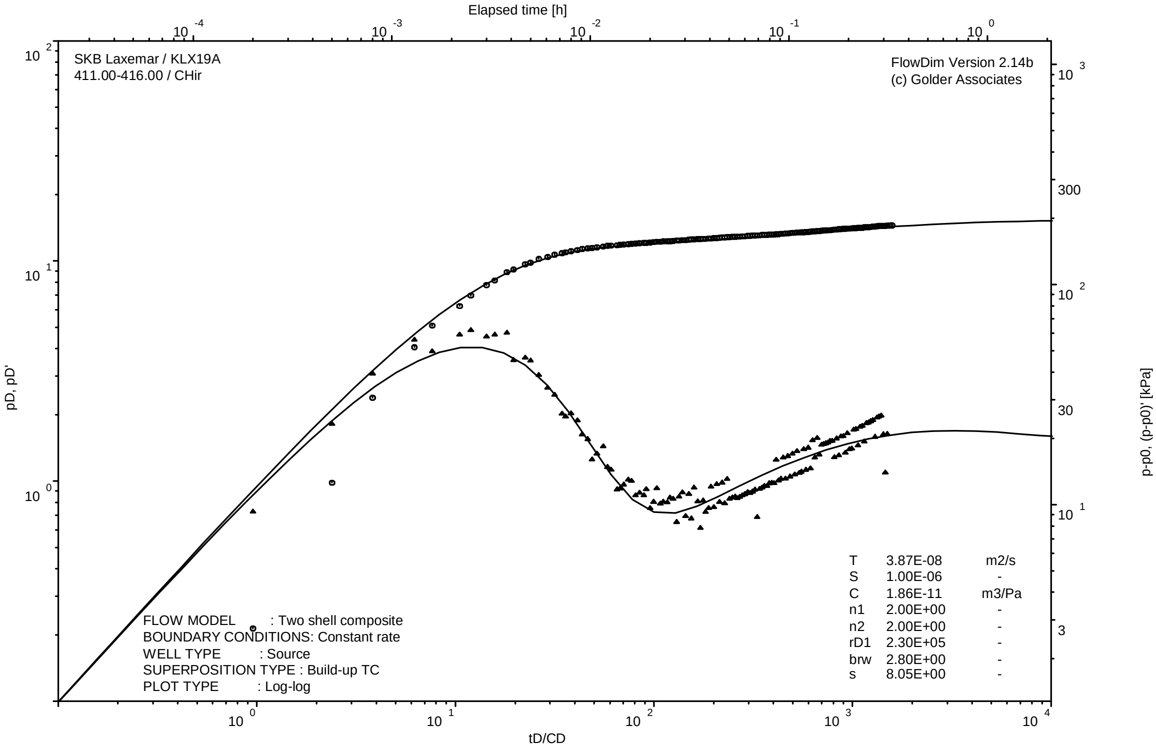
Pressure and flow rate vs. time; cartesian plot



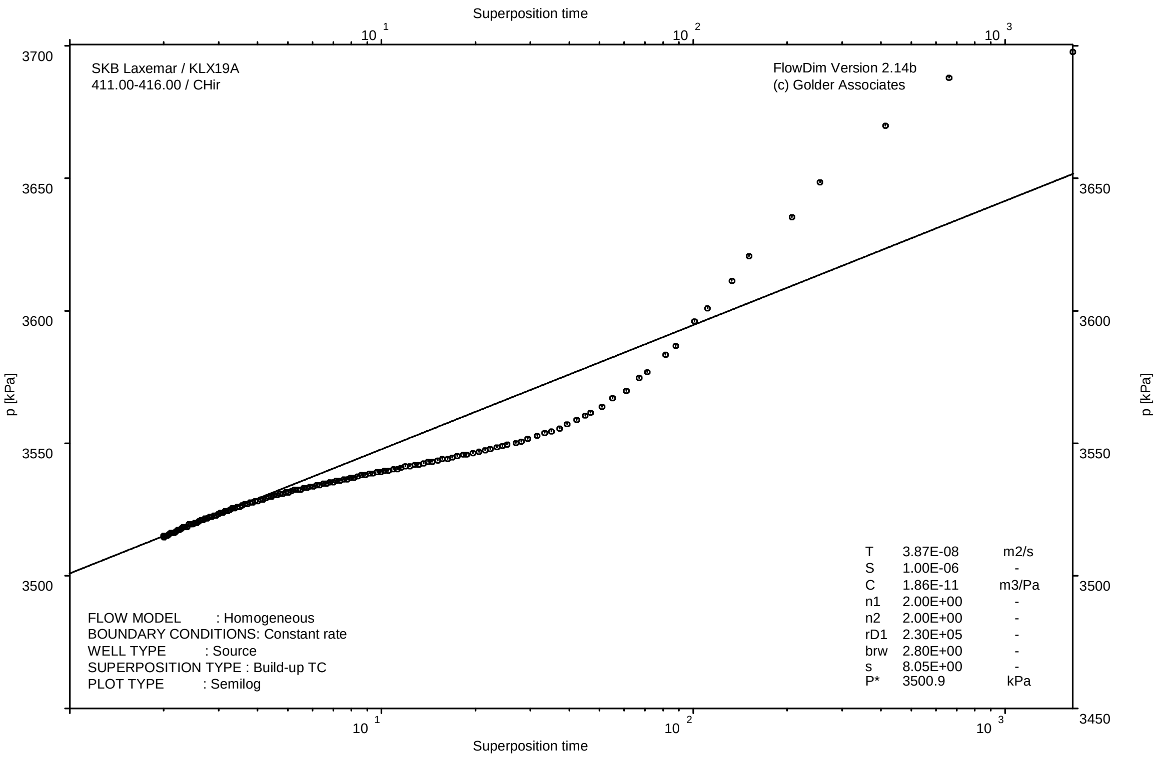
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

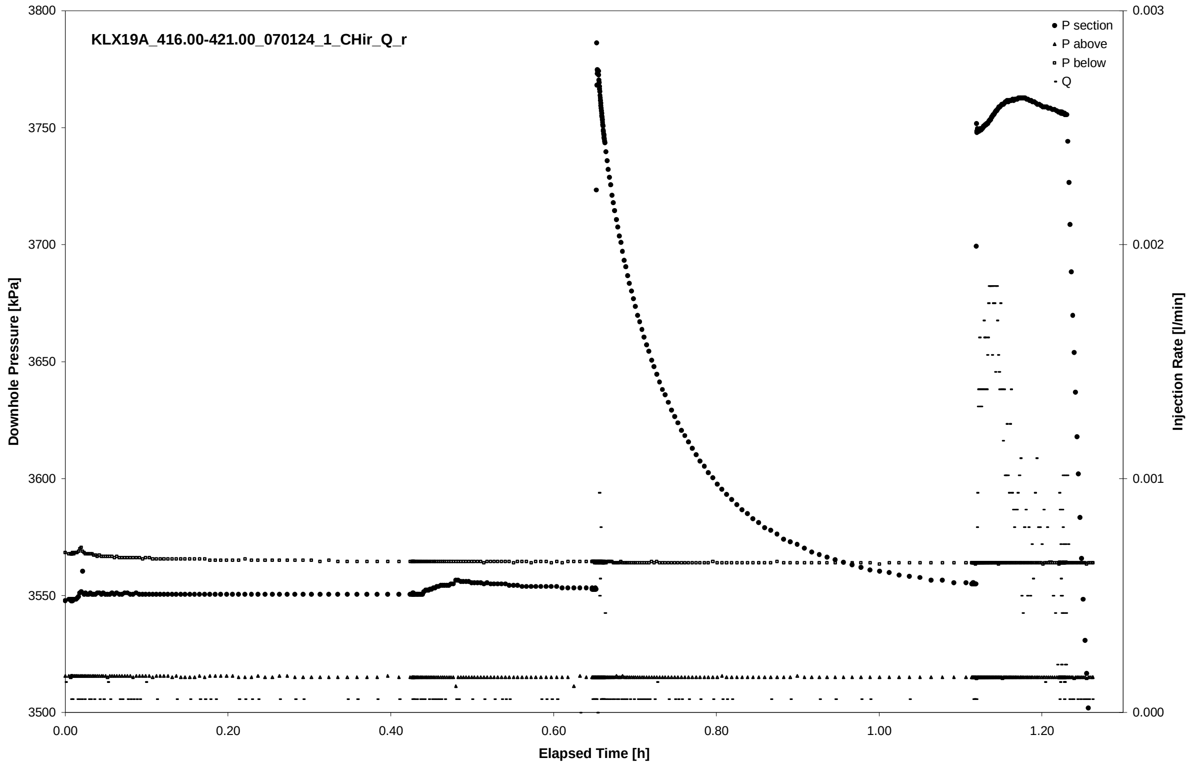


CHIR phase; HORNER match

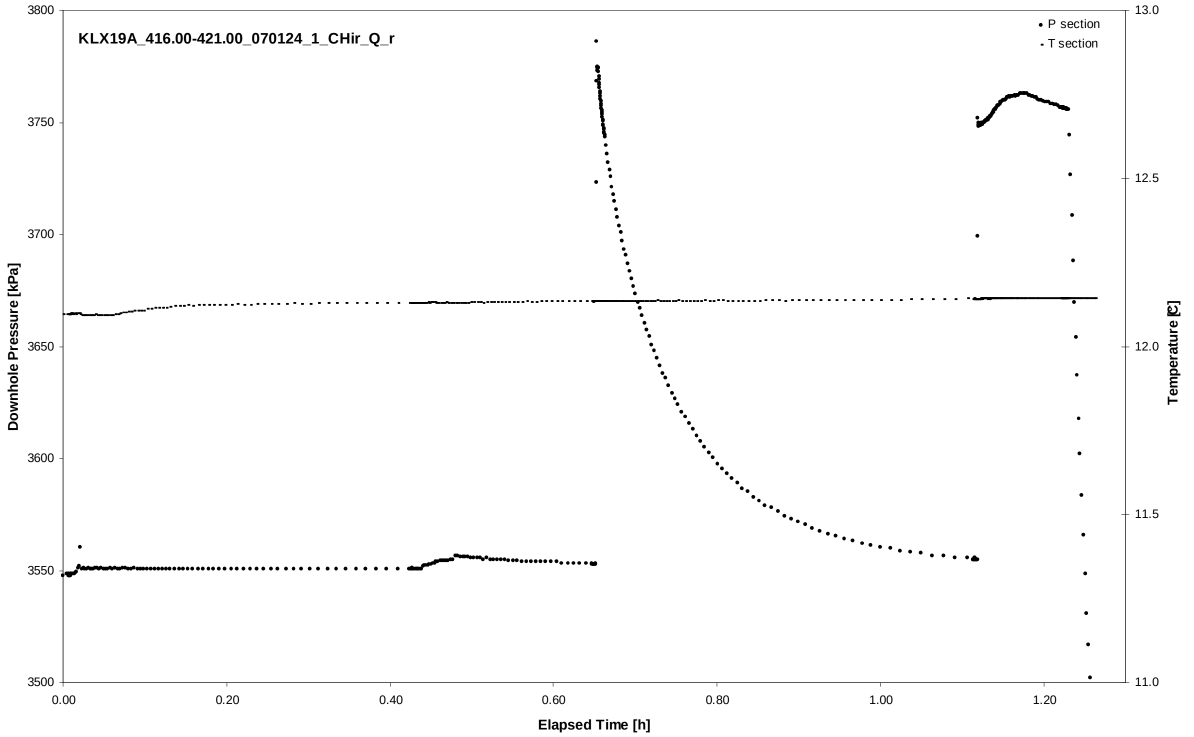
APPENDIX 2-40

Test 416.00 – 421.00 m

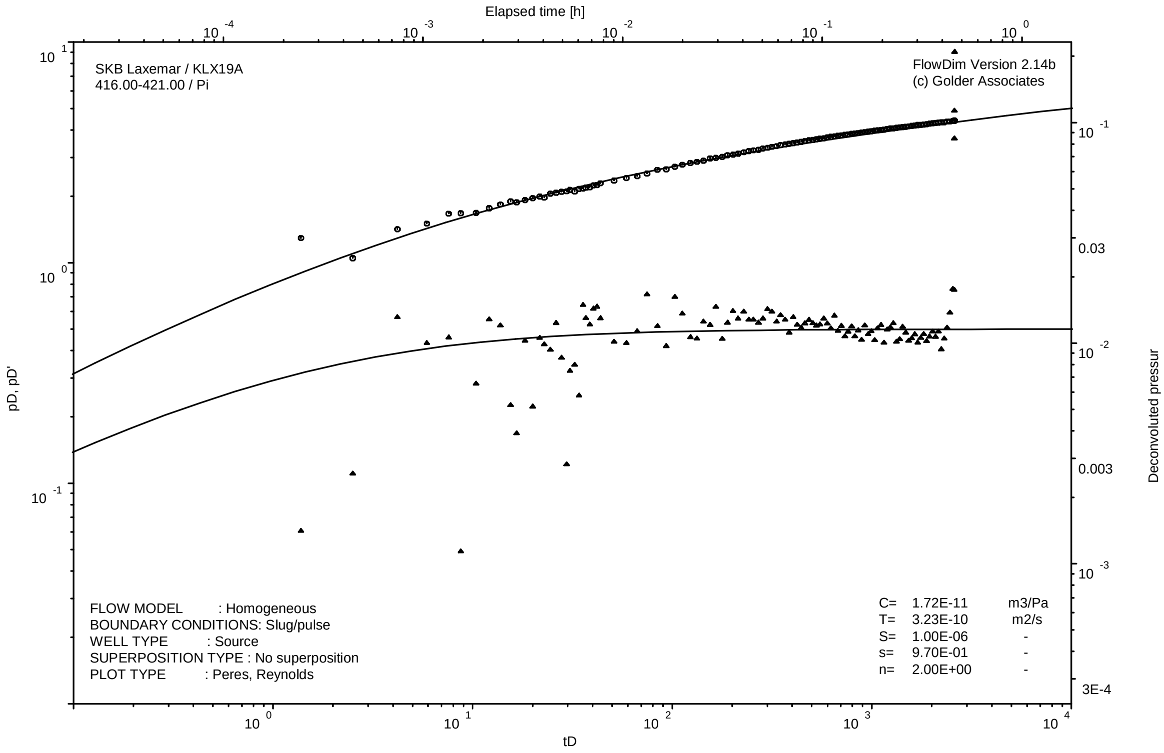
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

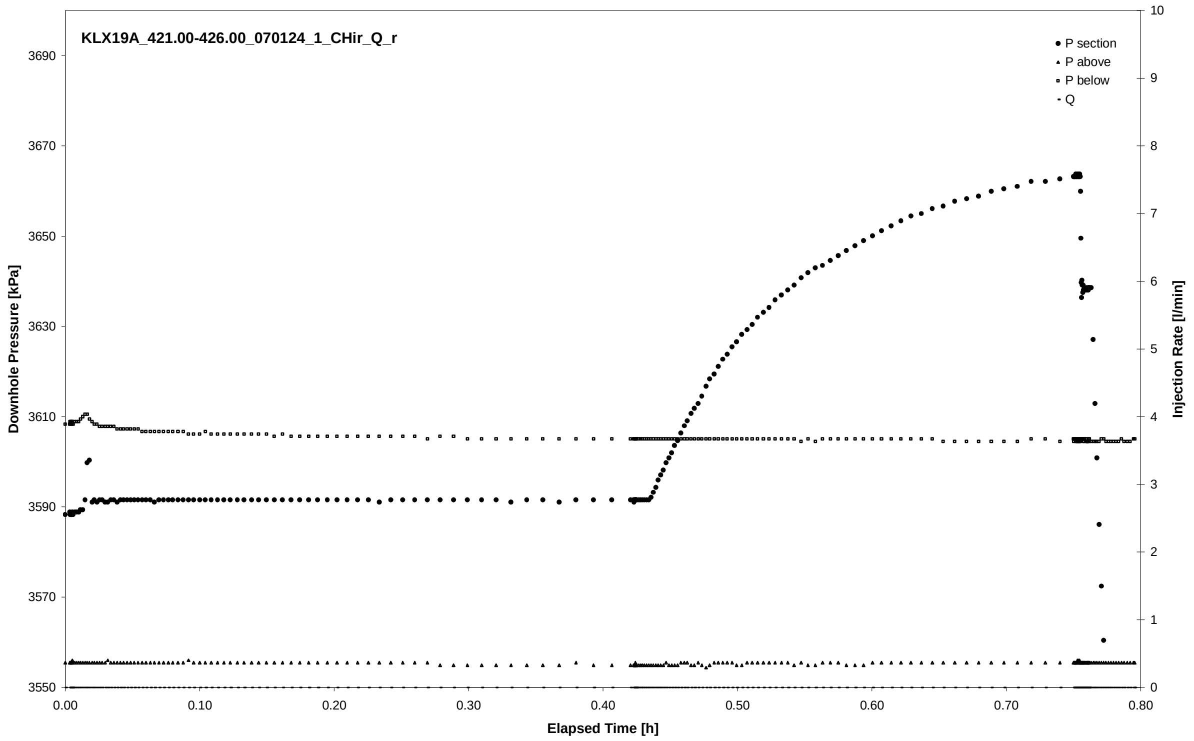


Pulse injection; deconvolution match

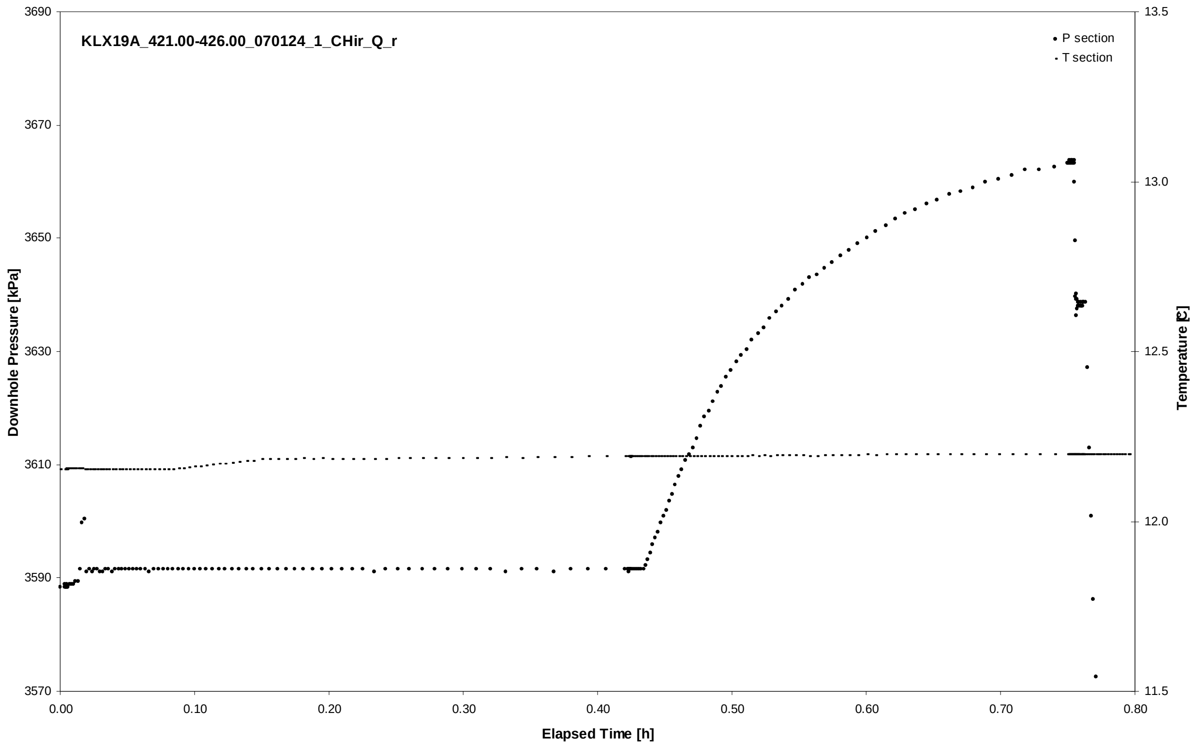
APPENDIX 2-41

Test 421.00 – 426.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

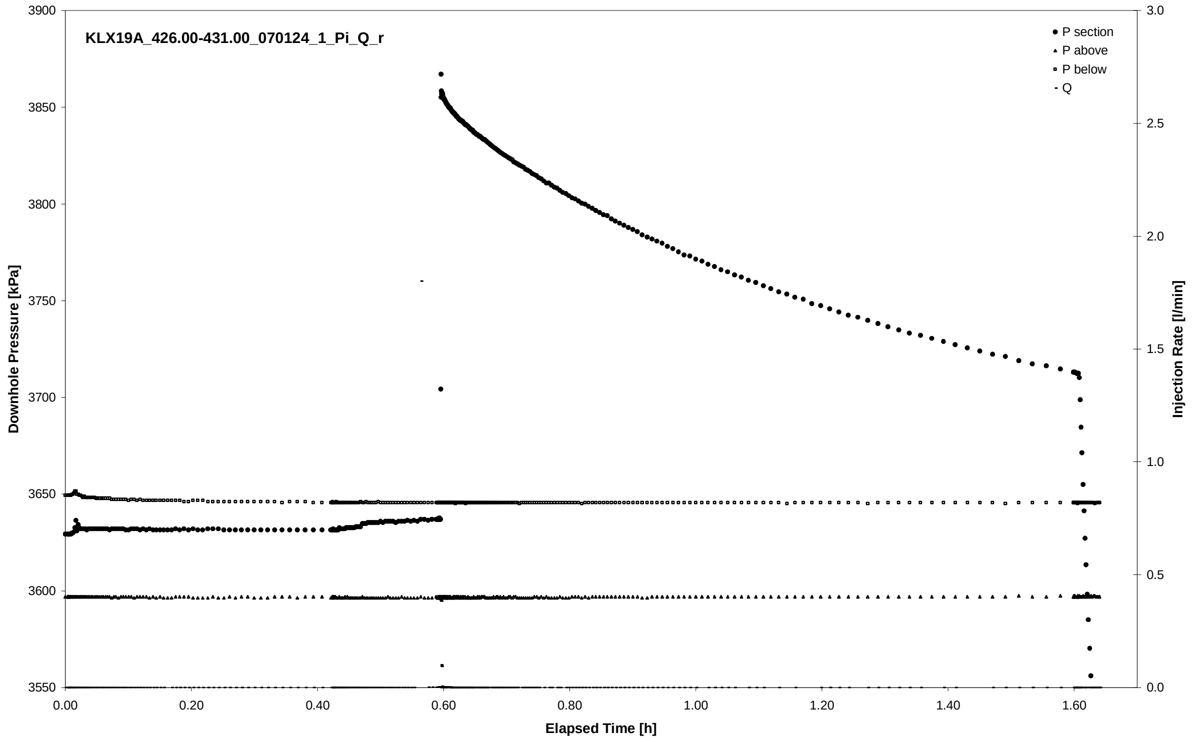
Not Analysed

CHIR phase; HORNER match

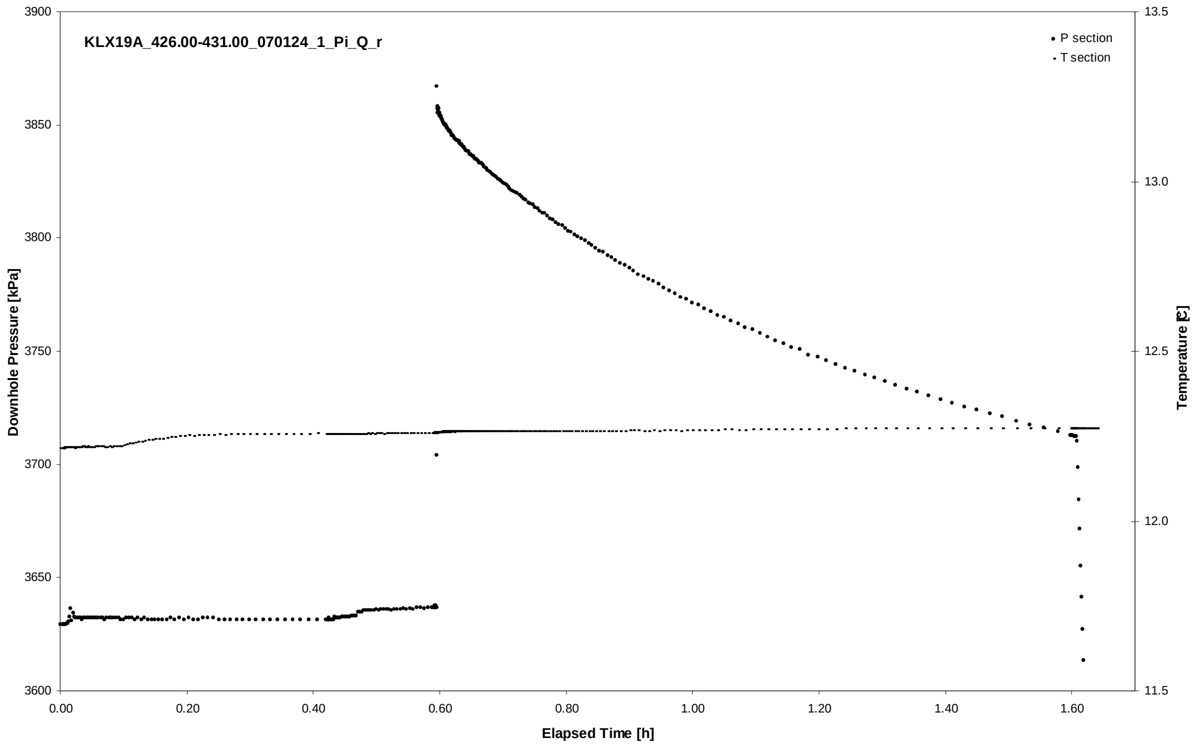
APPENDIX 2-42

Test 426.00 – 431.00 m

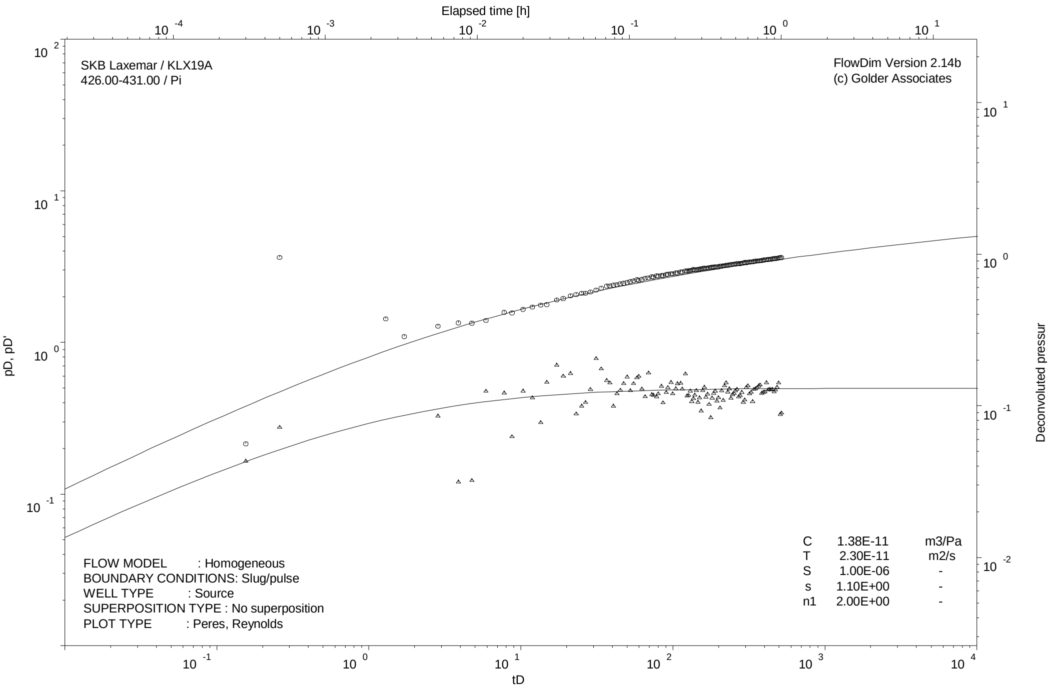
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

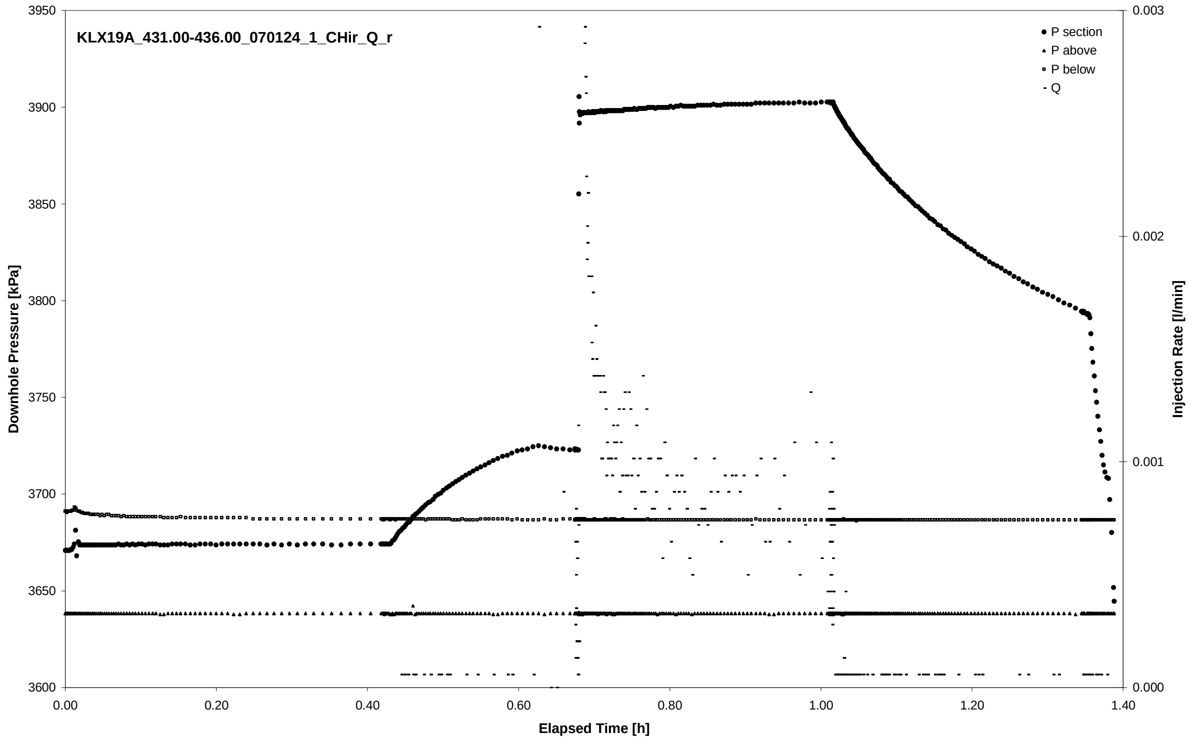


Pulse injection; deconvolution match

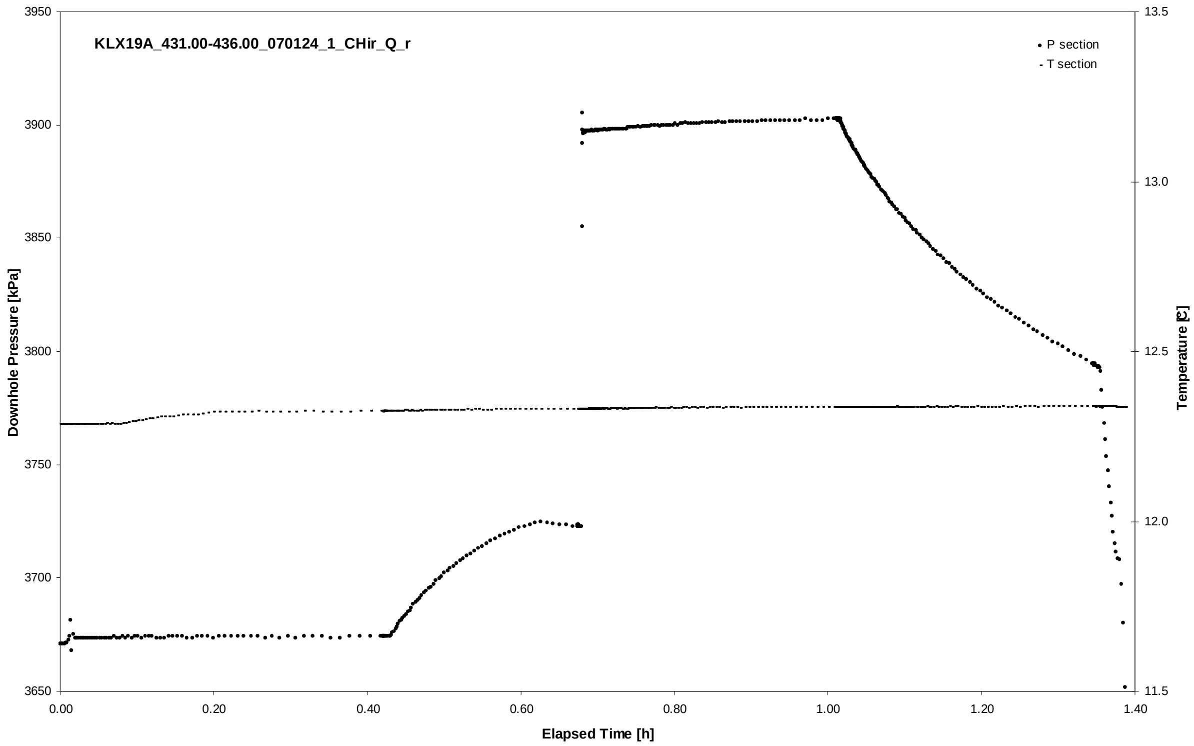
APPENDIX 2-43

Test 431.00 – 436.00 m

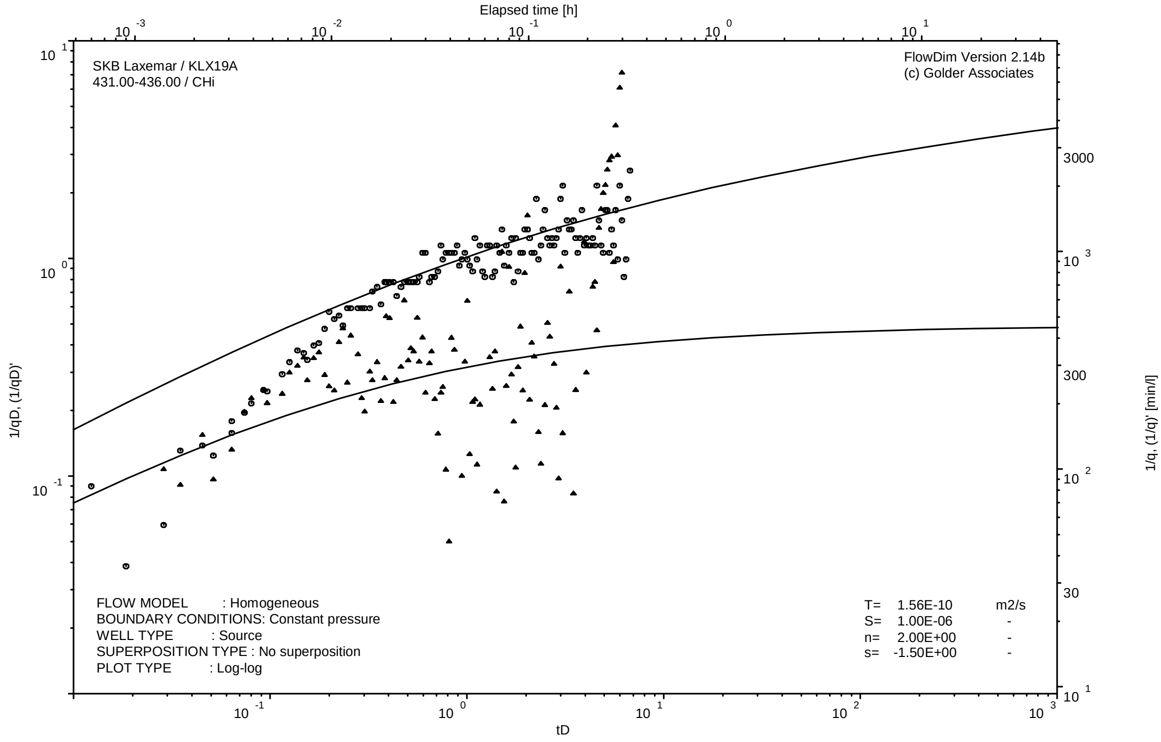
Analysis diagrams



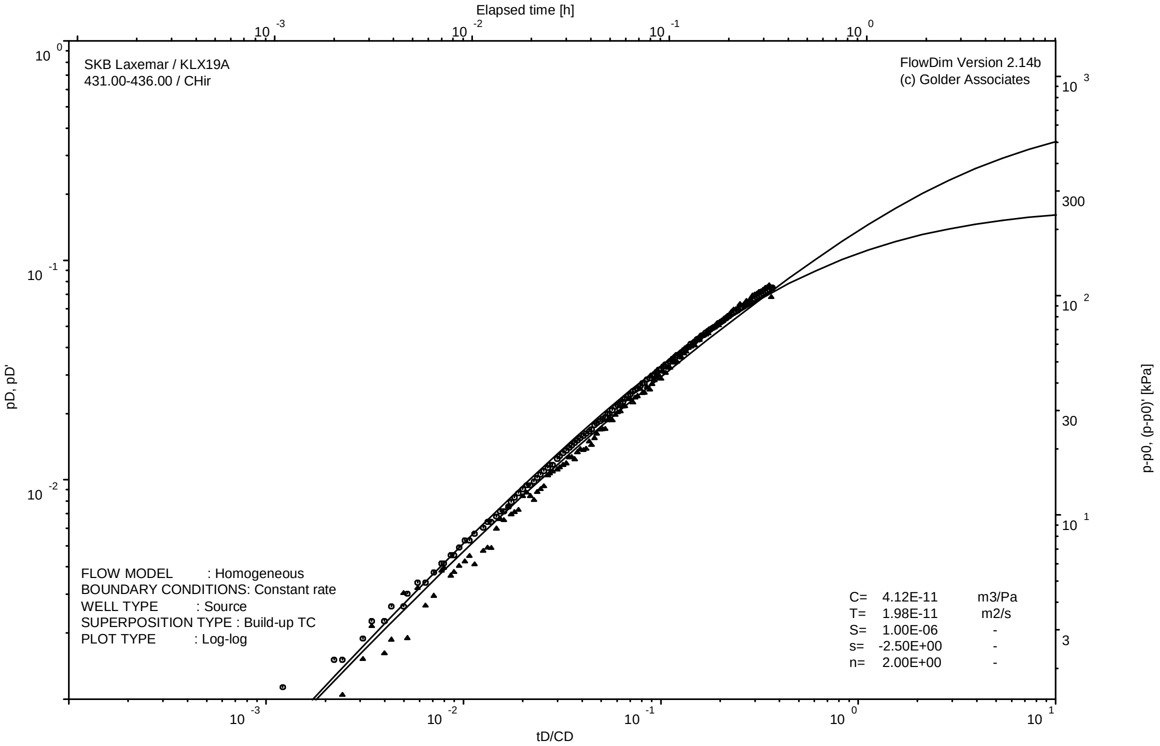
Pressure and flow rate vs. time; cartesian plot



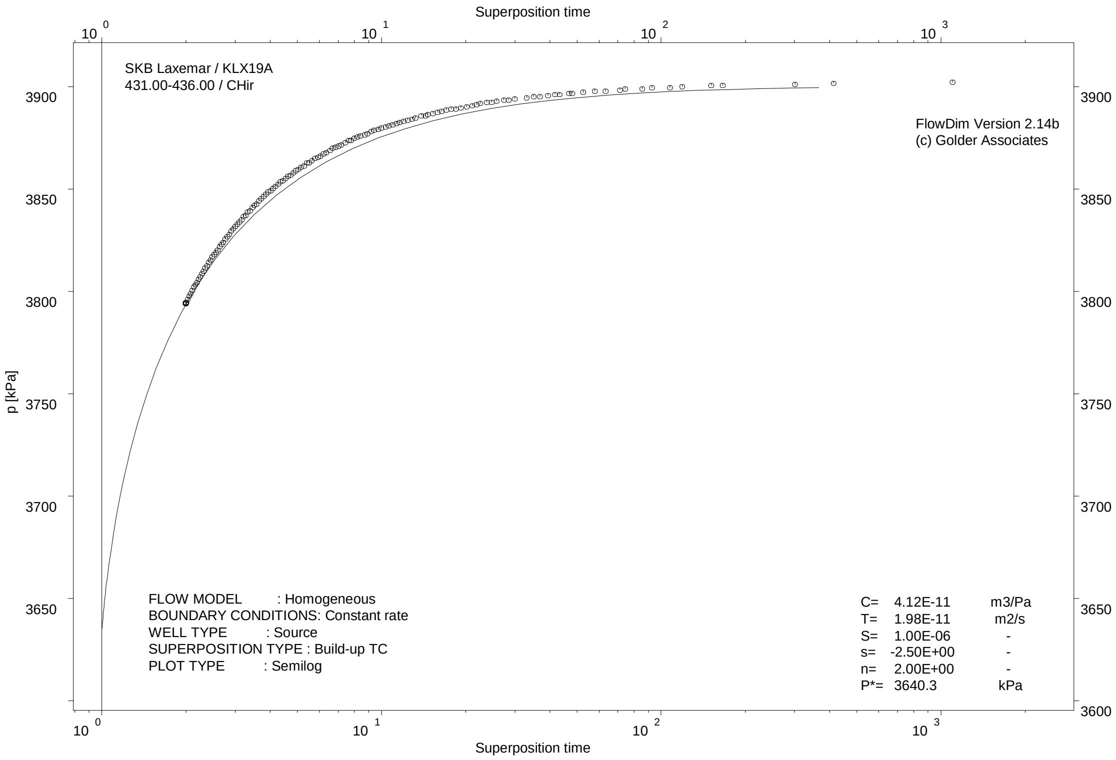
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

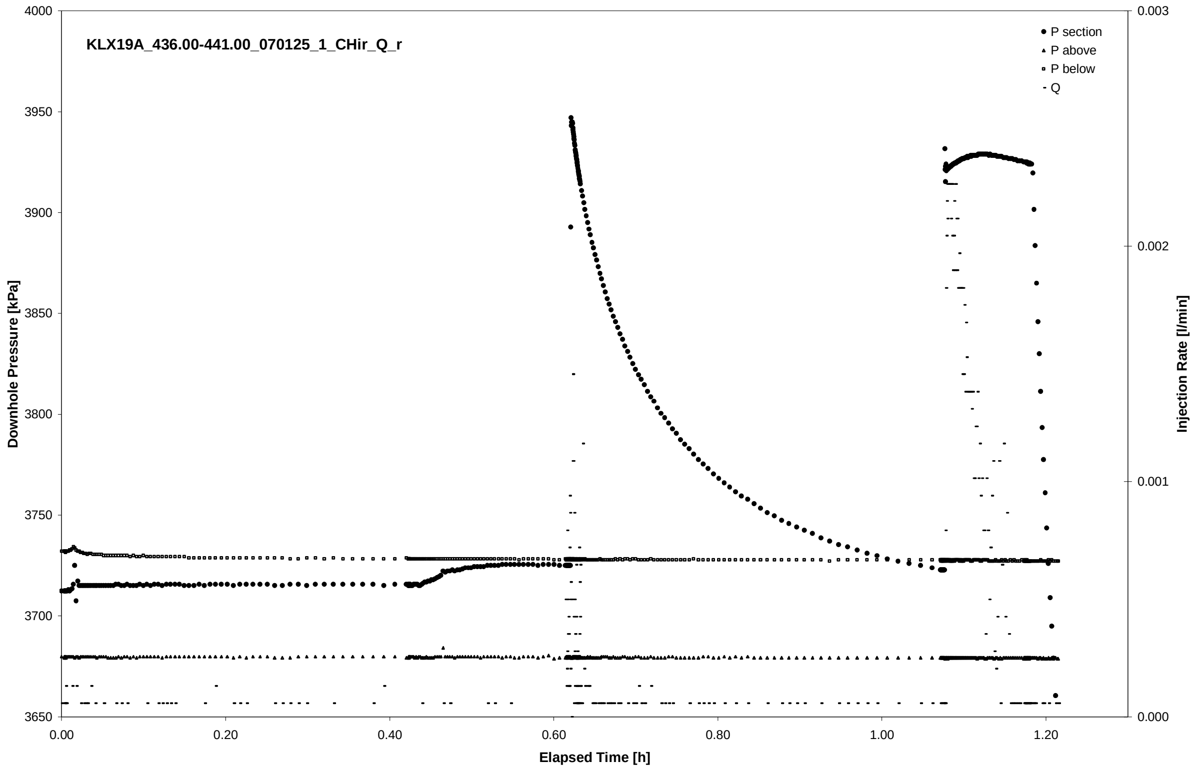


CHIR phase; HORNER match

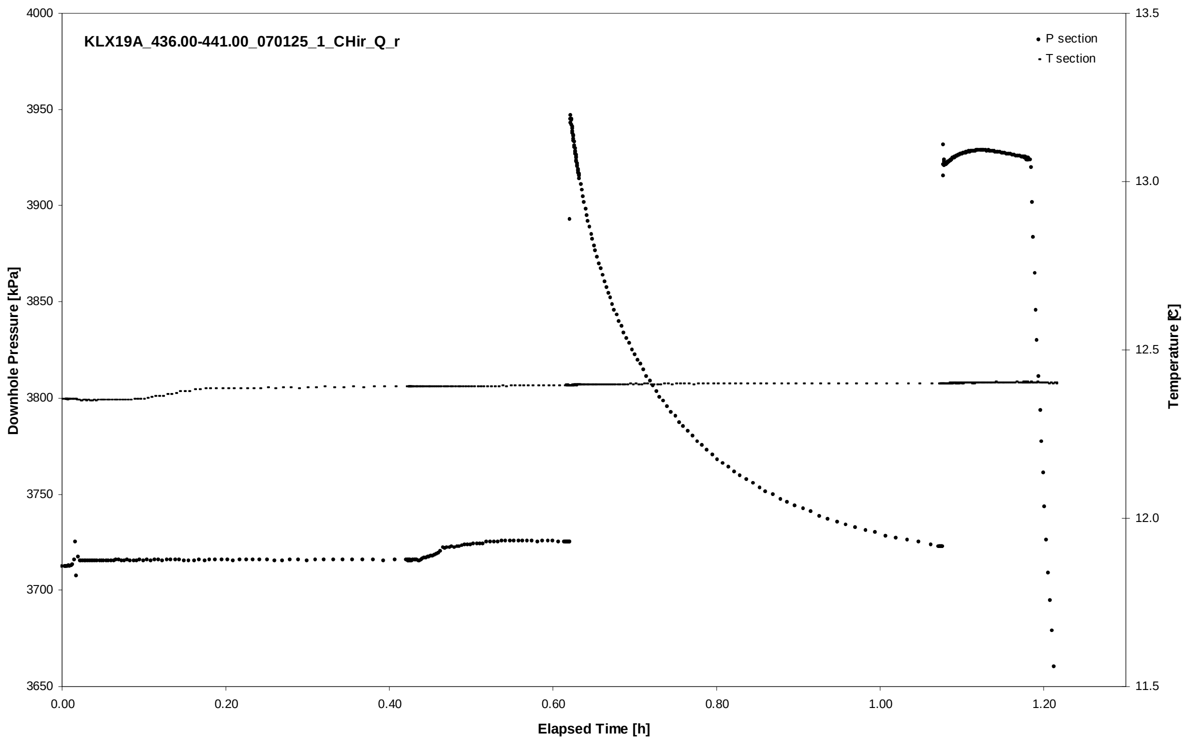
APPENDIX 2-44

Test 436.00 – 441.00 m

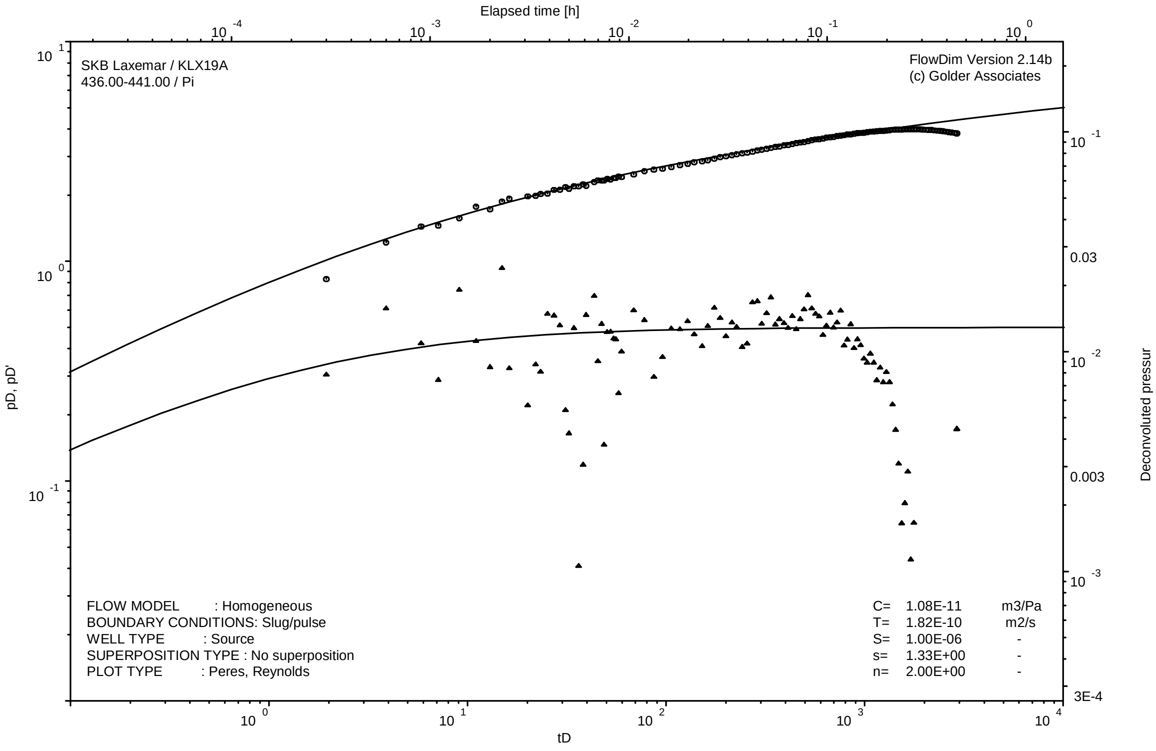
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

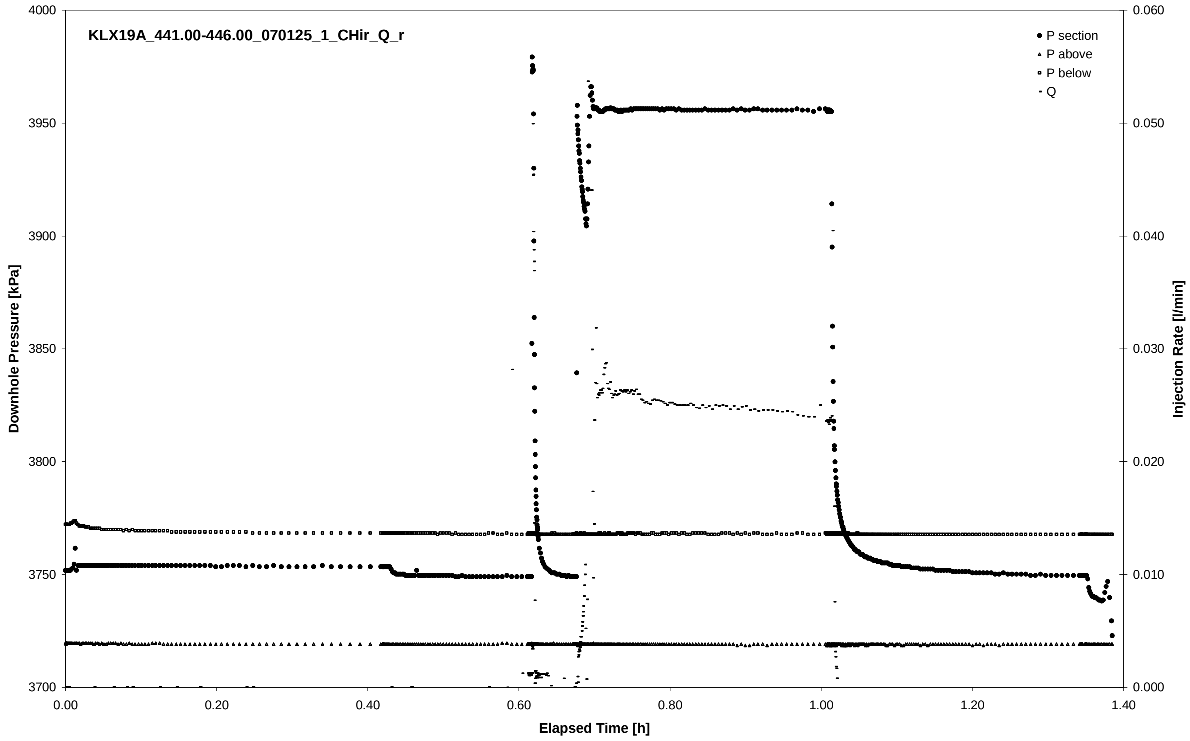


Pulse injection; deconvolution match

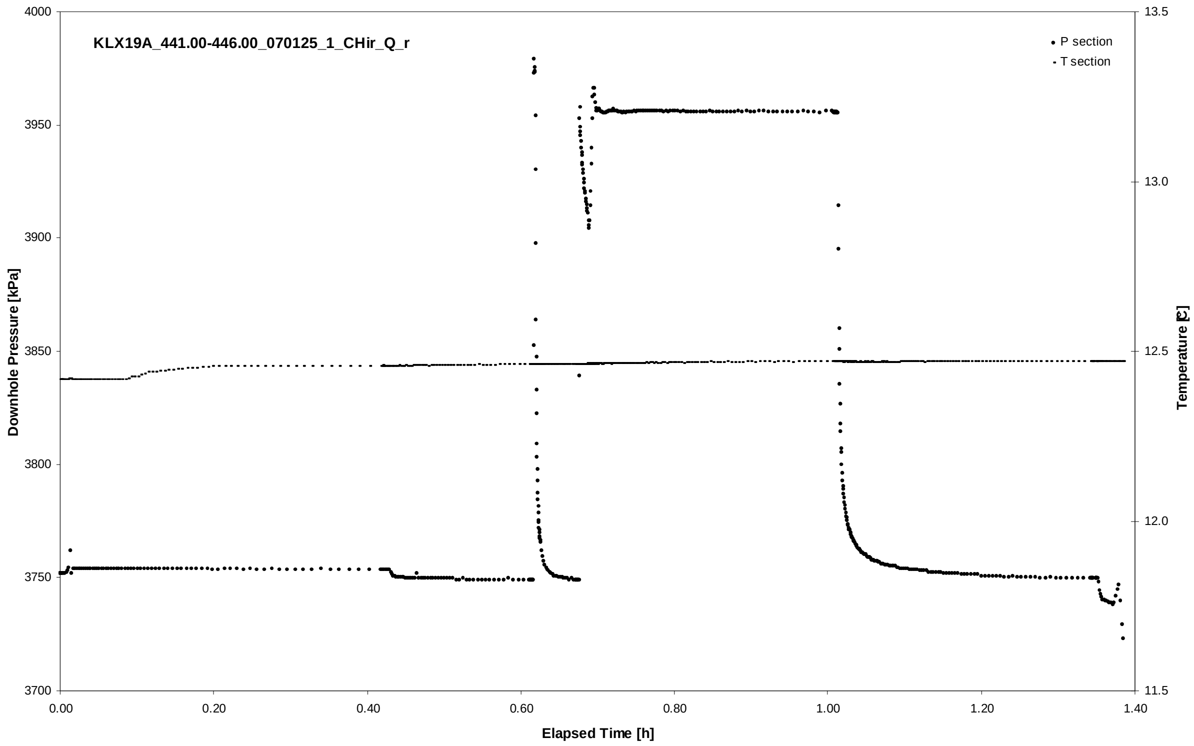
APPENDIX 2-45

Test 441.00 – 446.00 m

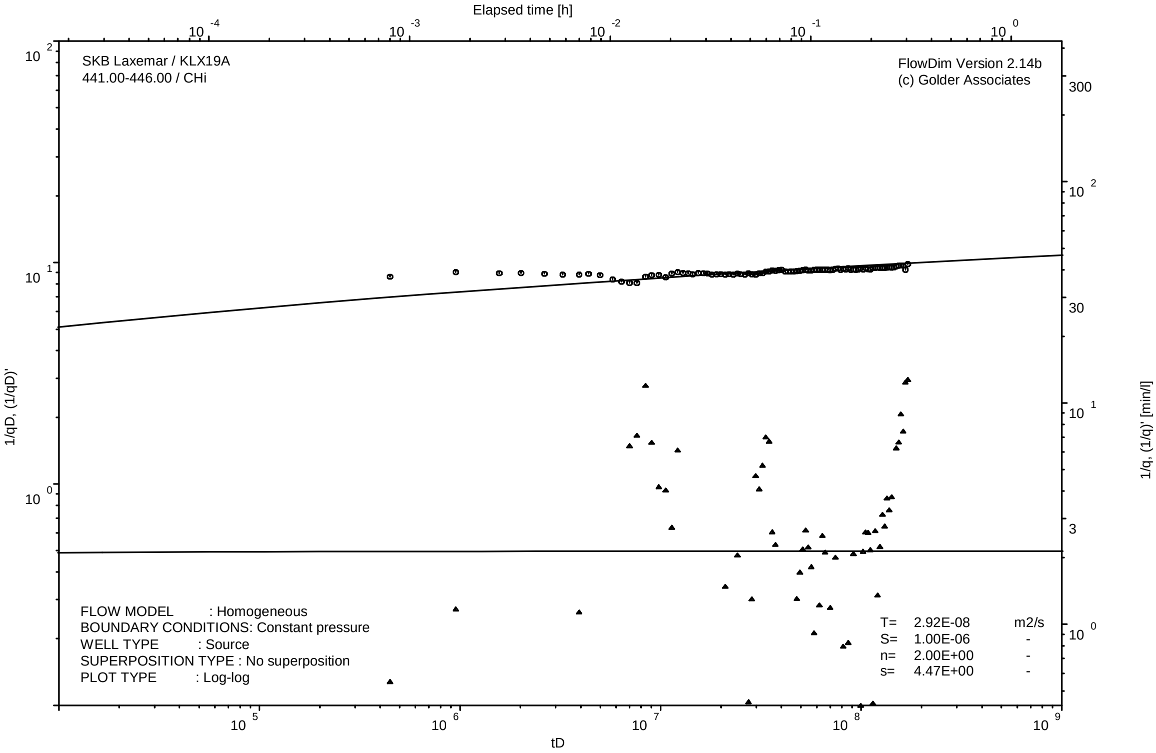
Analysis diagrams



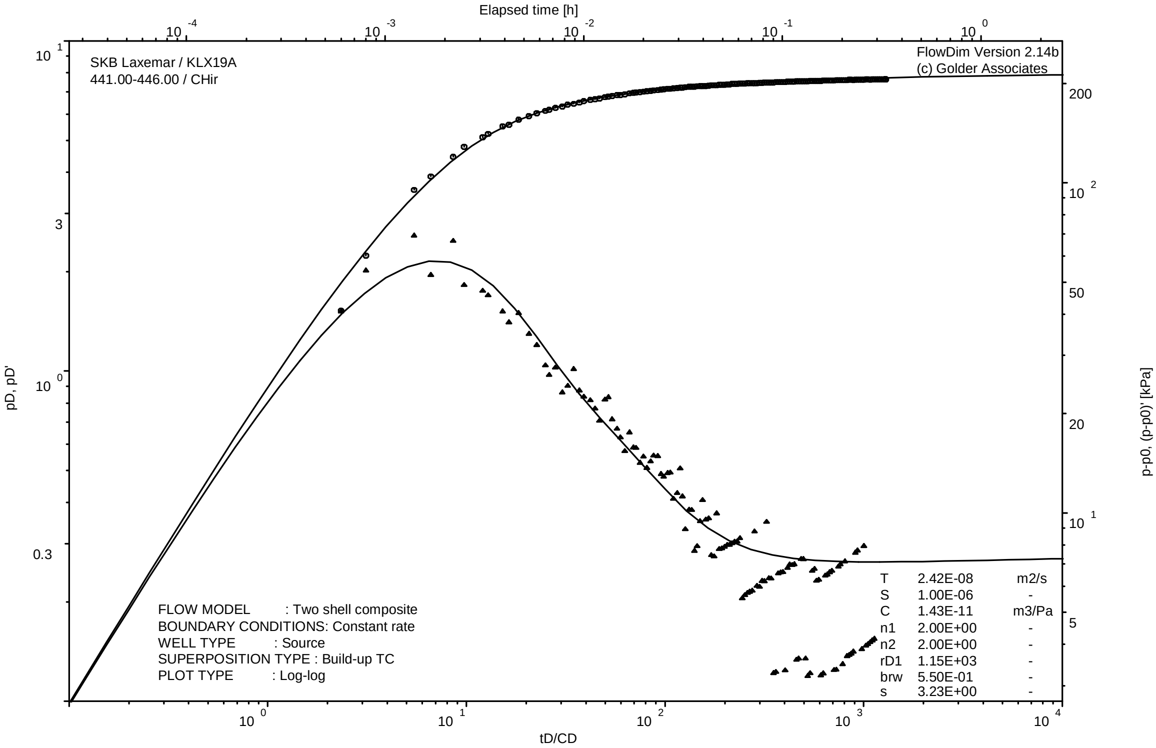
Pressure and flow rate vs. time; cartesian plot



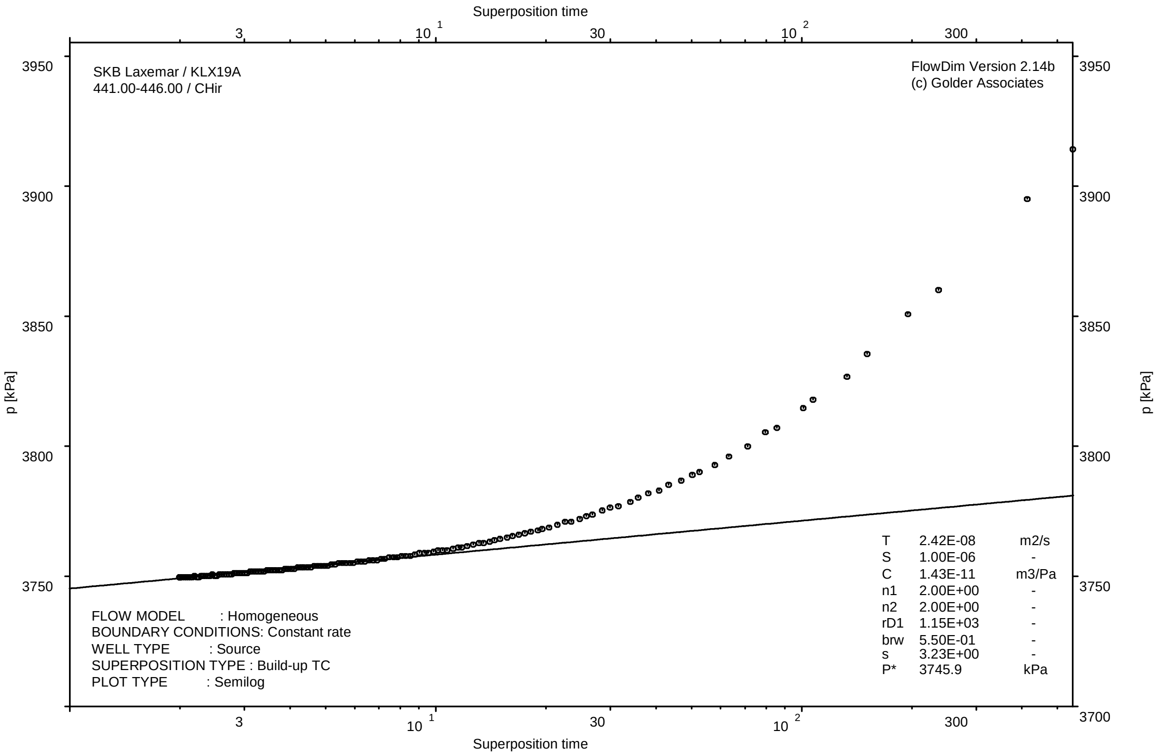
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

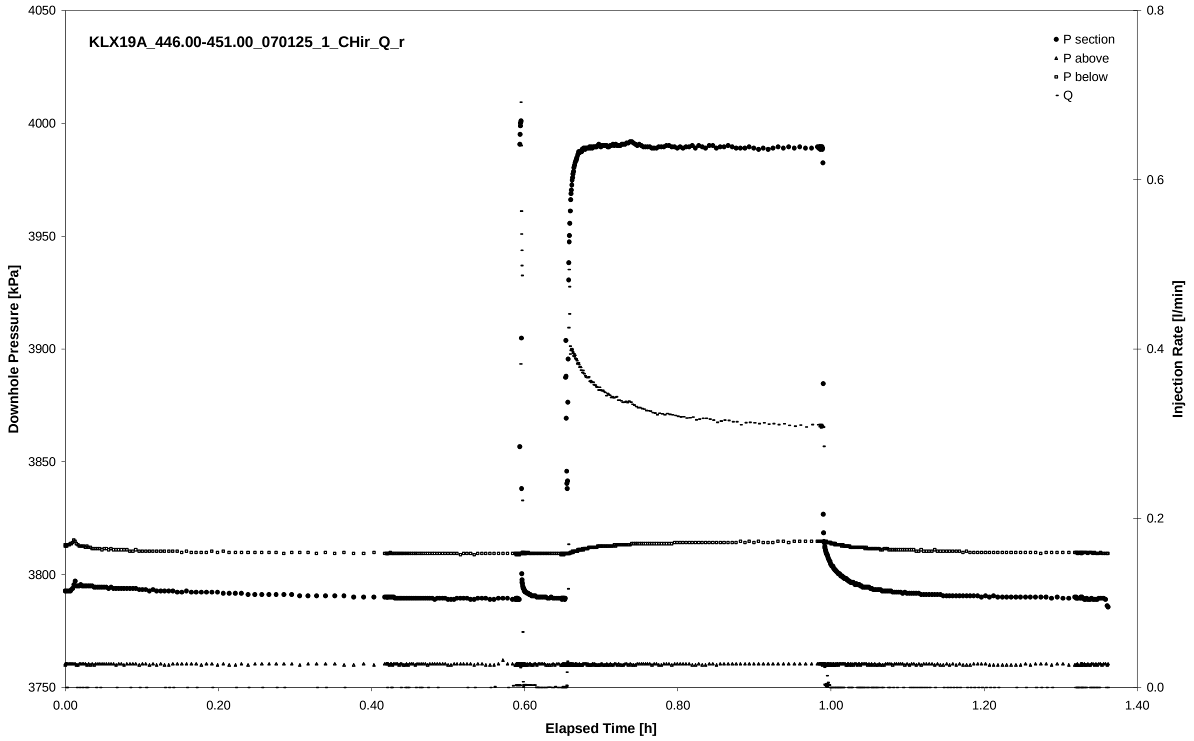


CHIR phase; HORNER match

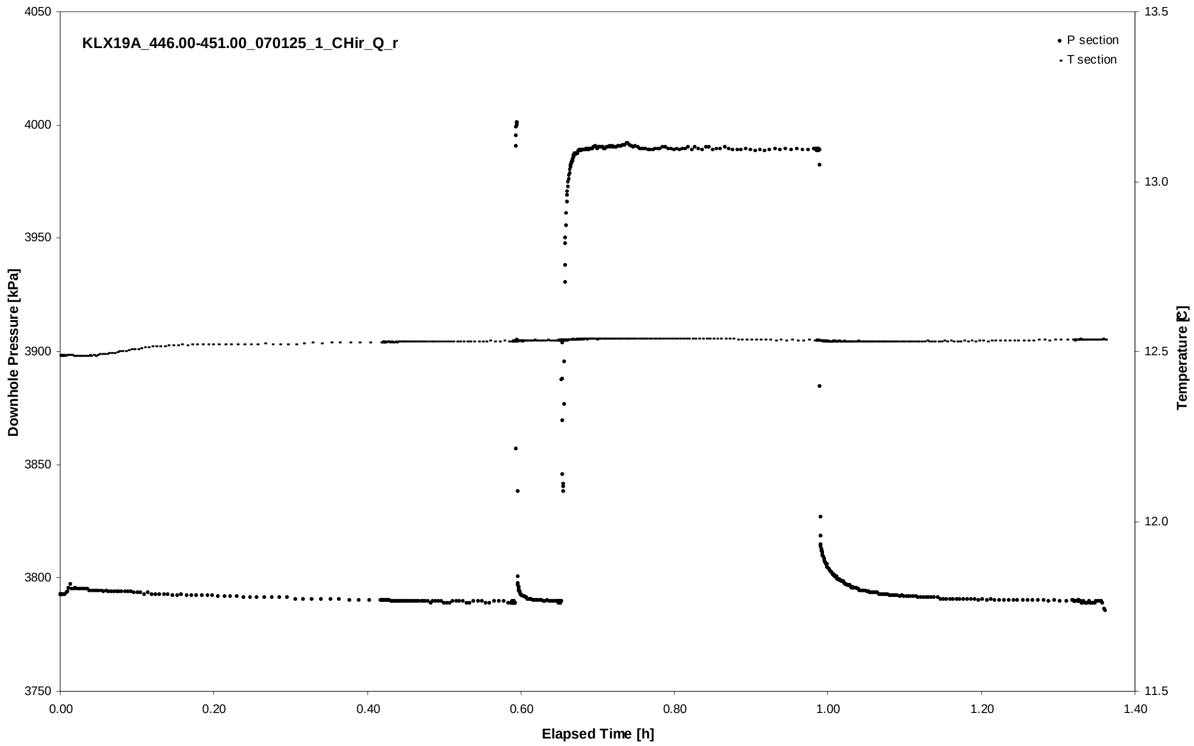
APPENDIX 2-46

Test 446.00 – 451.00 m

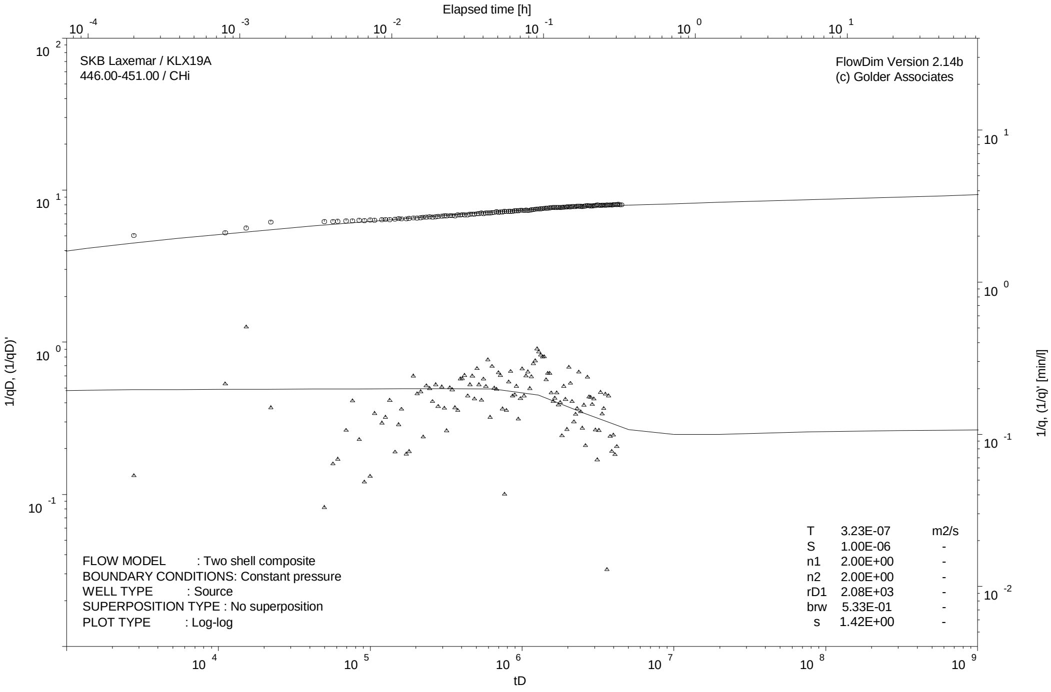
Analysis diagrams



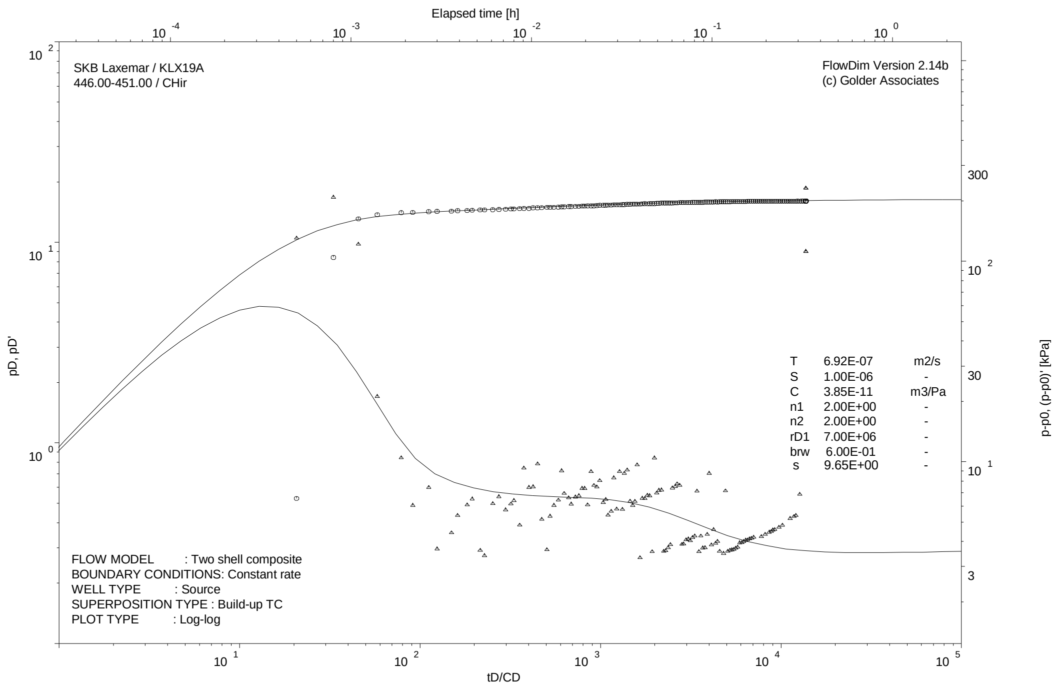
Pressure and flow rate vs. time; cartesian plot



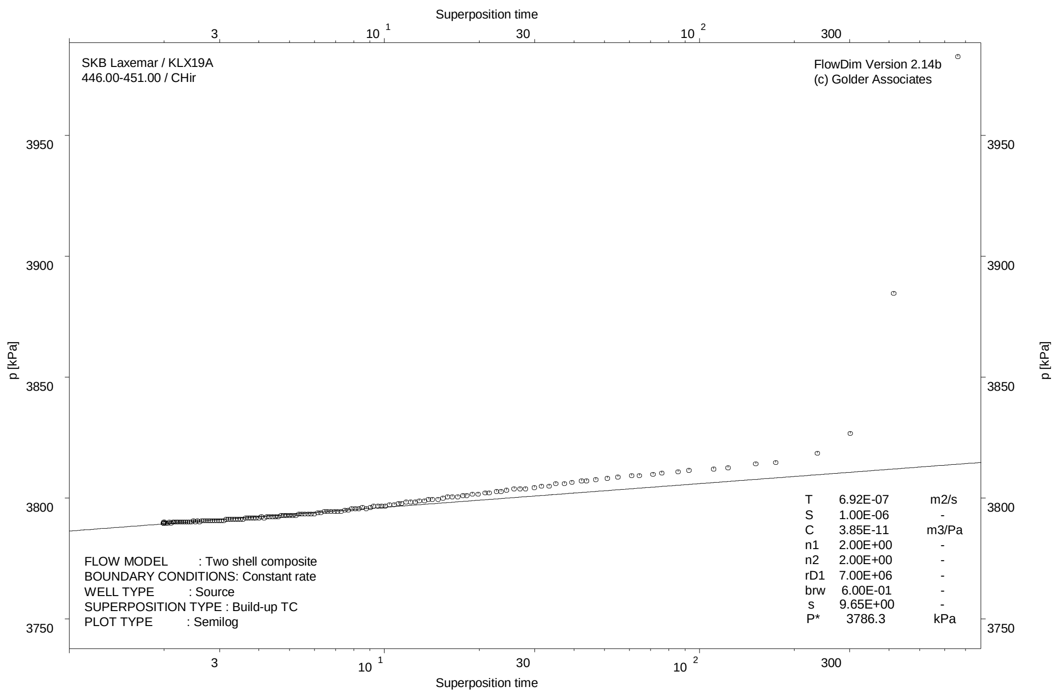
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

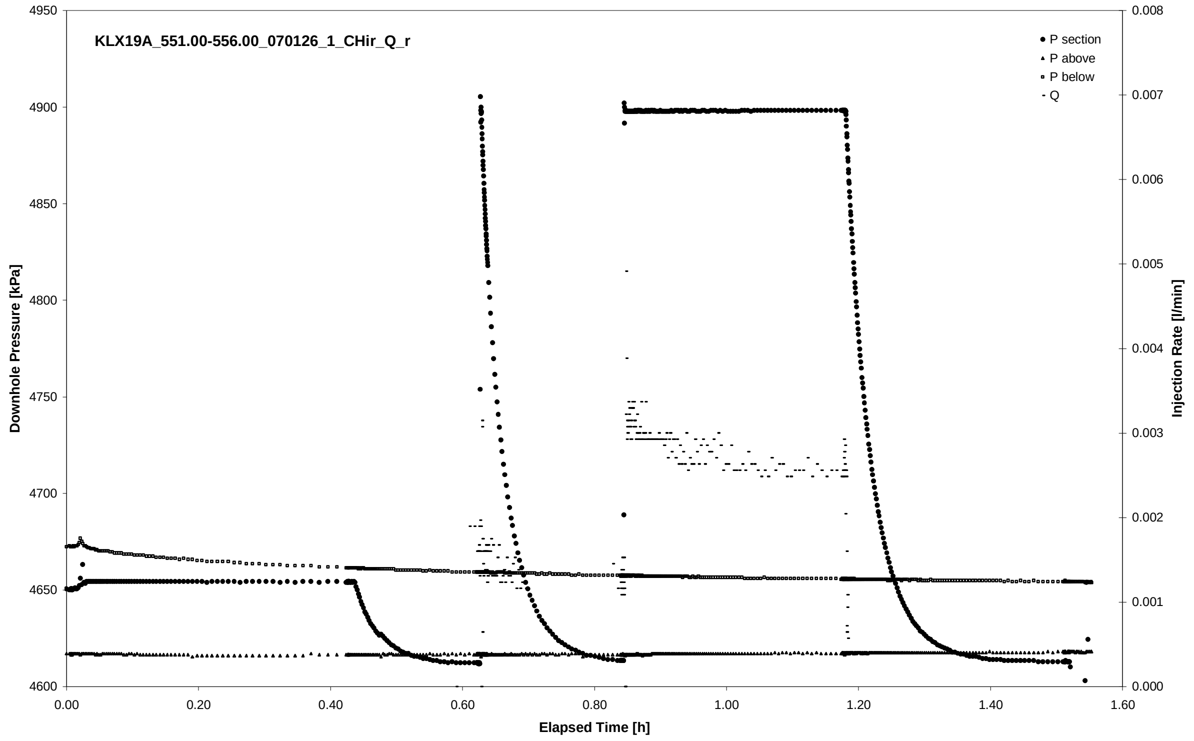


CHIR phase; HORNER match

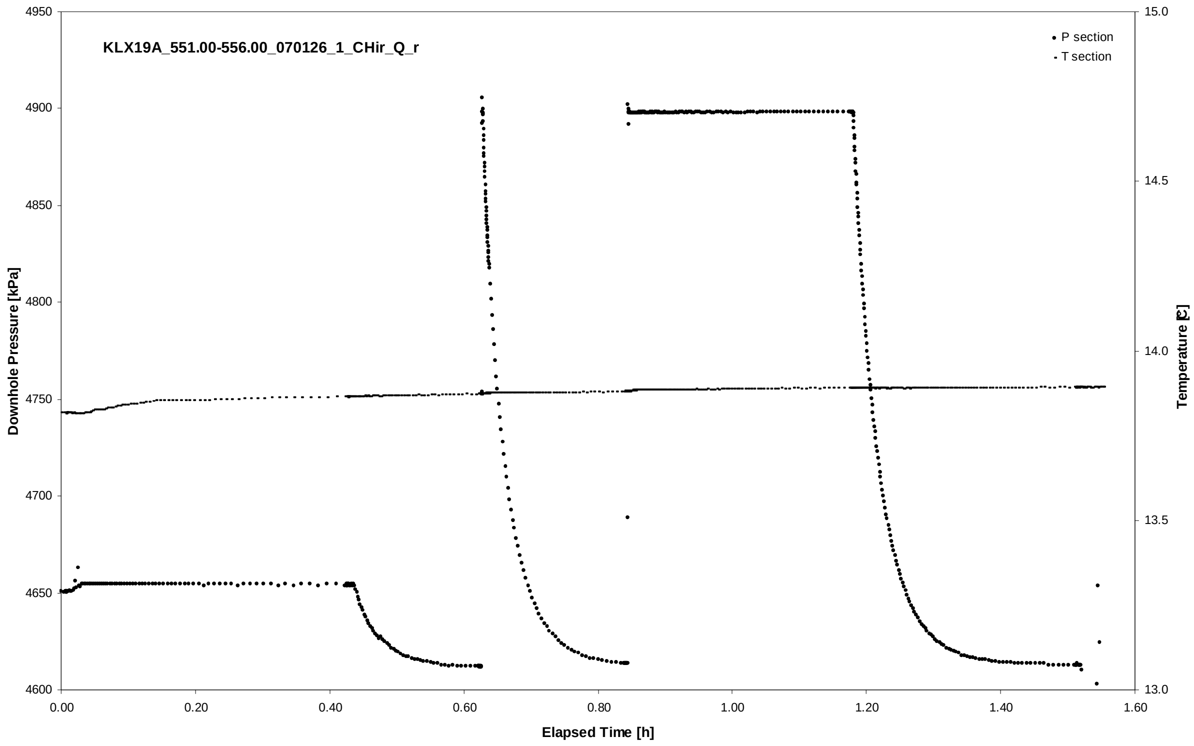
APPENDIX 2-47

Test 551.00 – 556.00 m

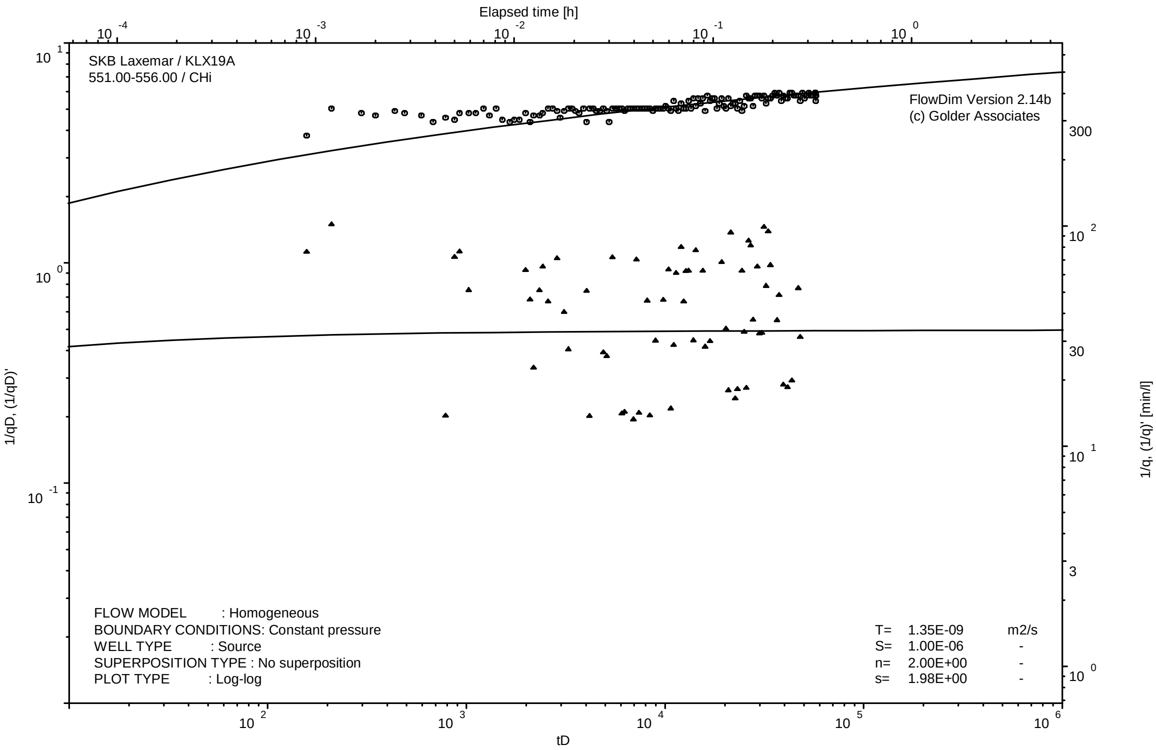
Analysis diagrams



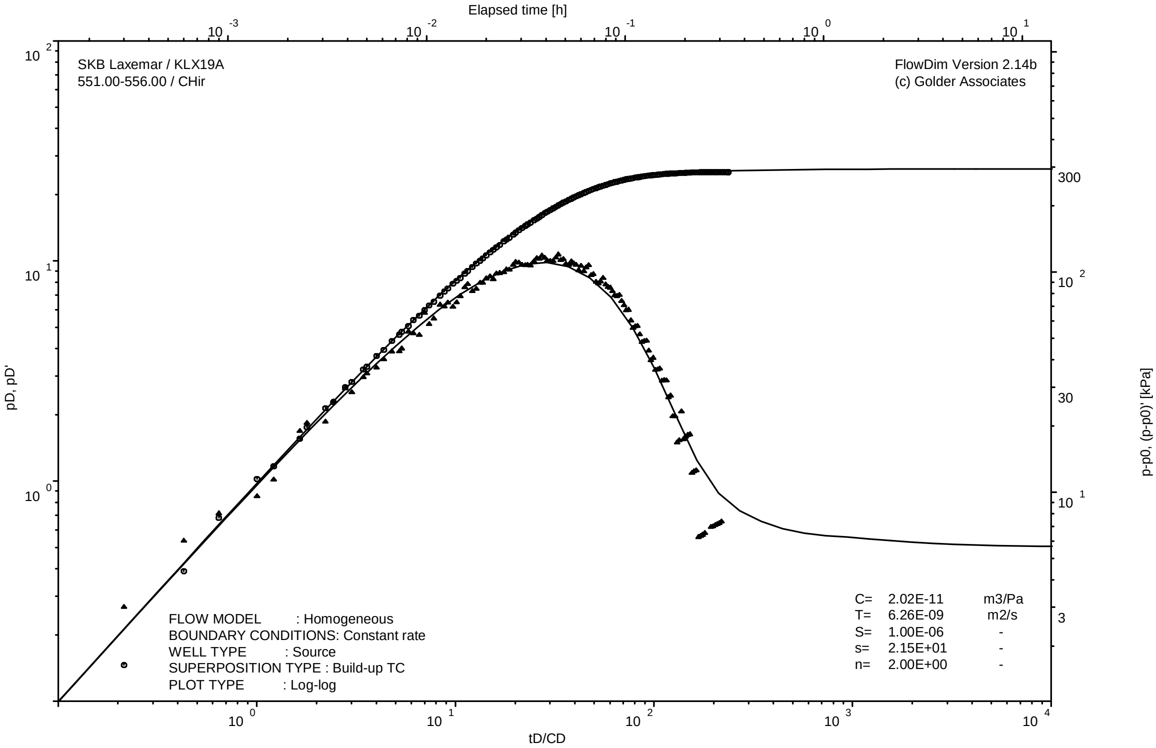
Pressure and flow rate vs. time; cartesian plot



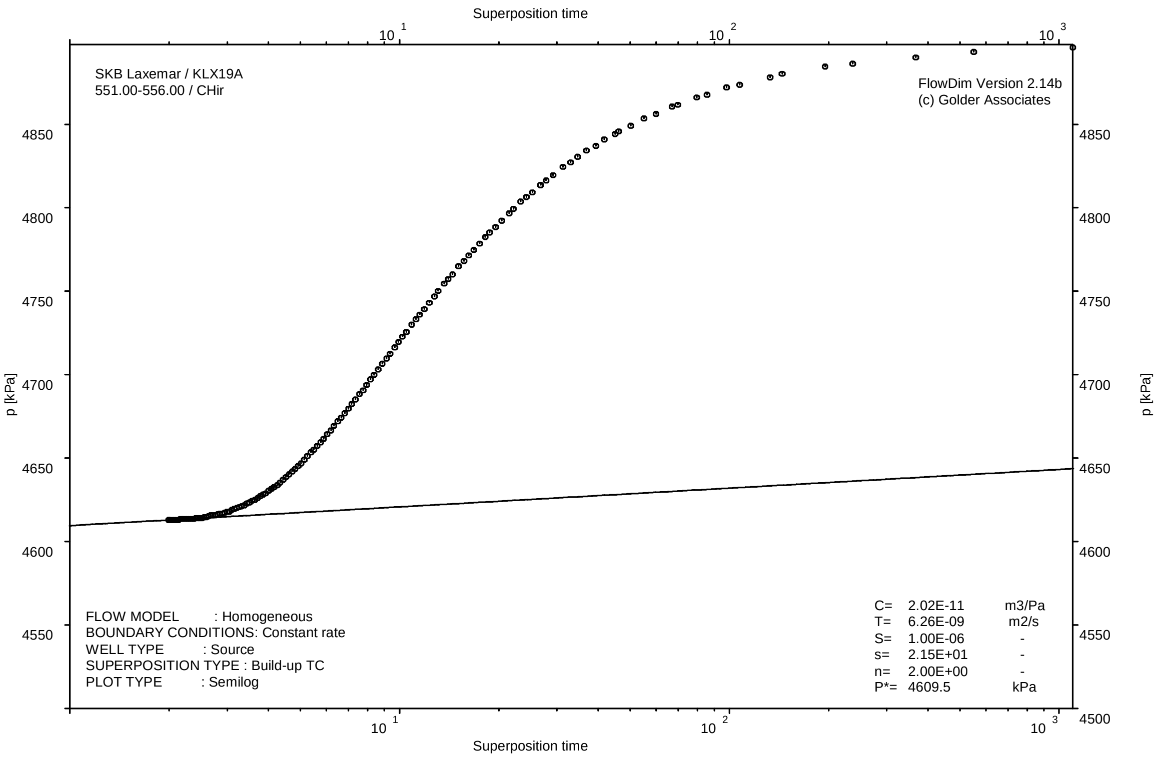
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

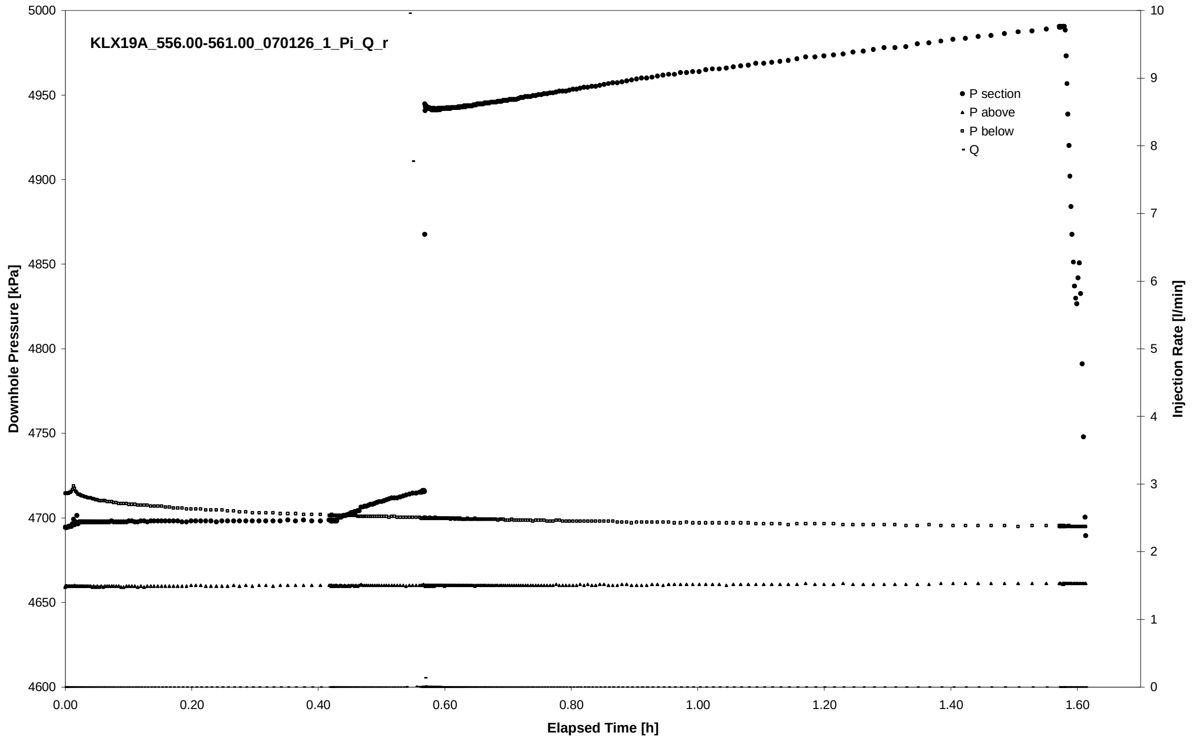


CHIR phase; HORNER match

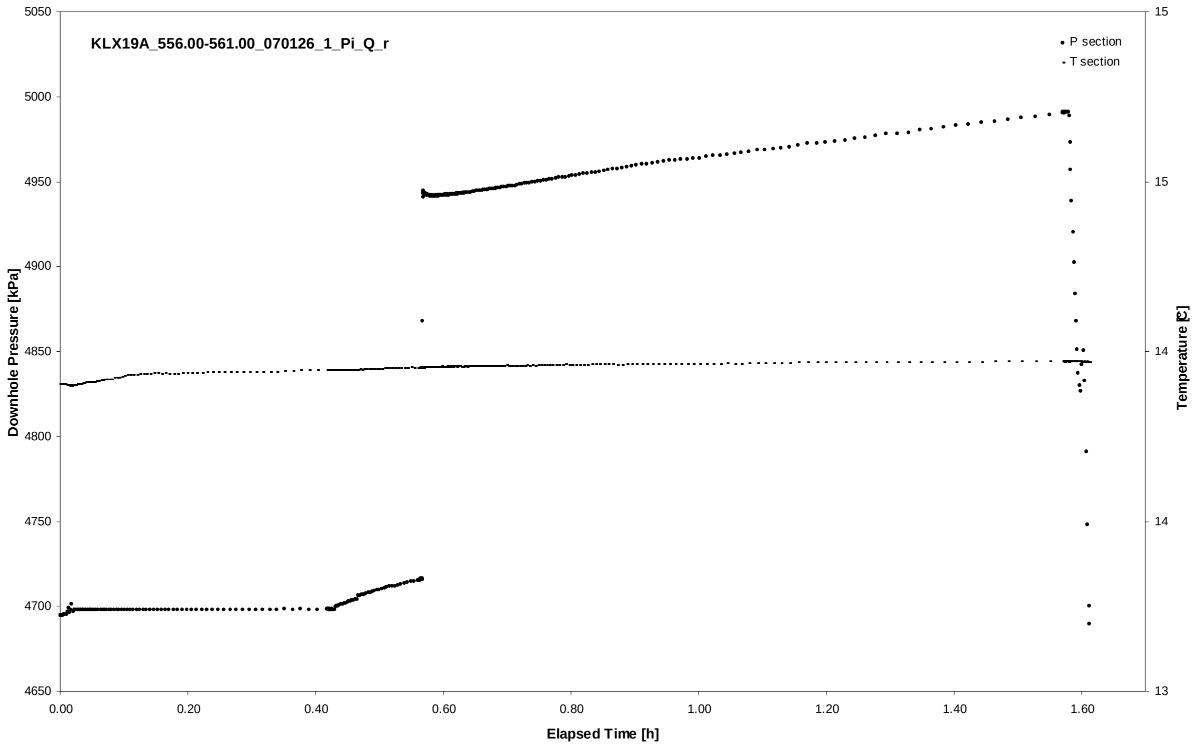
APPENDIX 2-48

Test 556.00 – 561.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

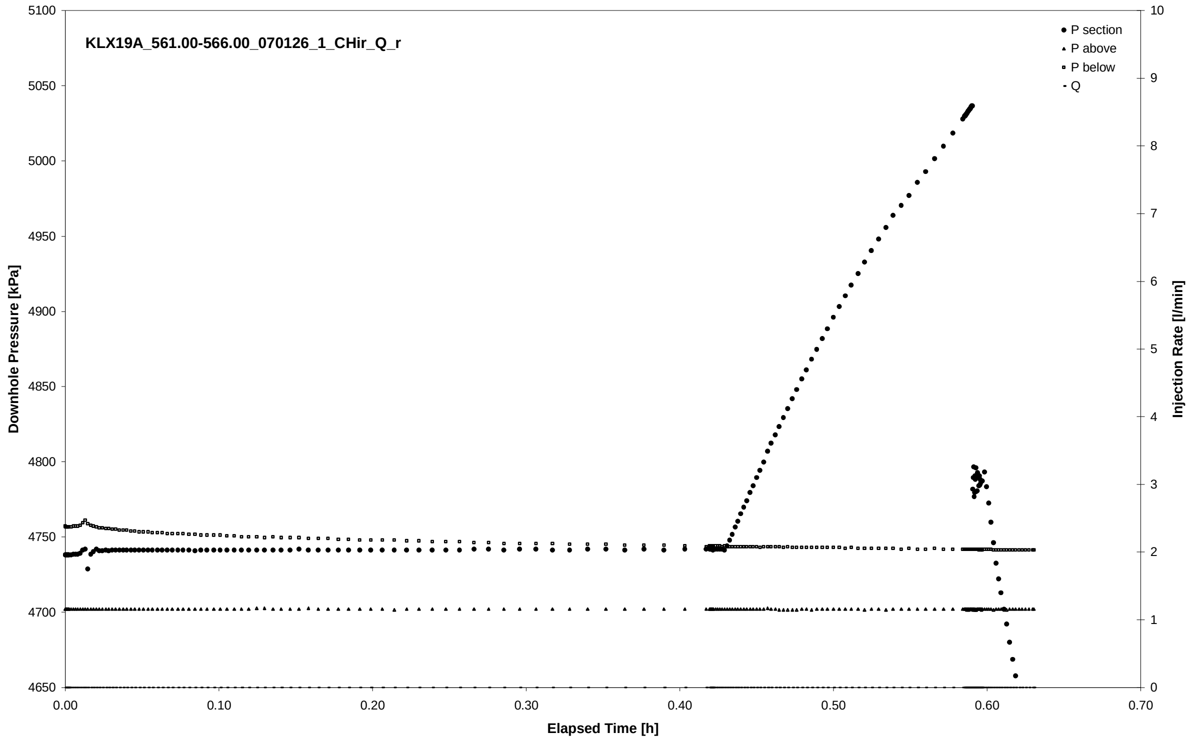
Not Analysed

CHIR phase; HORNER match

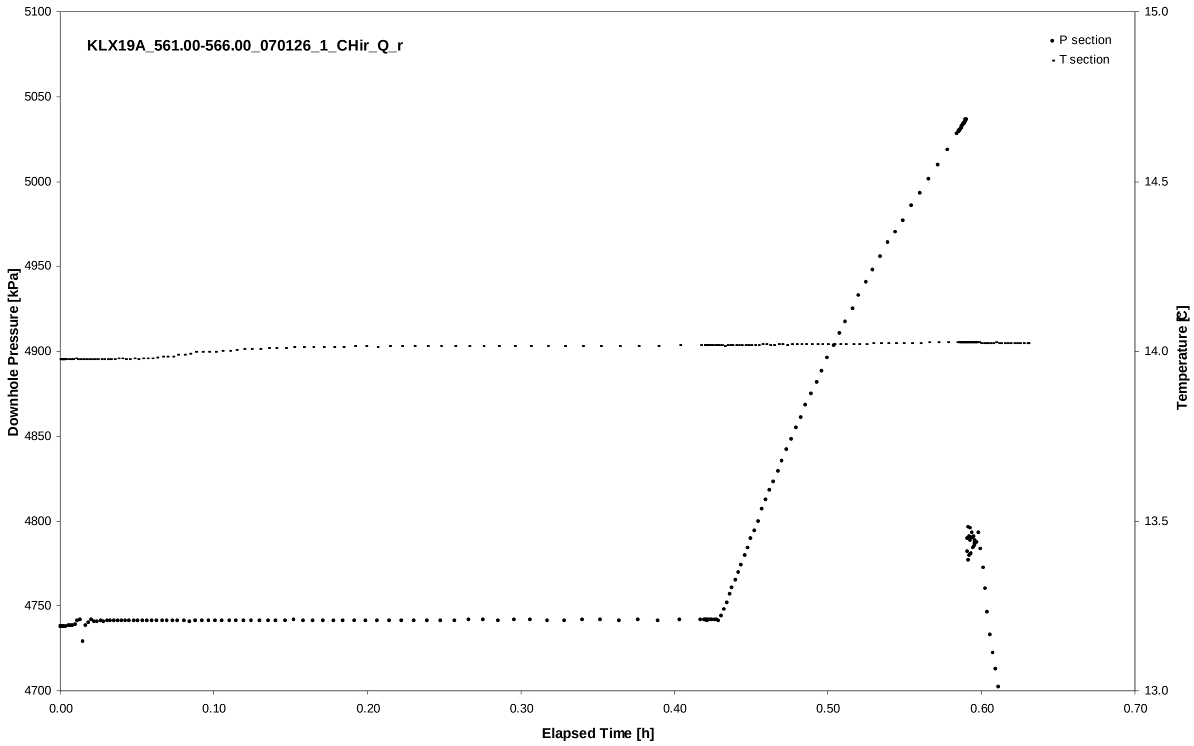
APPENDIX 2-49

Test 561.00 – 566.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

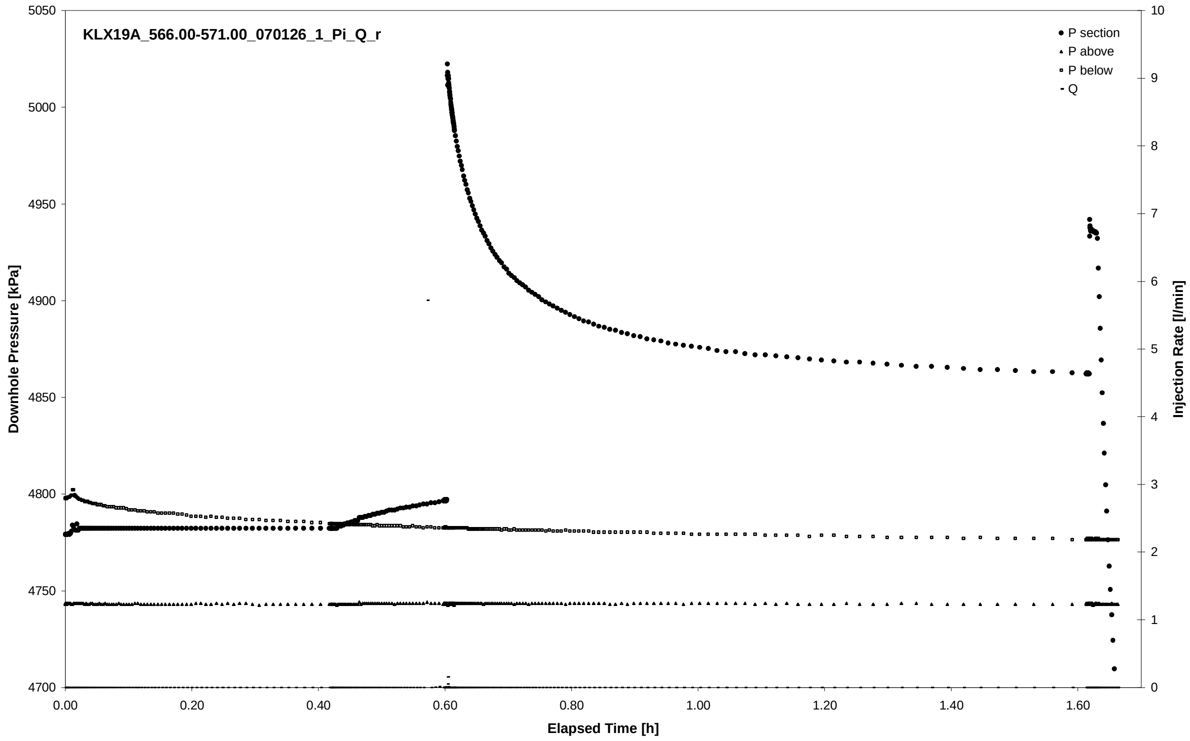
Not Analysed

CHIR phase; HORNER match

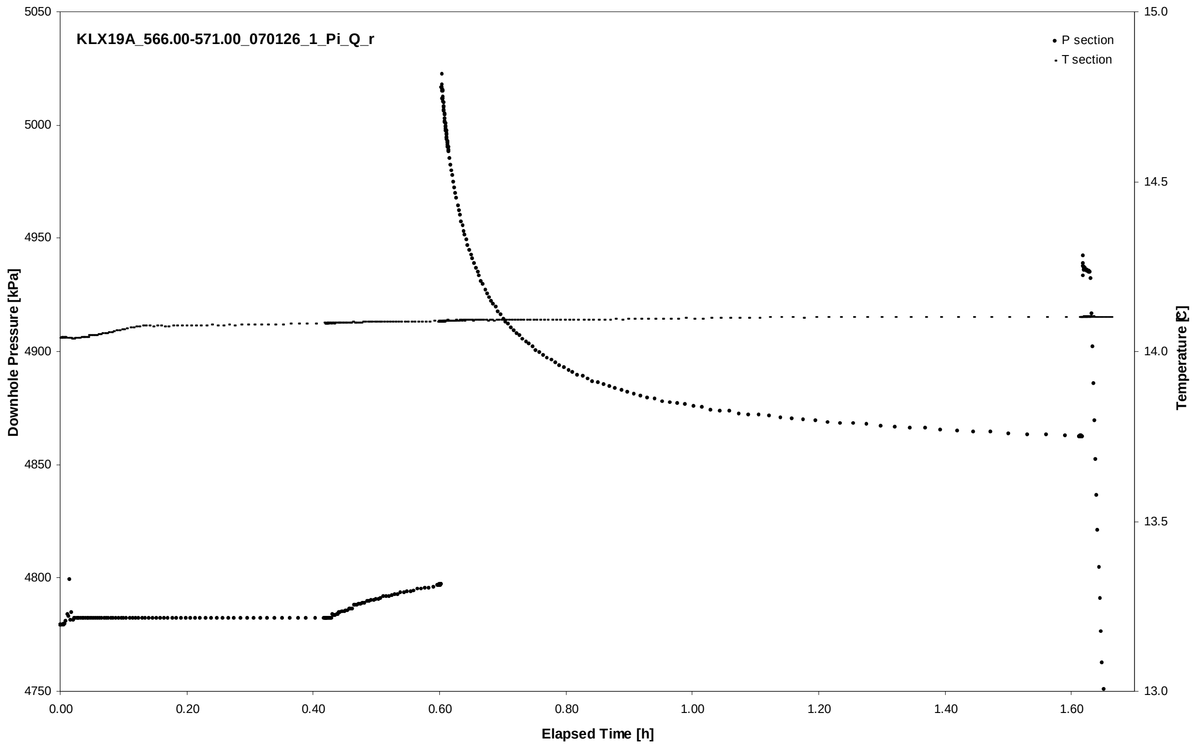
APPENDIX 2-50

Test 566.00 – 571.00 m

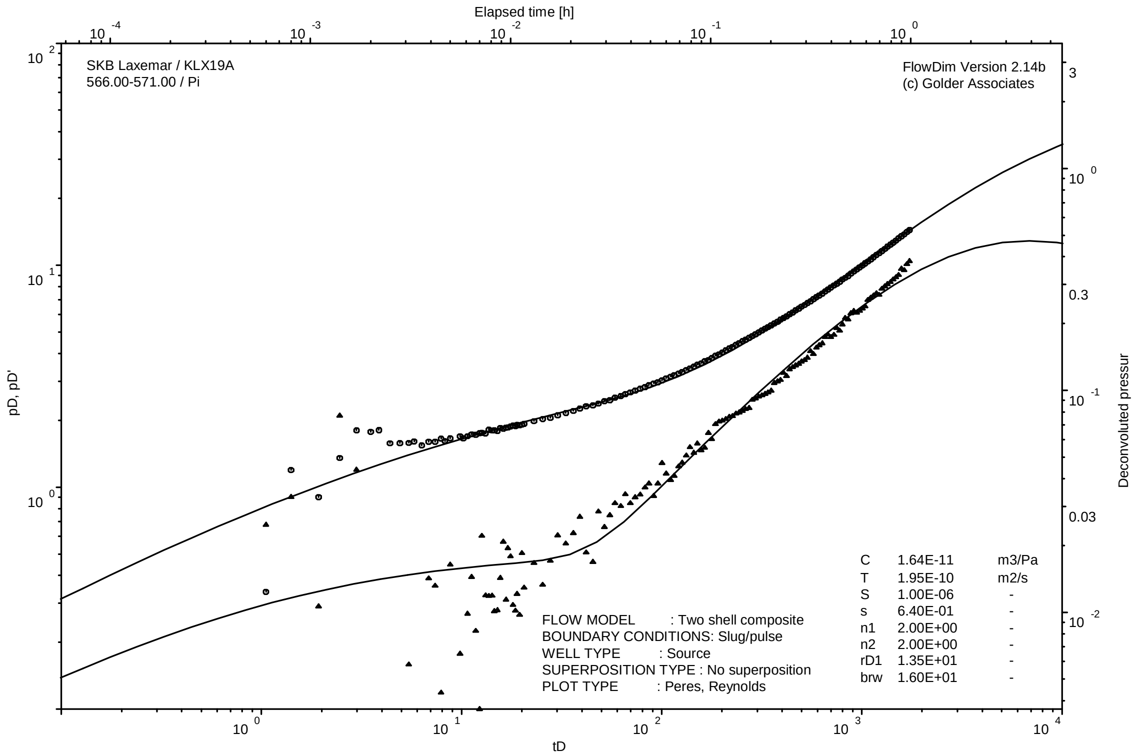
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

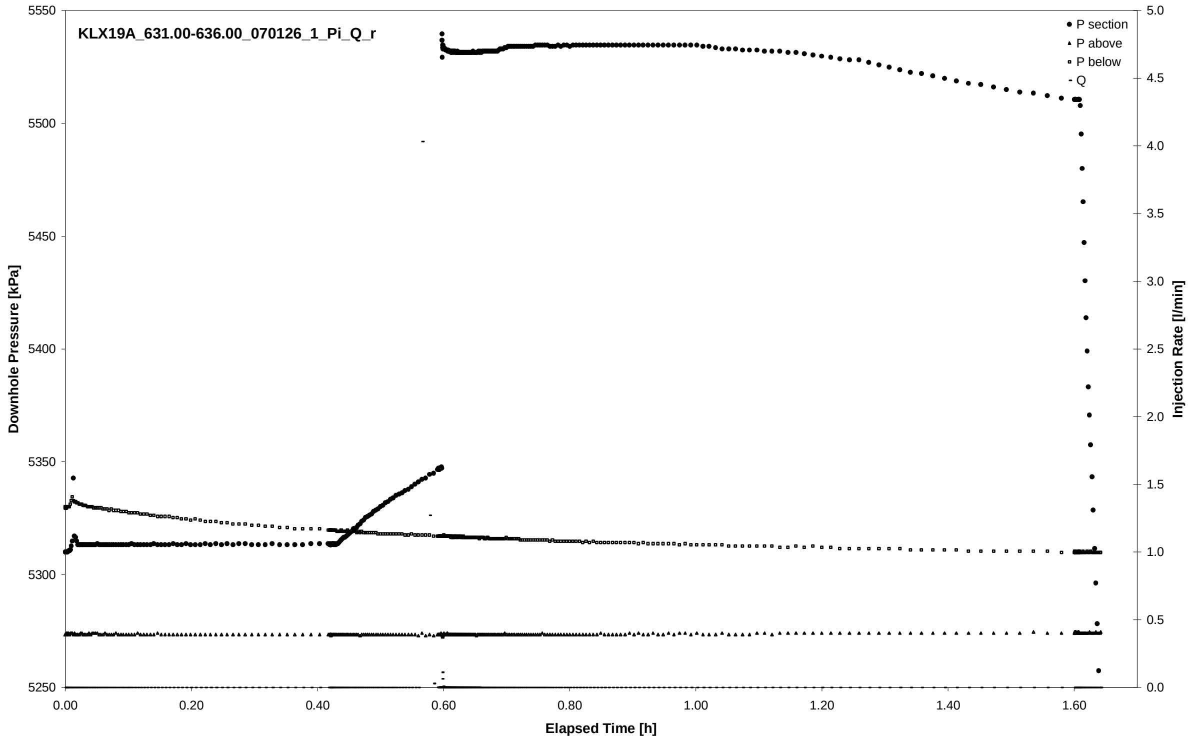


Pulse injection; deconvolution match

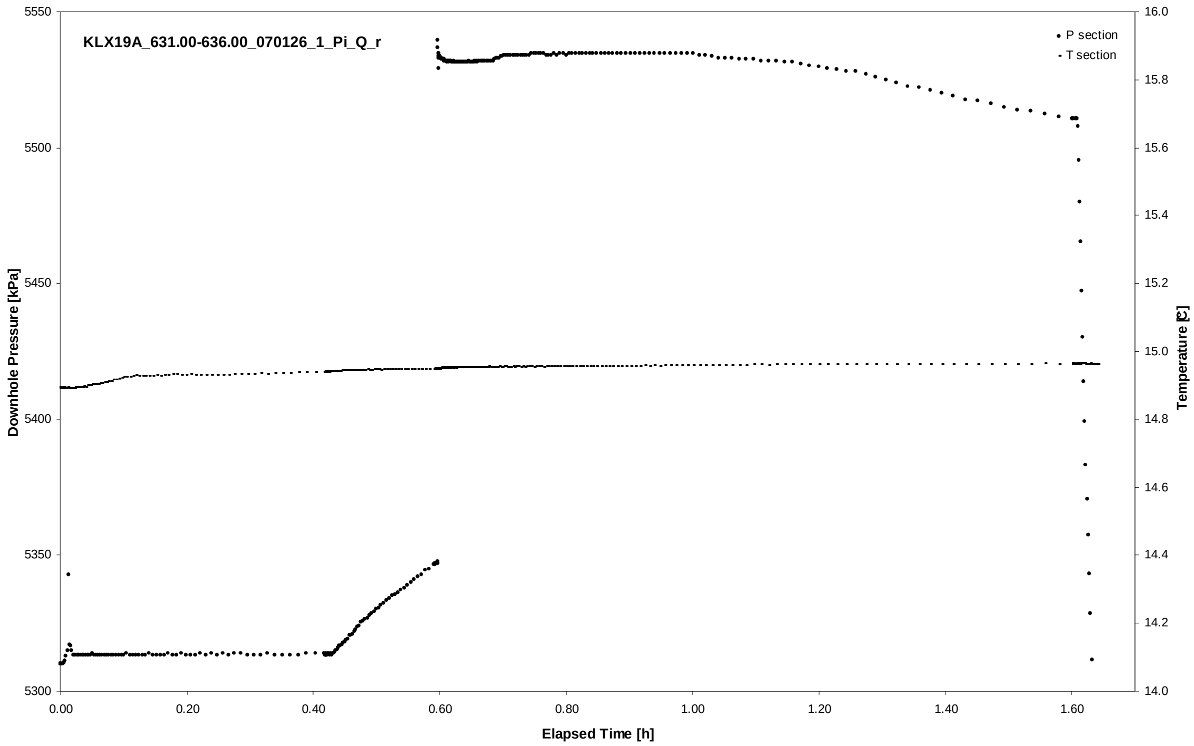
APPENDIX 2-51

Test 631.00 – 636.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

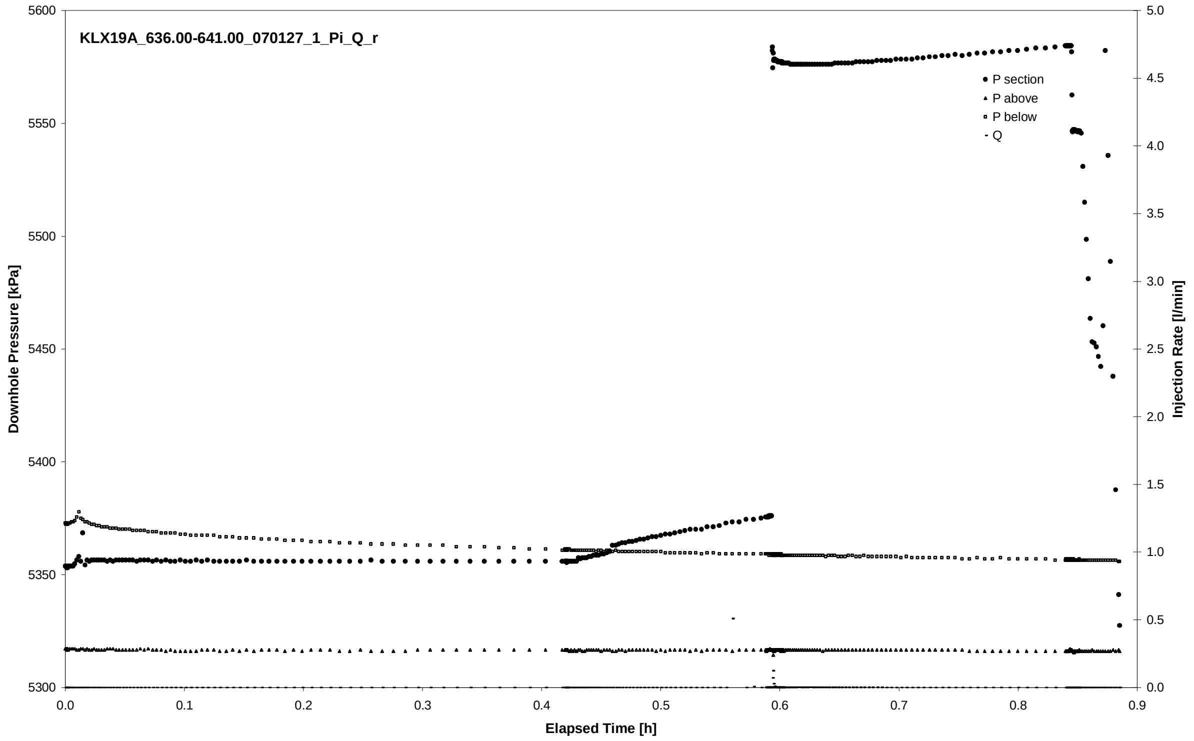
Not Analysed

CHIR phase; HORNER match

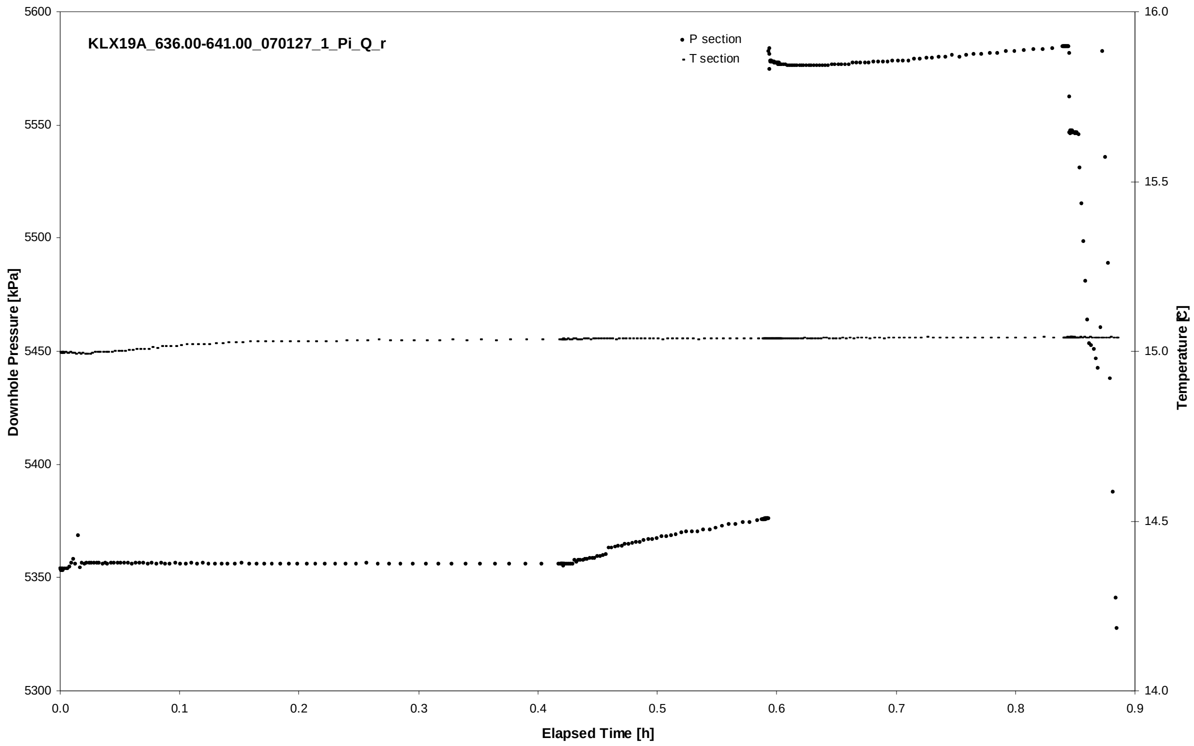
APPENDIX 2-52

Test 636.00 – 641.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

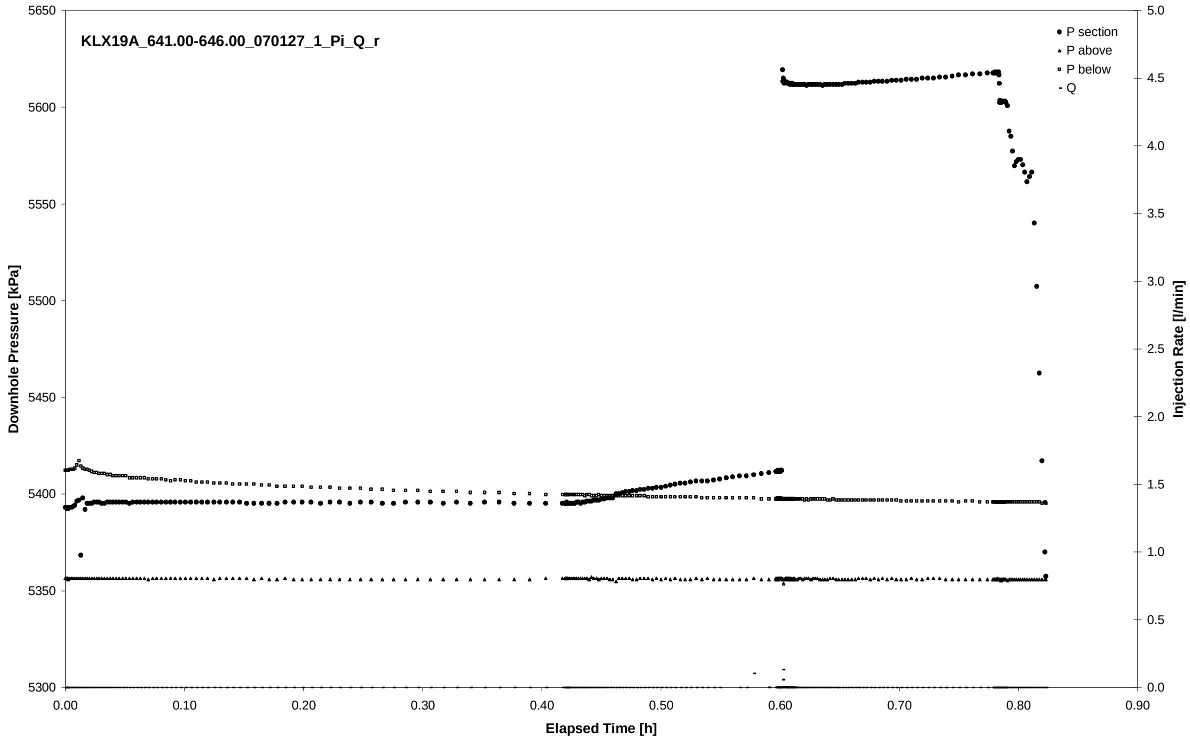
Not Analysed

CHIR phase; HORNER match

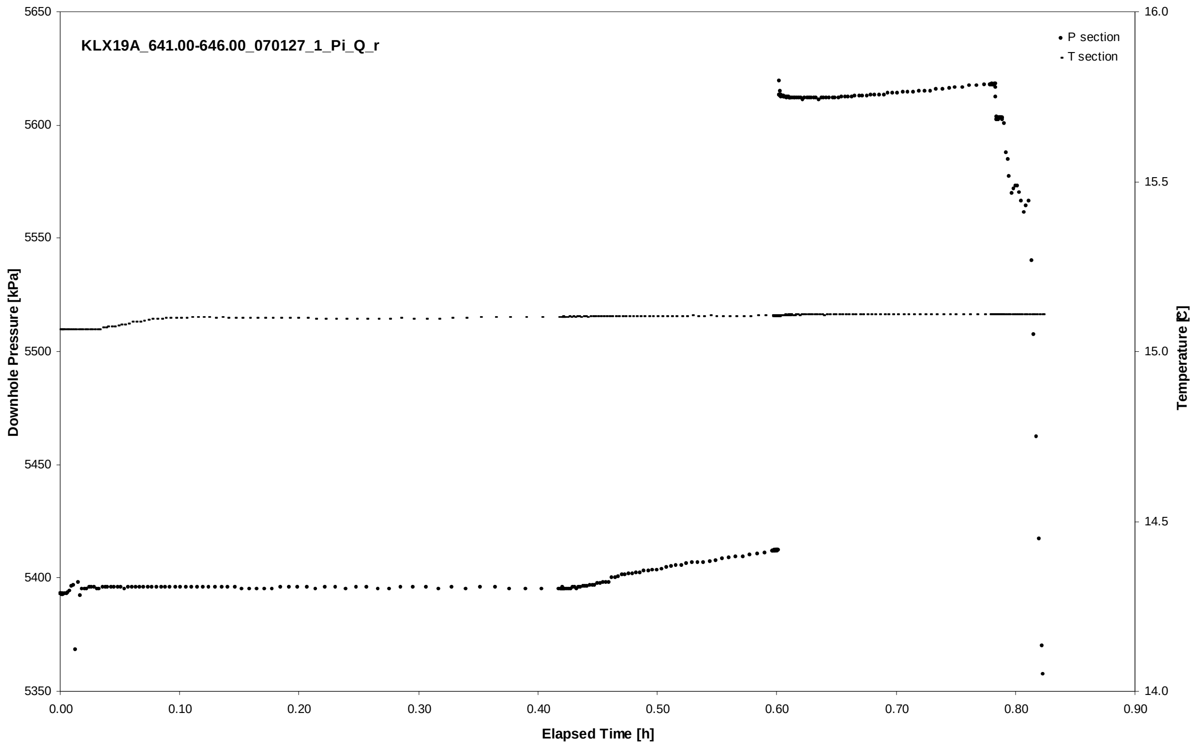
APPENDIX 2-53

Test 641.00 – 646.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

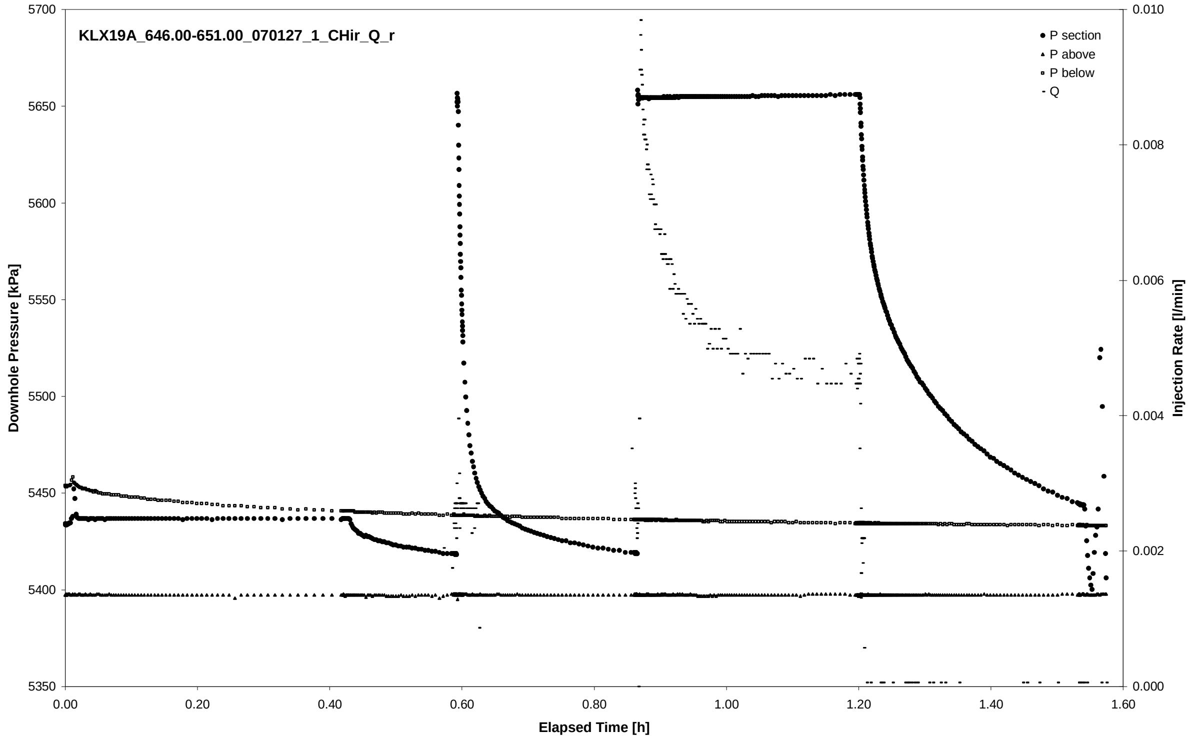
Not Analysed

CHIR phase; HORNER match

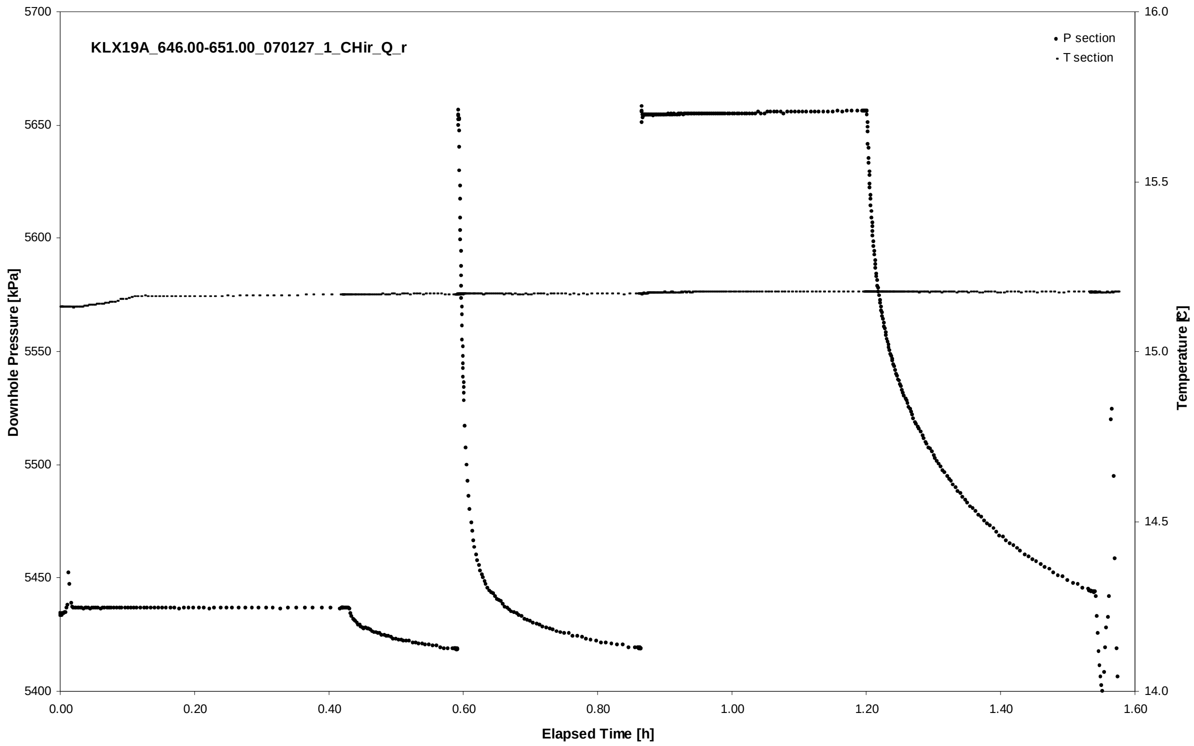
APPENDIX 2-54

Test 646.00 – 651.00 m

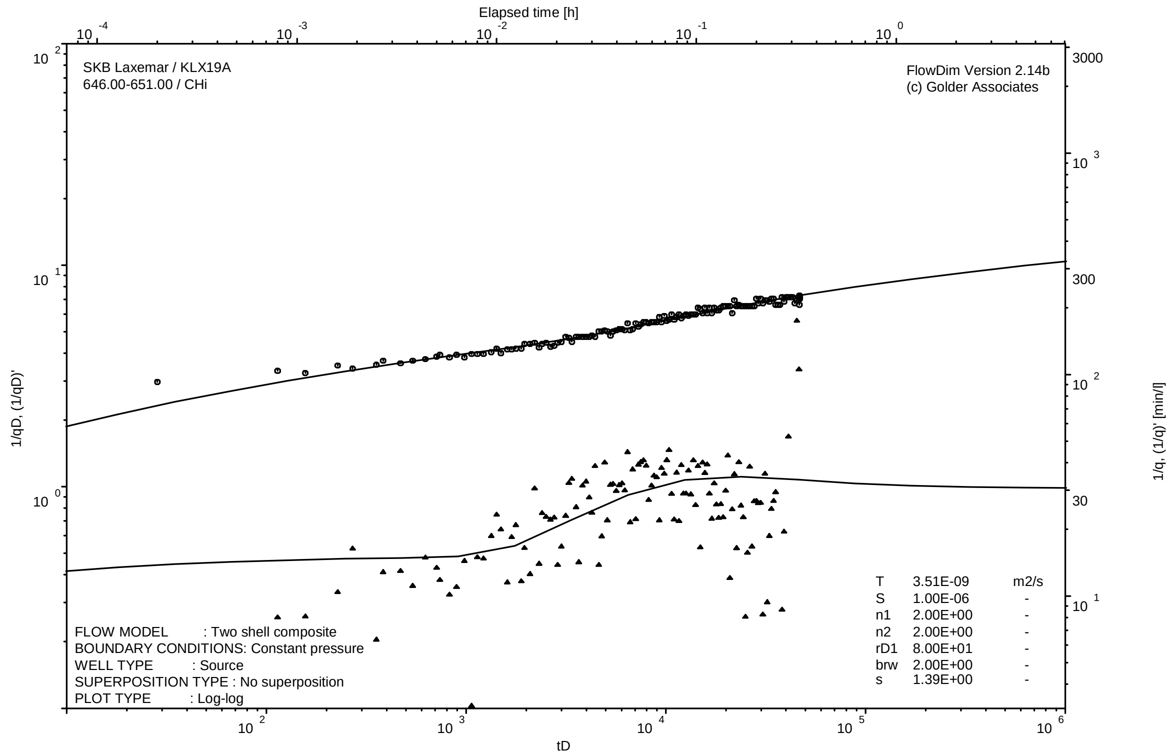
Analysis diagrams



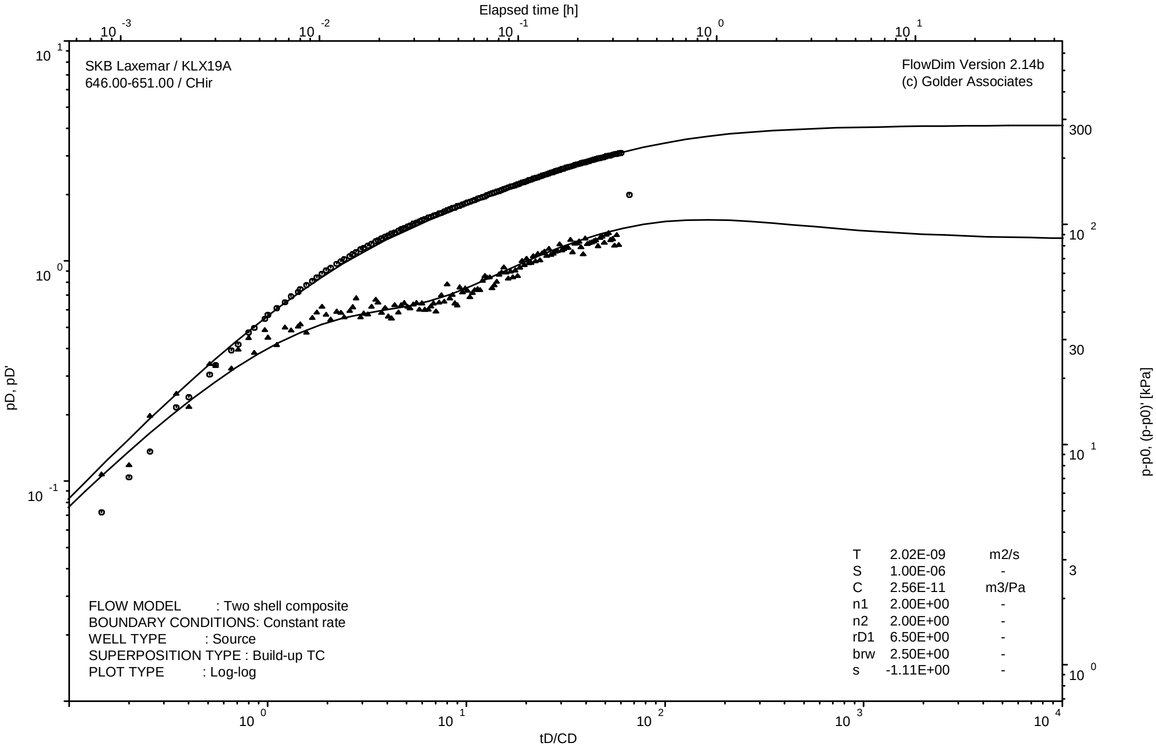
Pressure and flow rate vs. time; cartesian plot



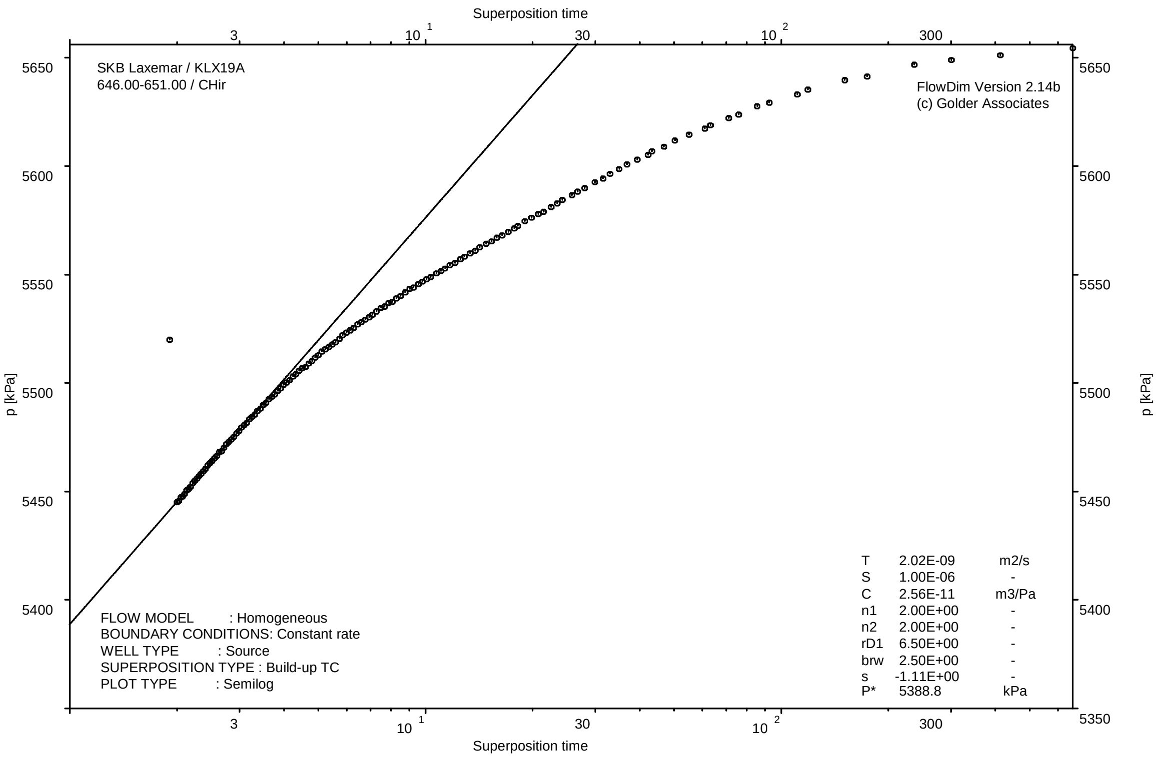
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

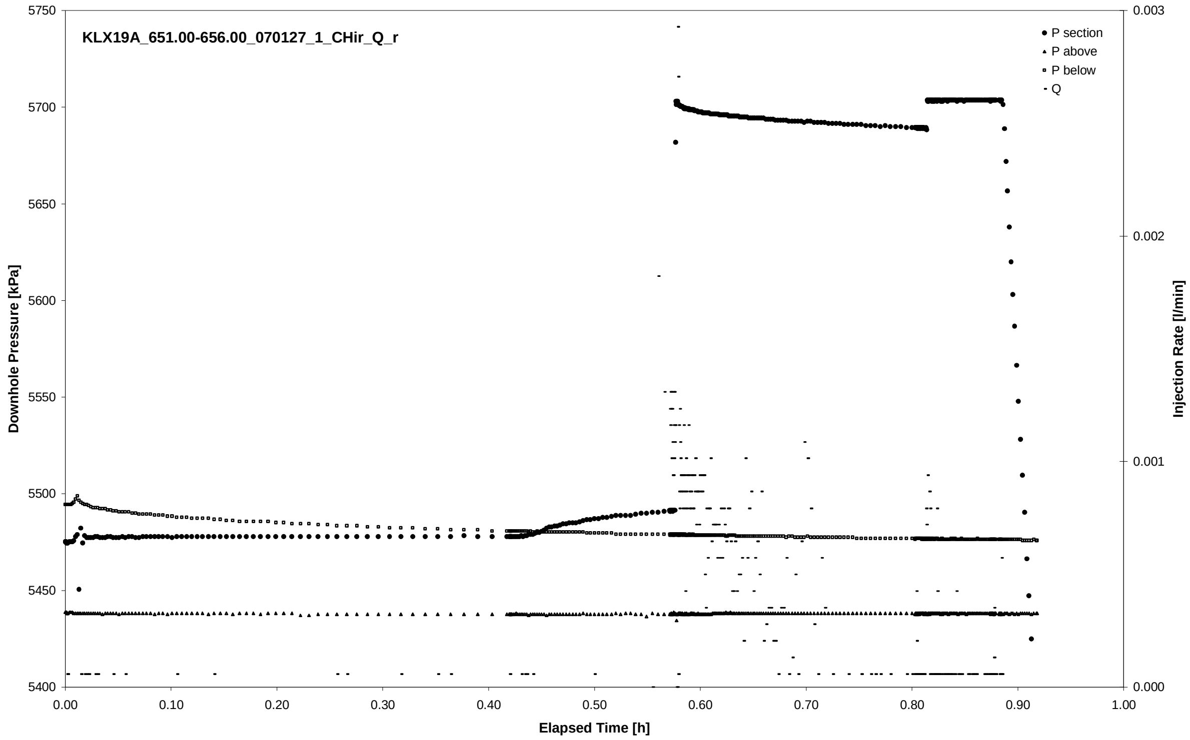


CHIR phase; HORNER match

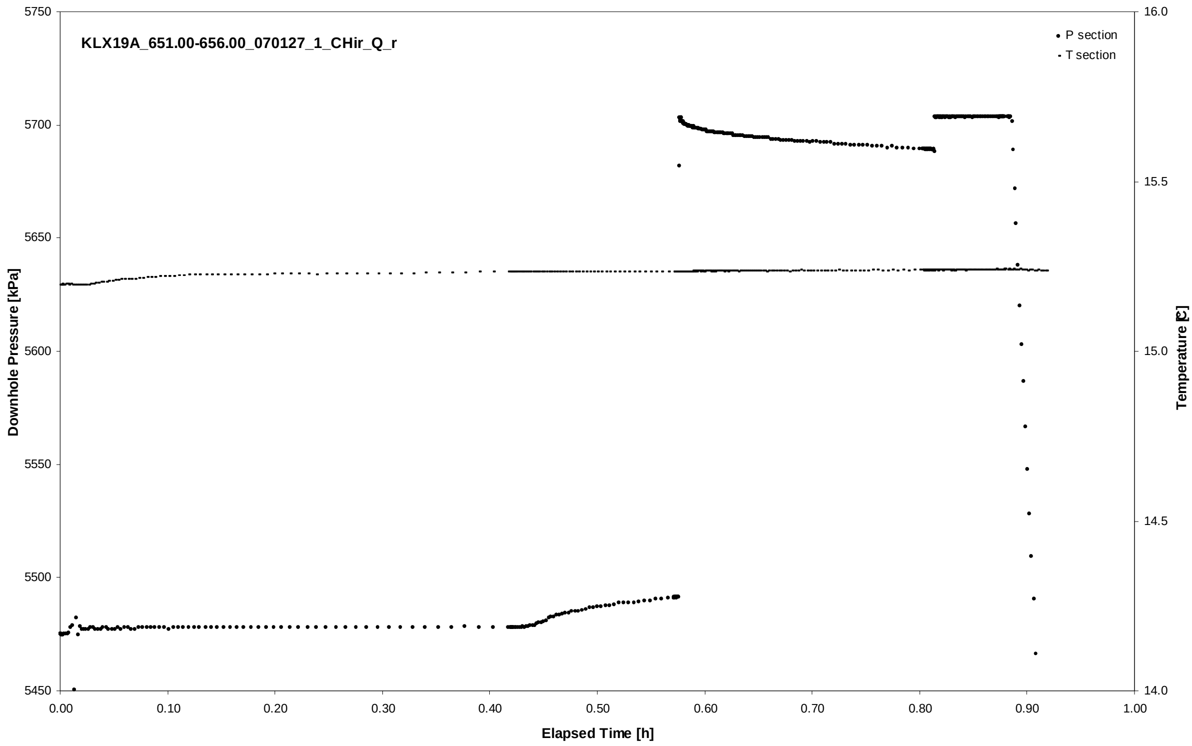
APPENDIX 2-55

Test 651.00 – 656.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

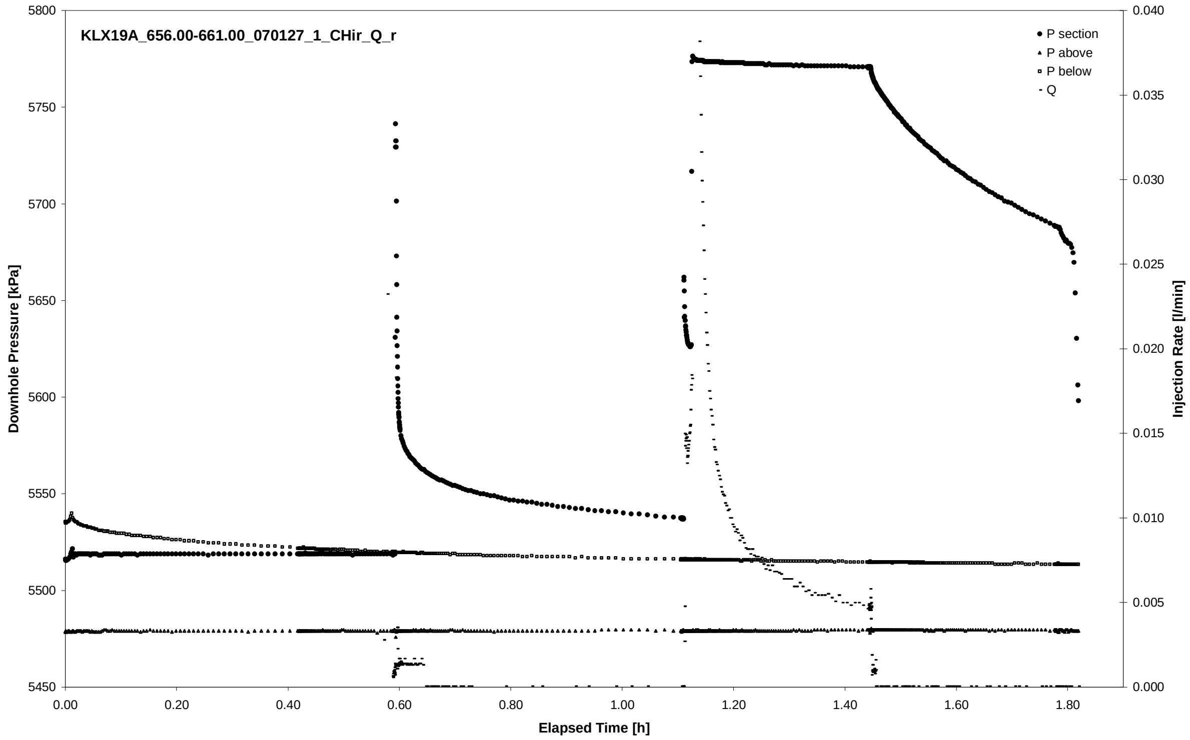
Not Analysed

CHIR phase; HORNER match

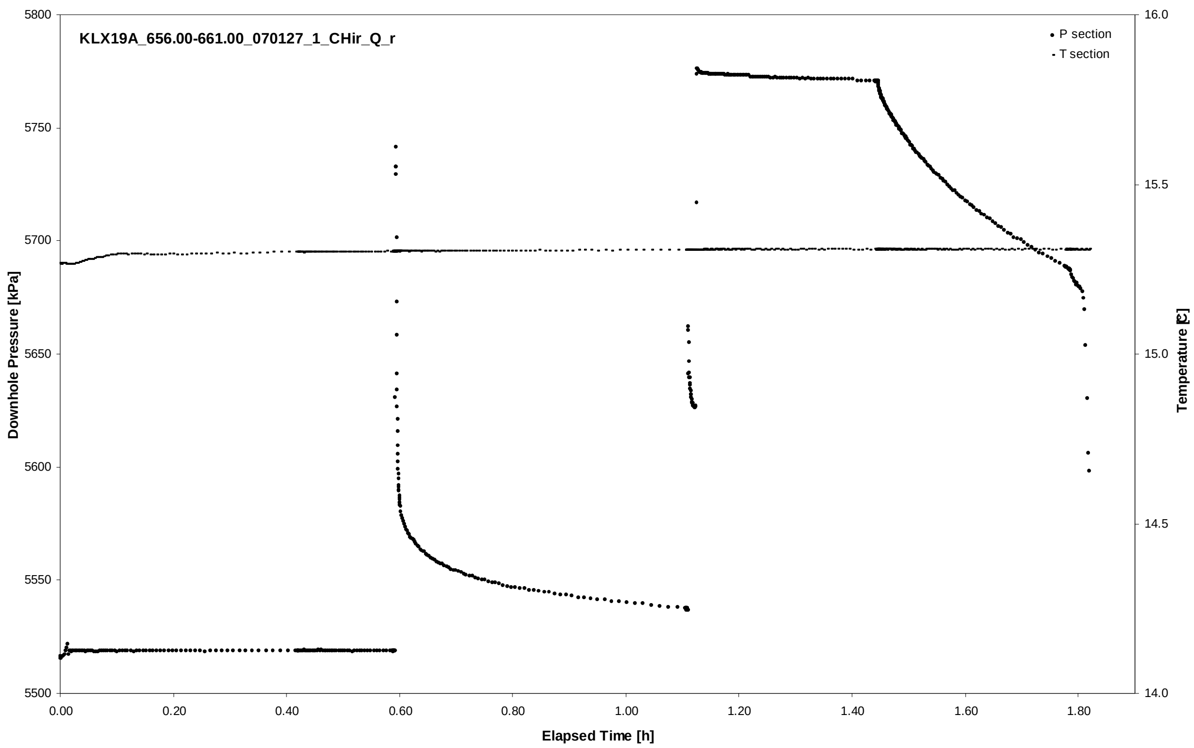
APPENDIX 2-56

Test 656.00 – 661.00 m

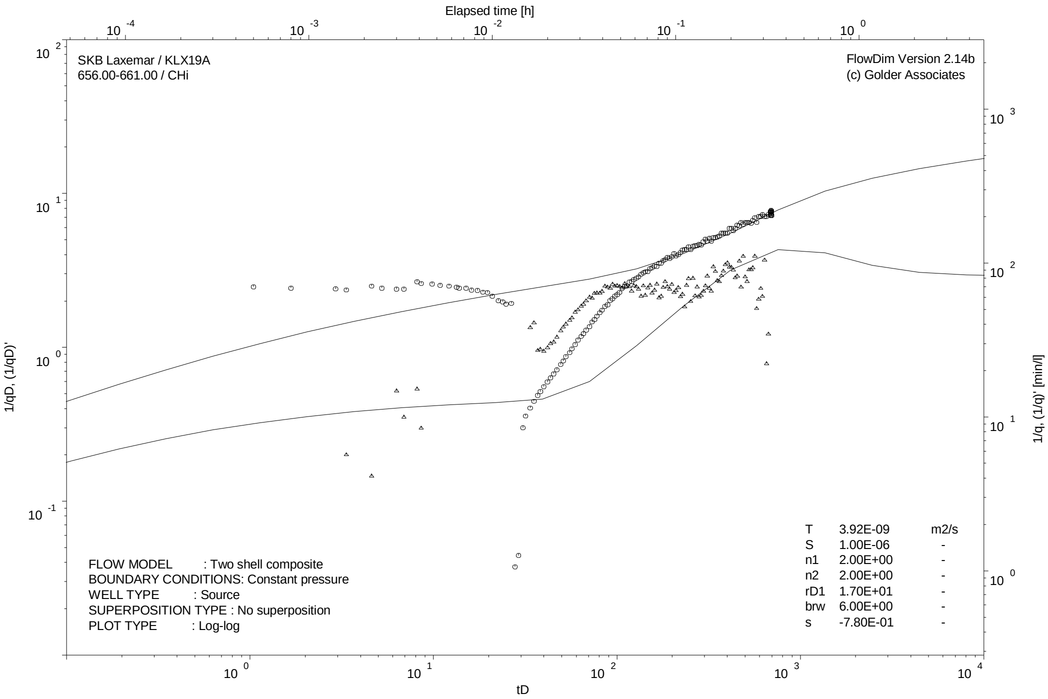
Analysis diagrams



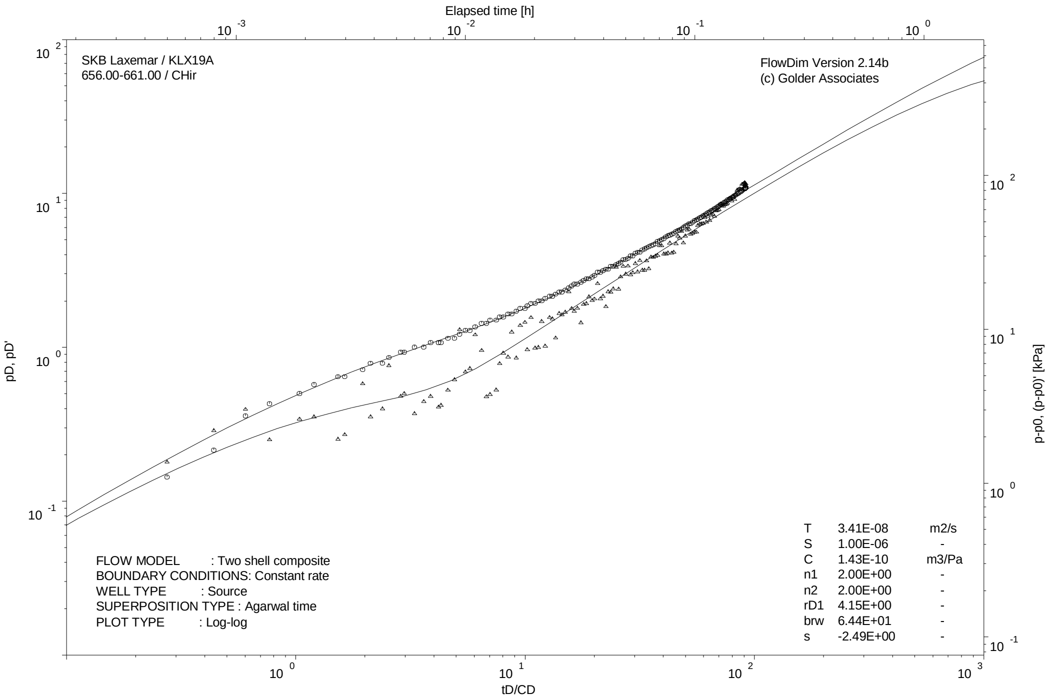
Pressure and flow rate vs. time; cartesian plot



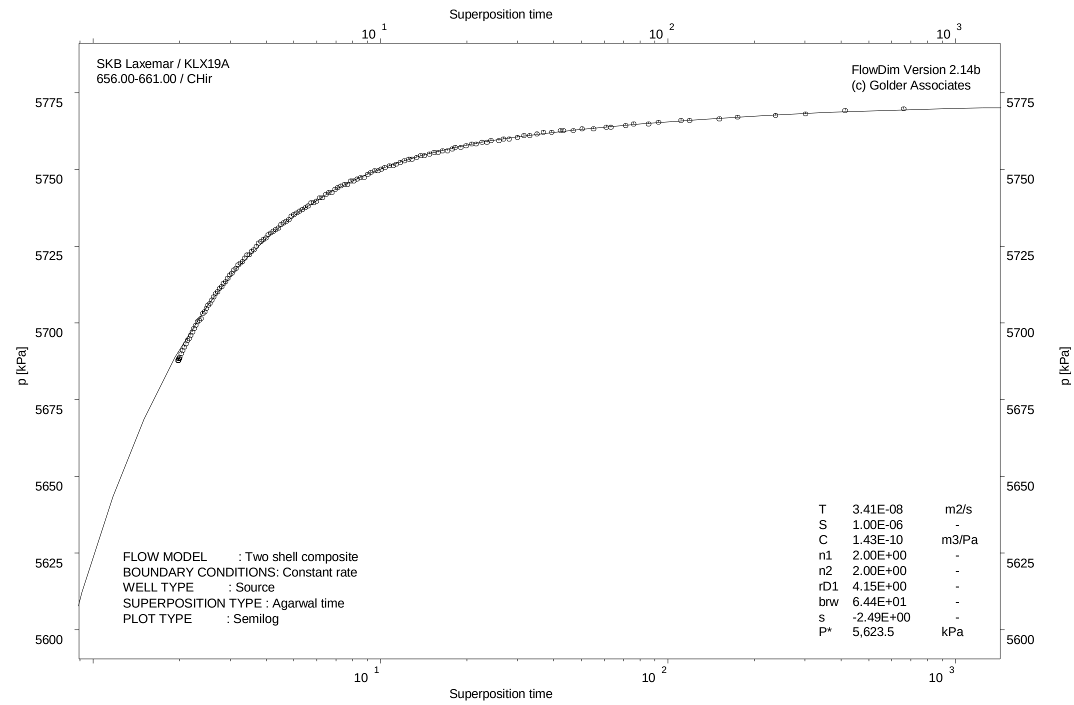
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

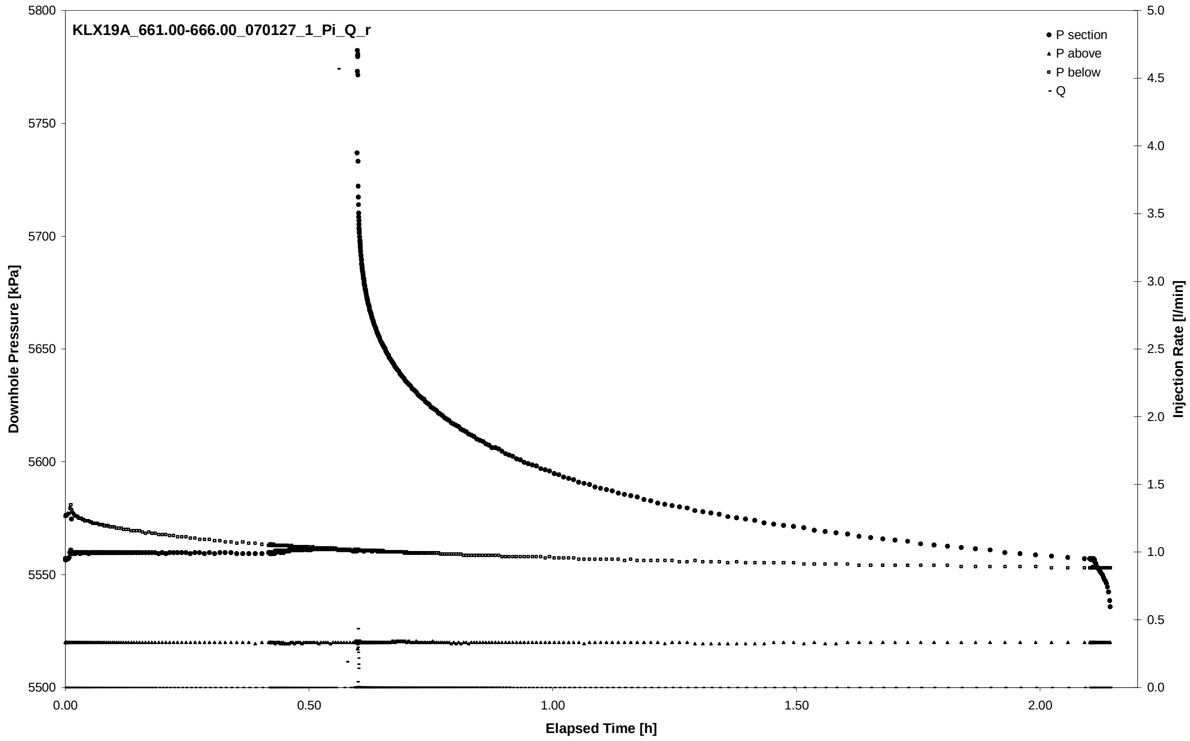


CHIR phase; HORNER match

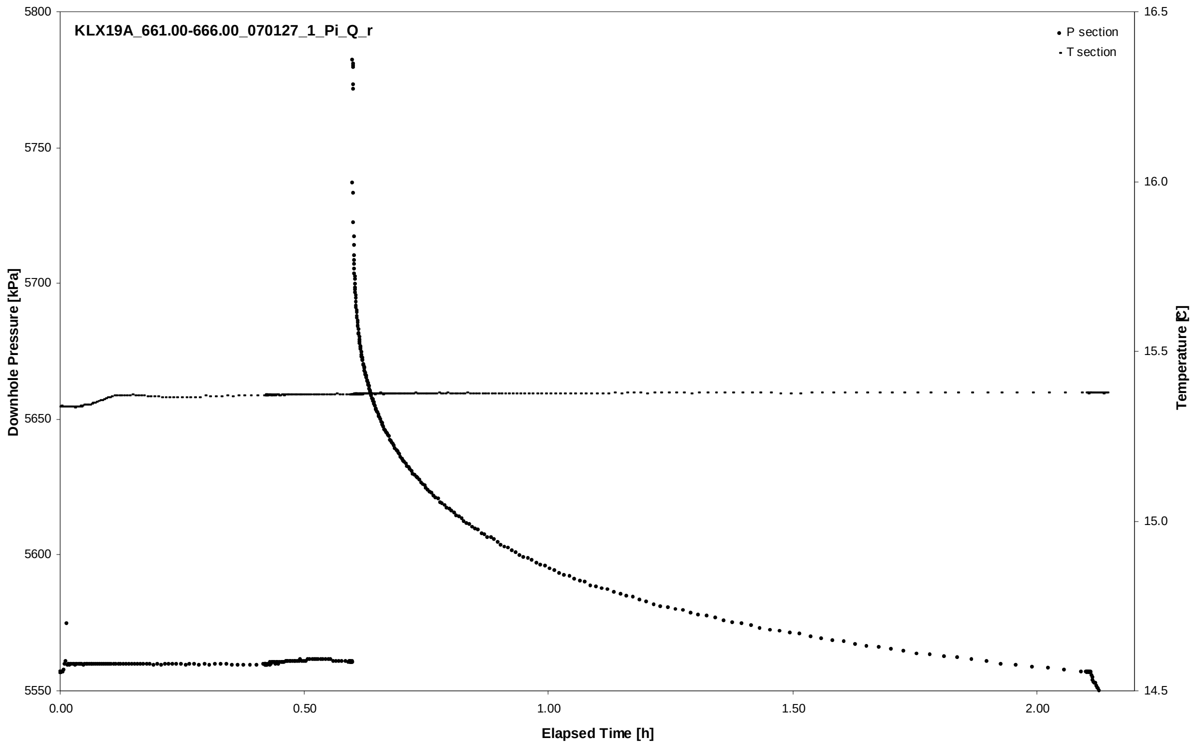
APPENDIX 2-57

Test 661.00 – 666.00 m

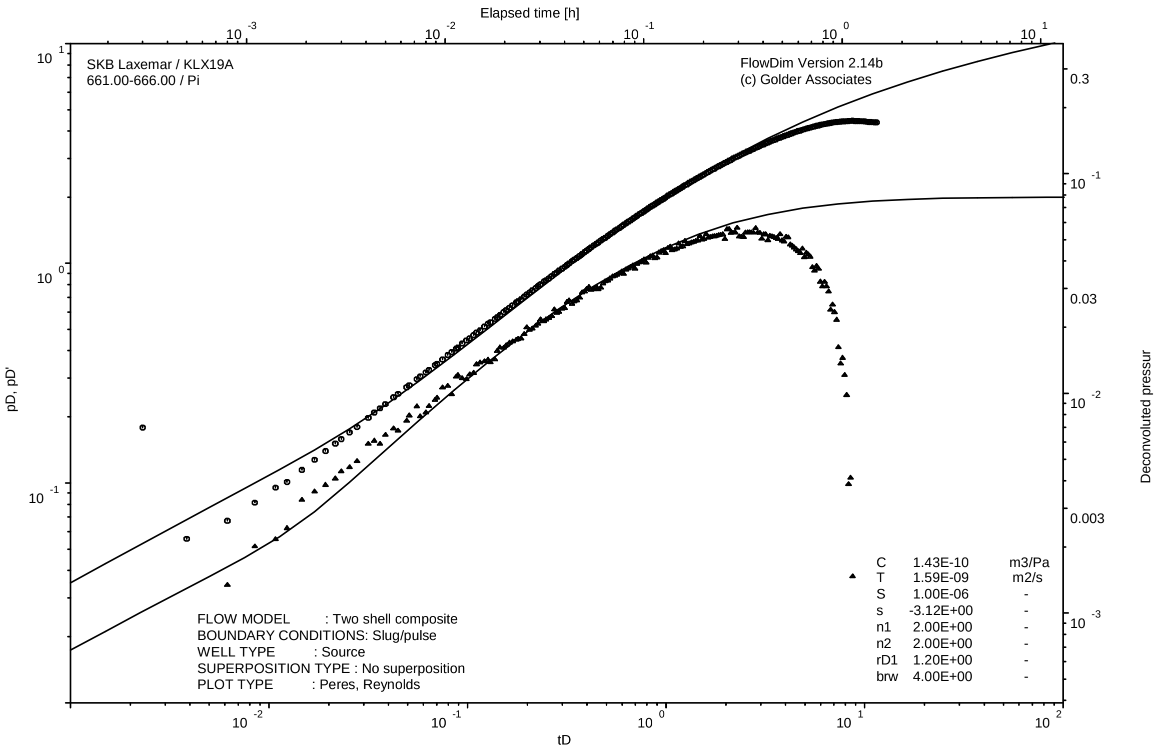
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

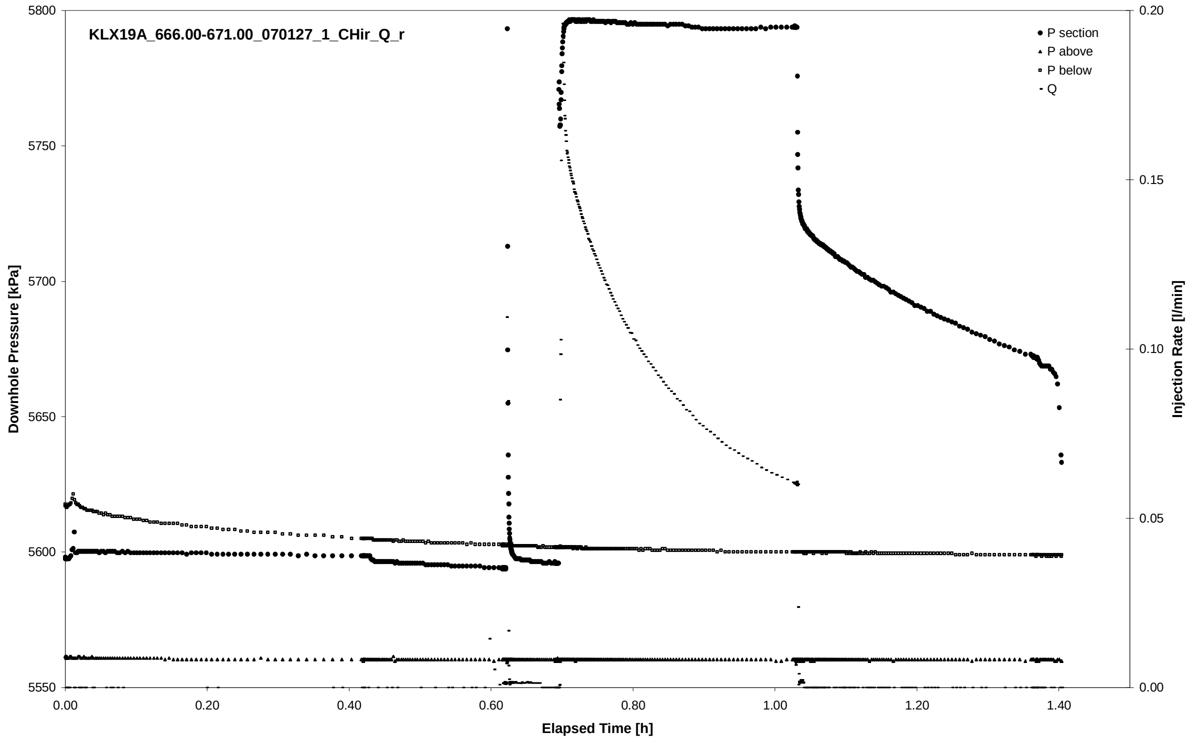


Pulse injection; deconvolution match

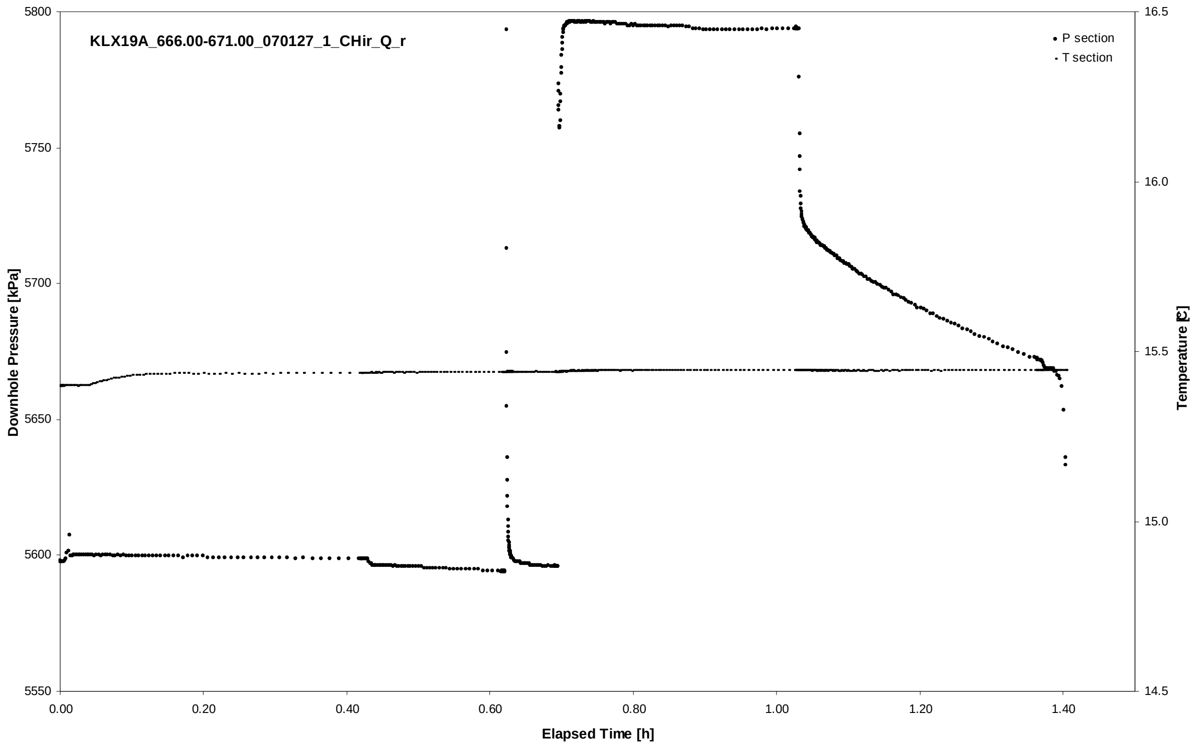
APPENDIX 2-58

Test 666.00 – 671.00 m

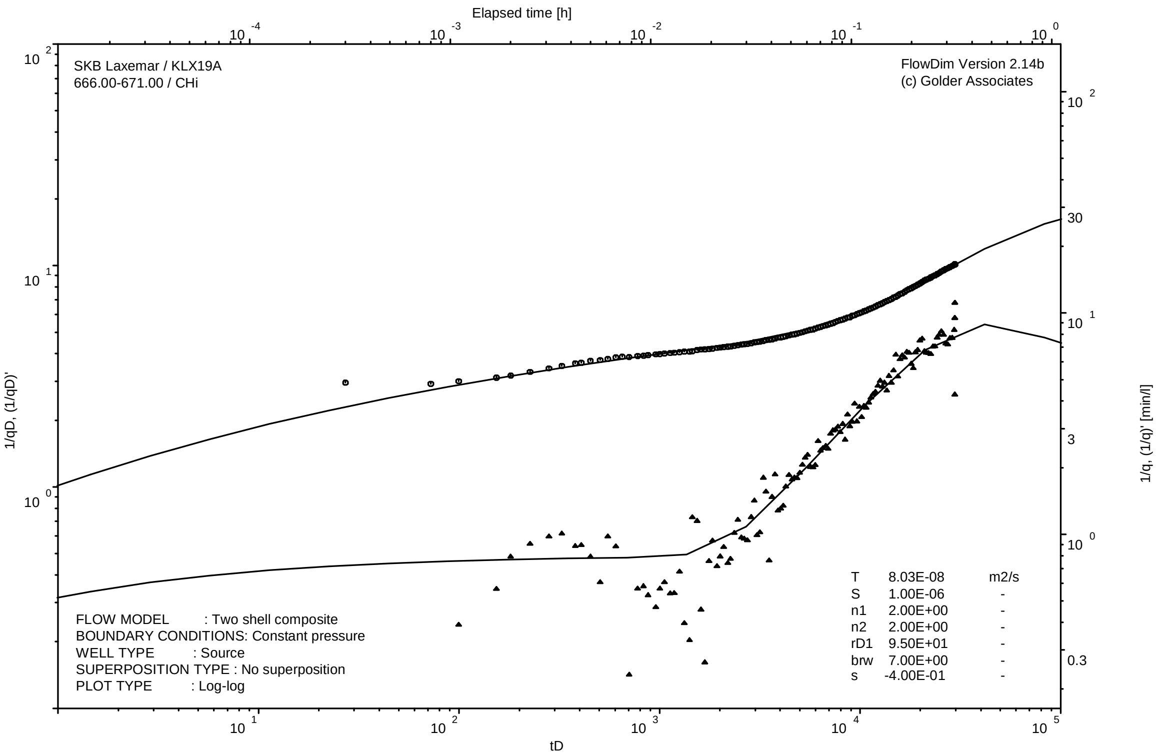
Analysis diagrams



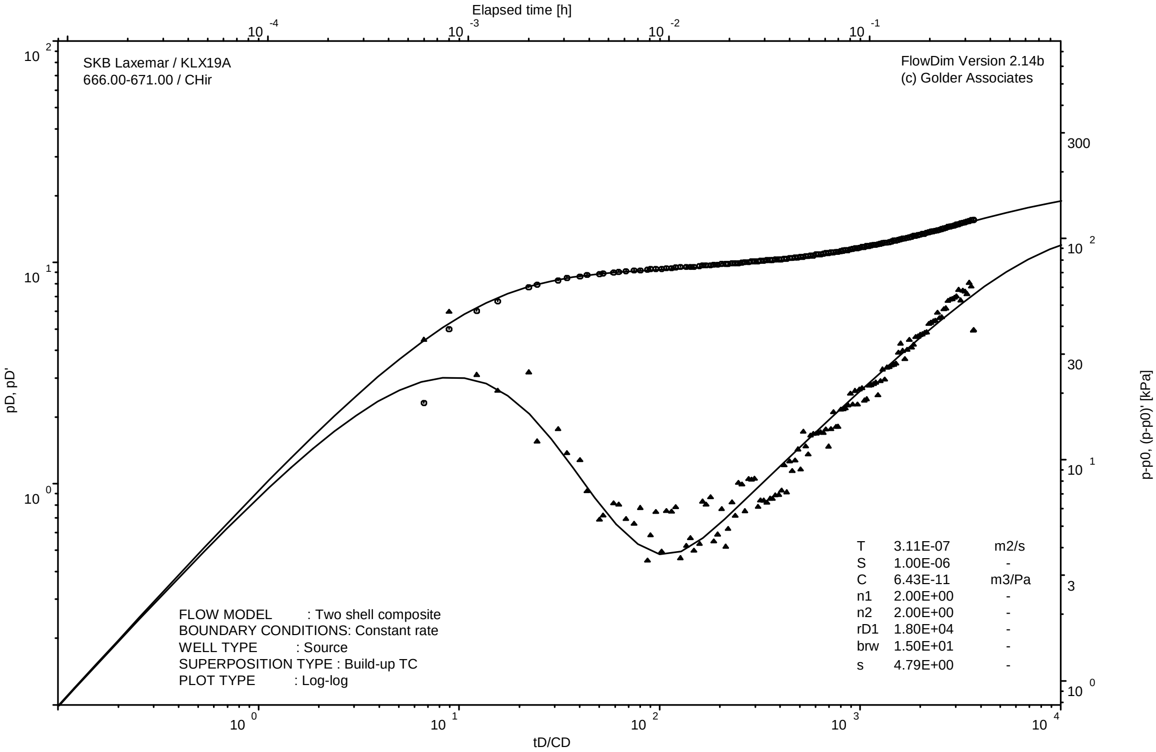
Pressure and flow rate vs. time; cartesian plot



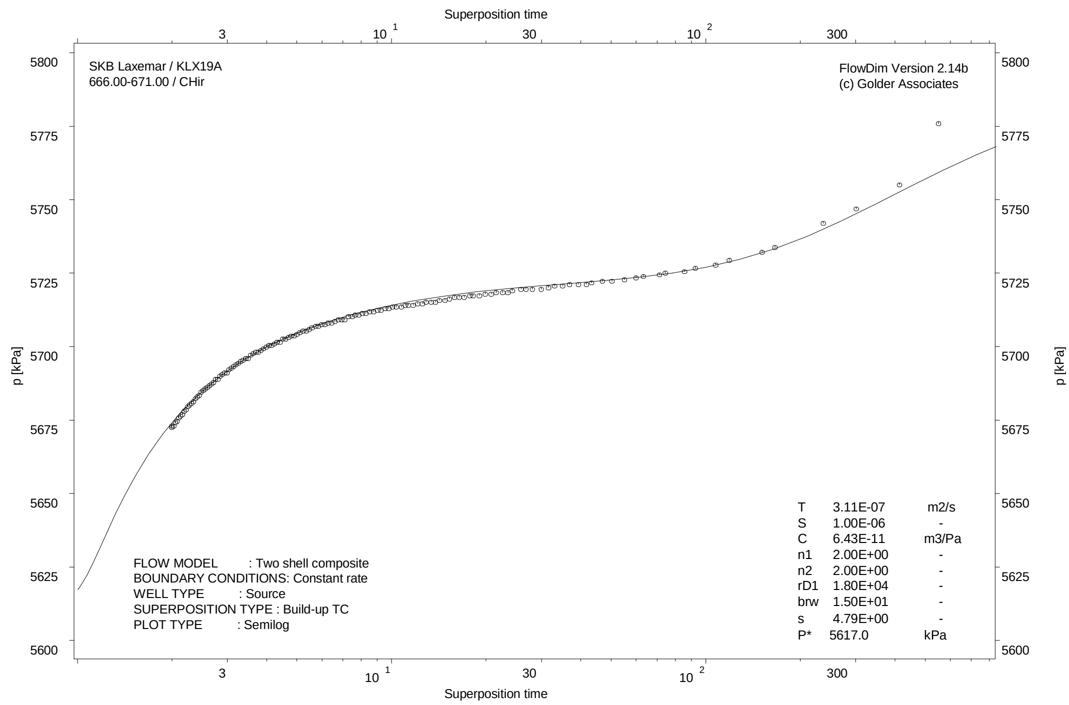
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

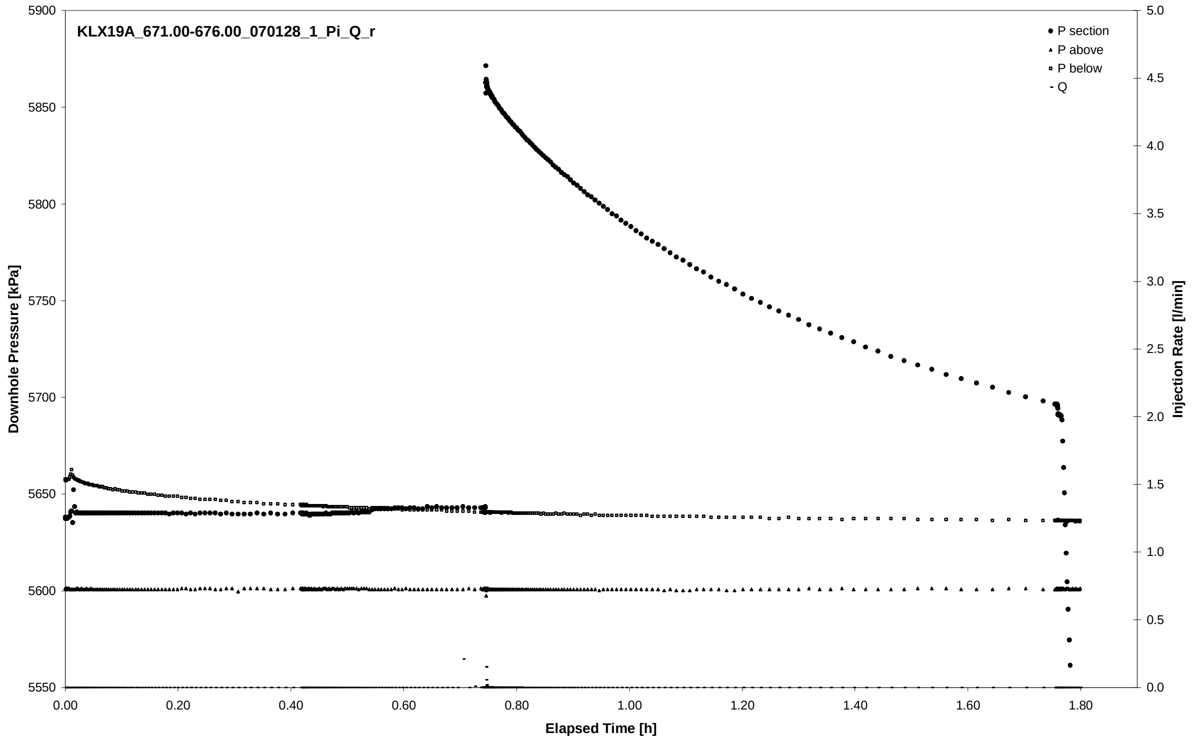


CHIR phase; HORNER match

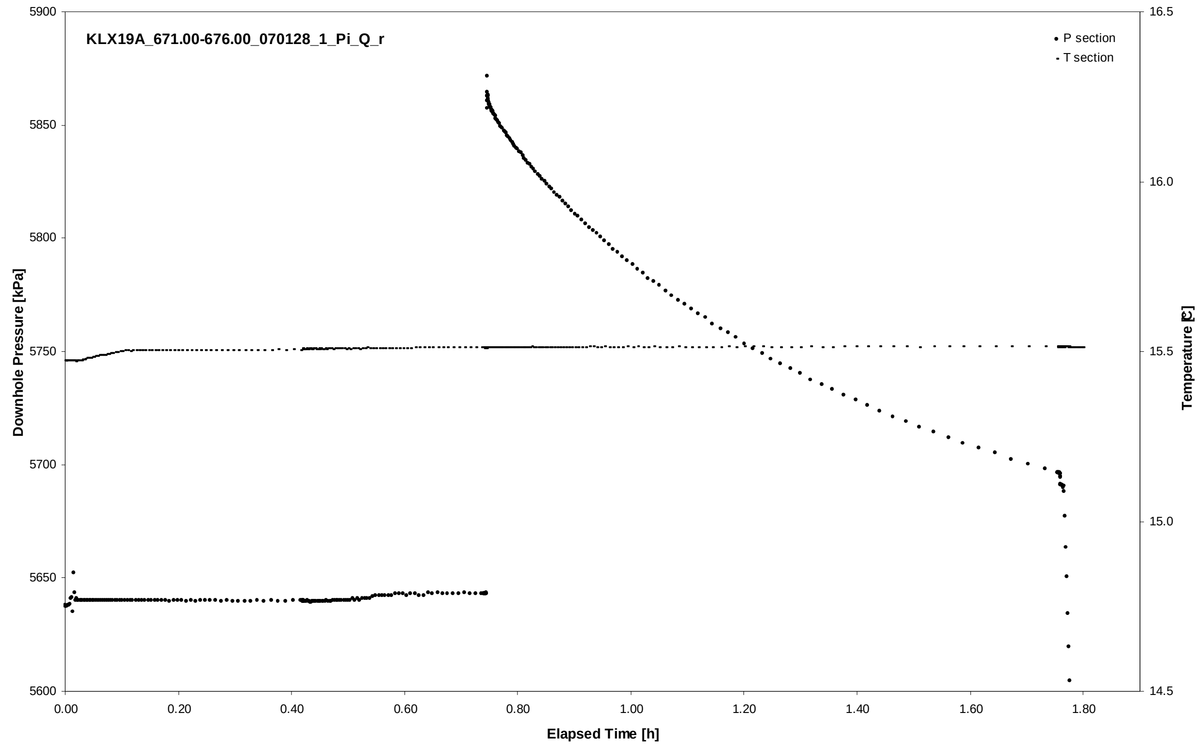
APPENDIX 2-59

Test 671.00 – 676.00 m

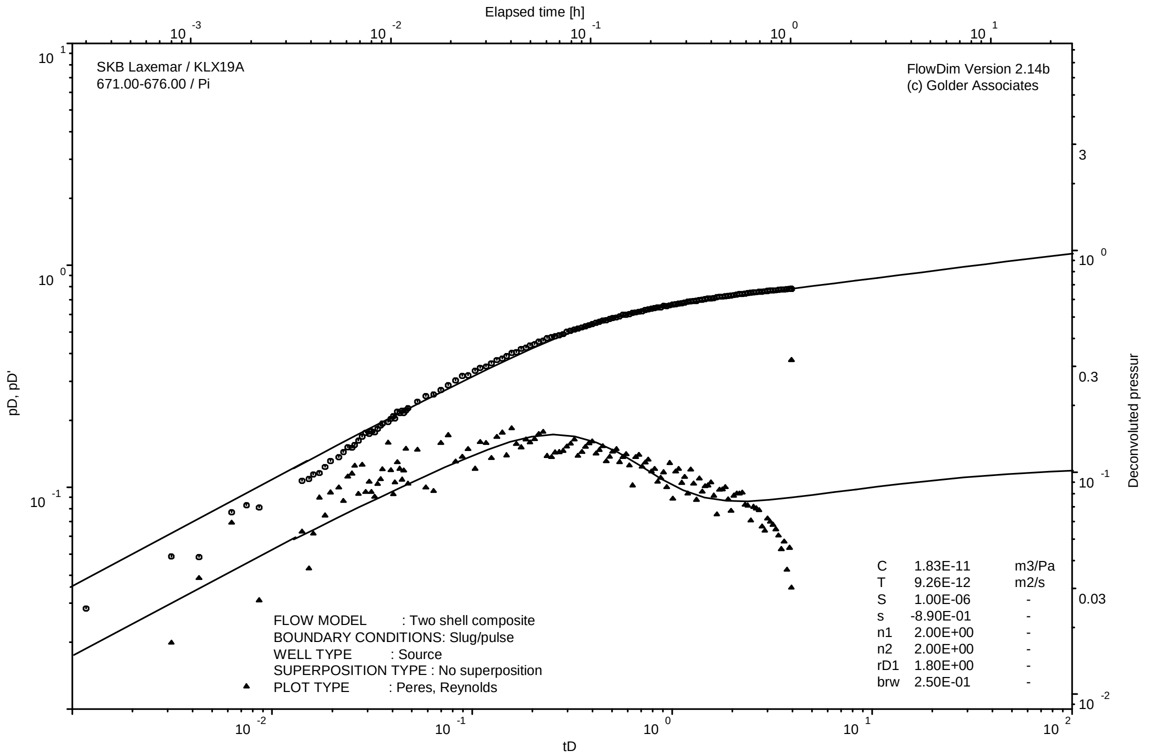
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

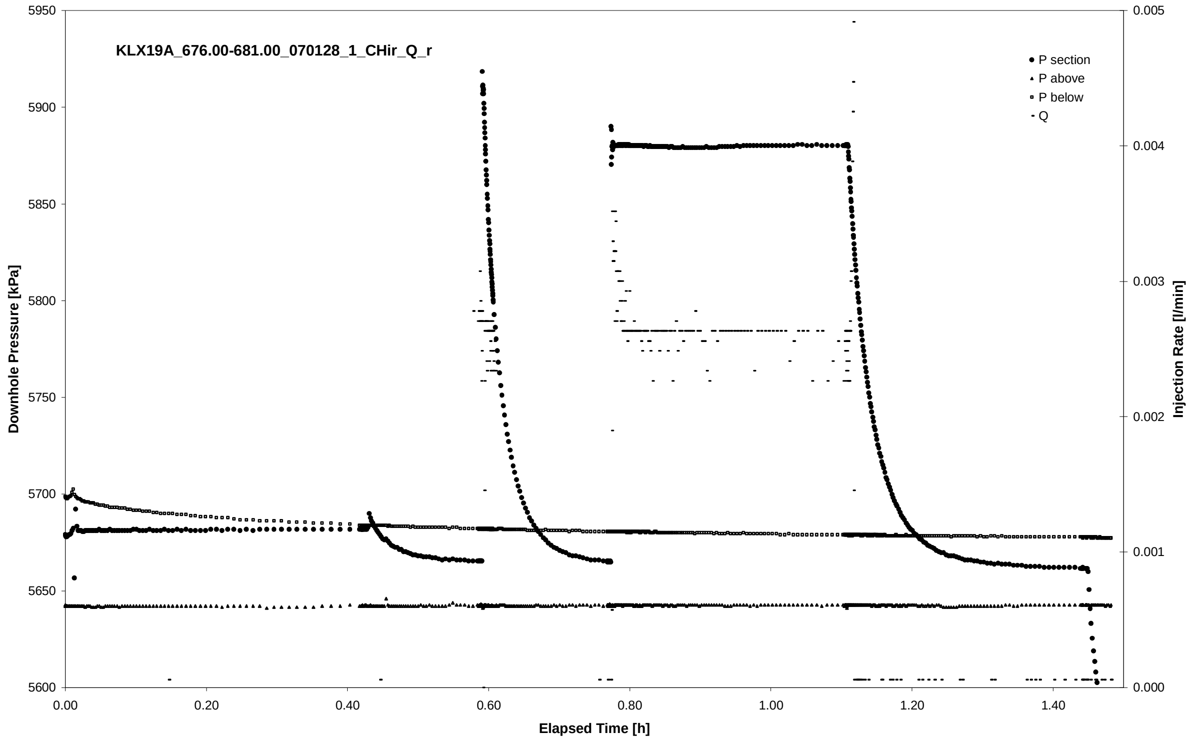


Pulse injection; deconvolution match

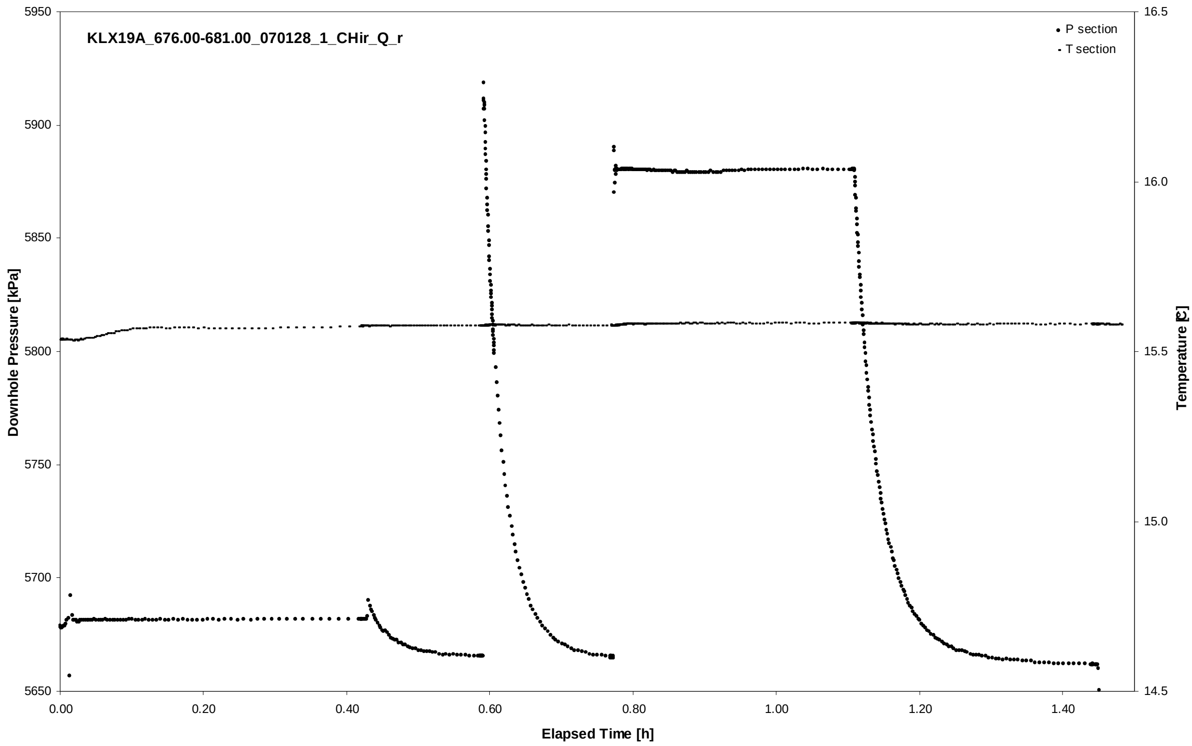
APPENDIX 2-60

Test 676.00 – 681.00 m

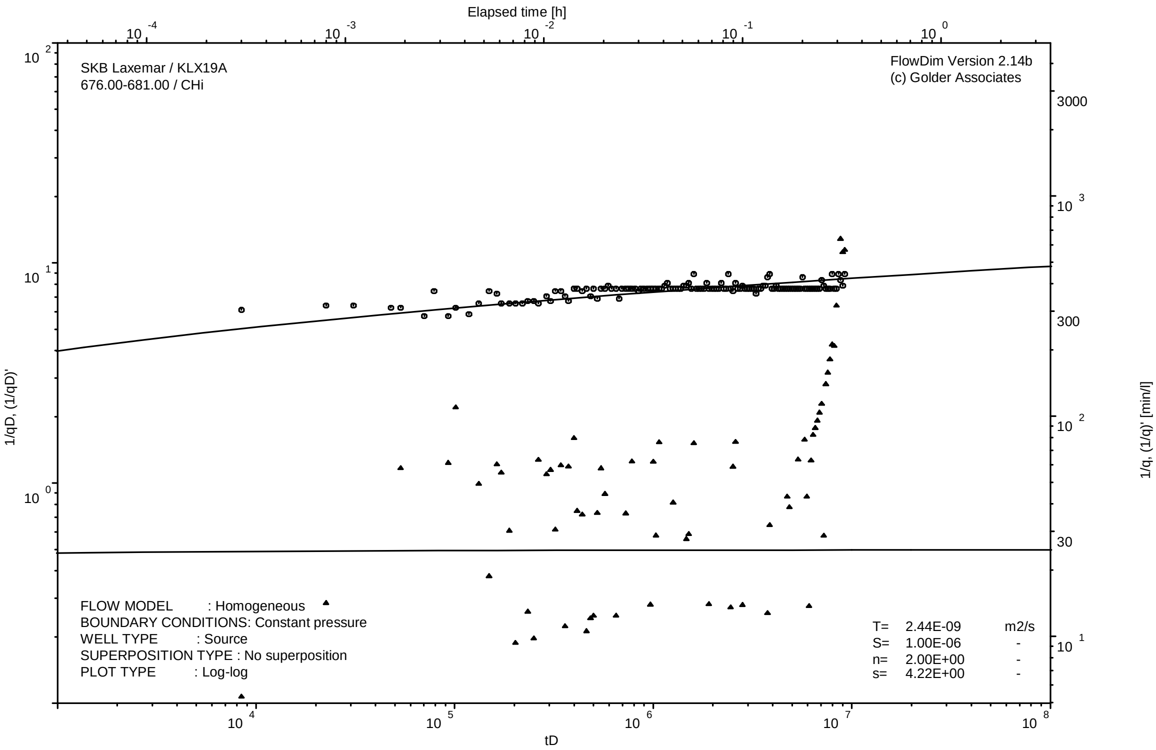
Analysis diagrams



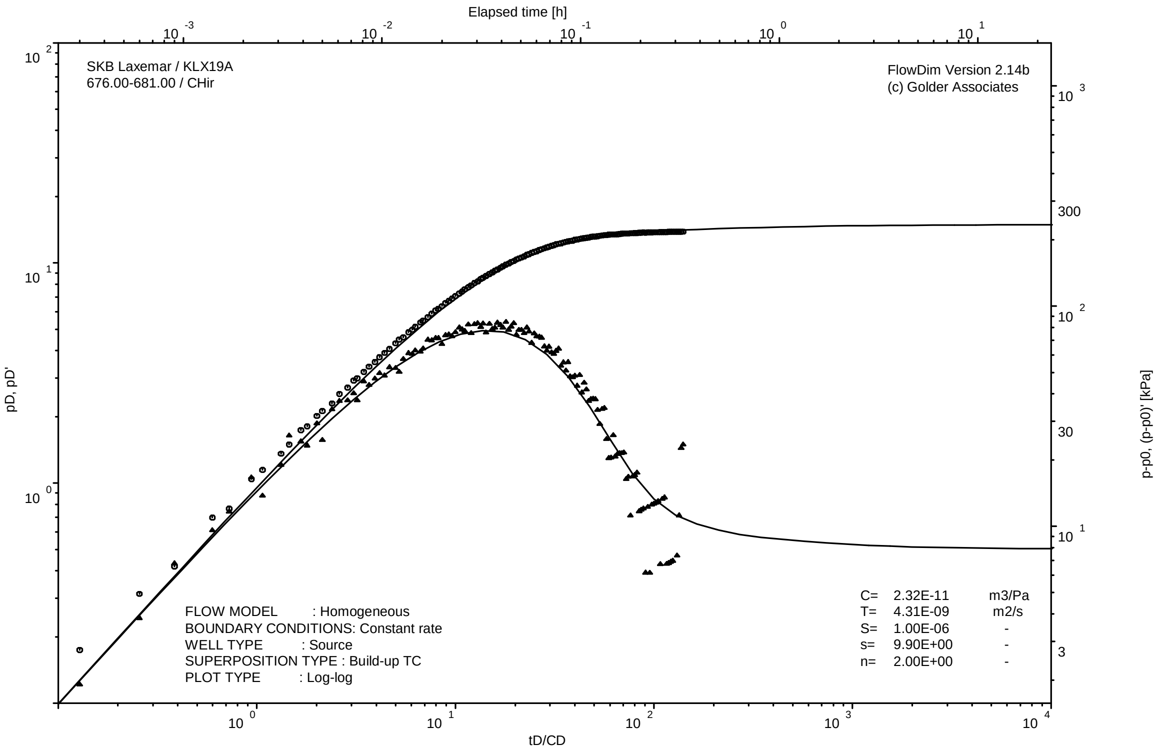
Pressure and flow rate vs. time; cartesian plot



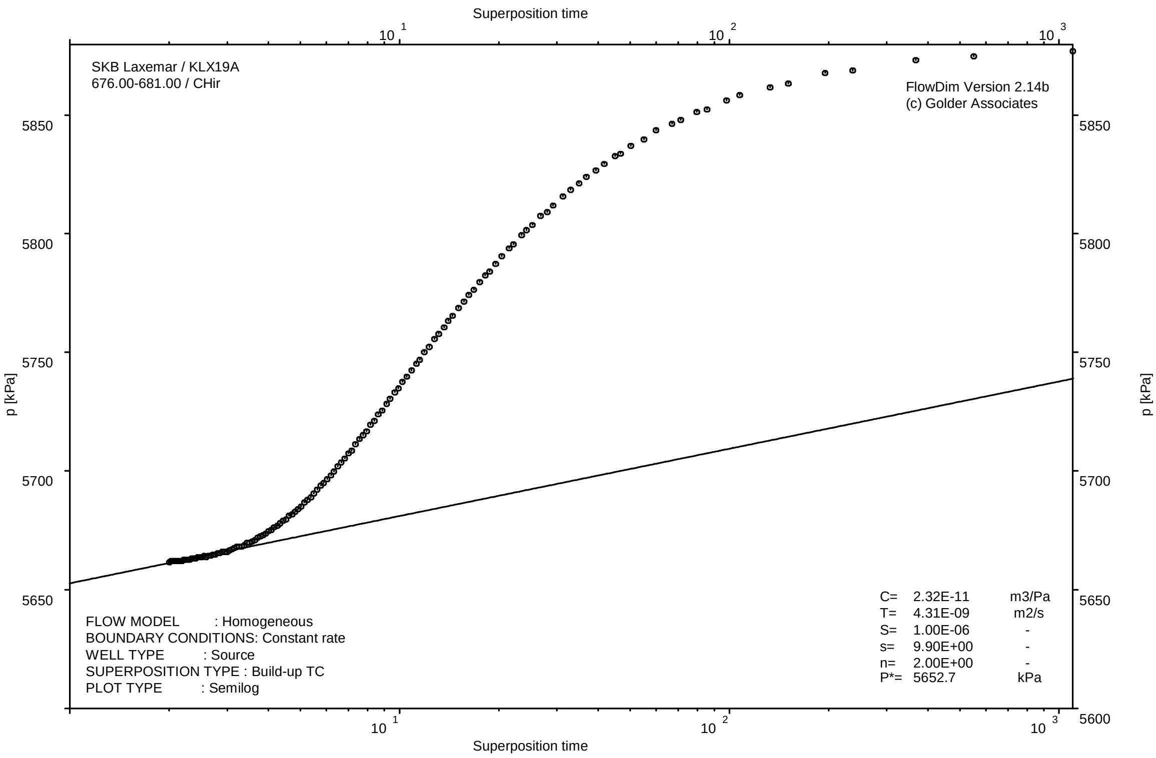
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

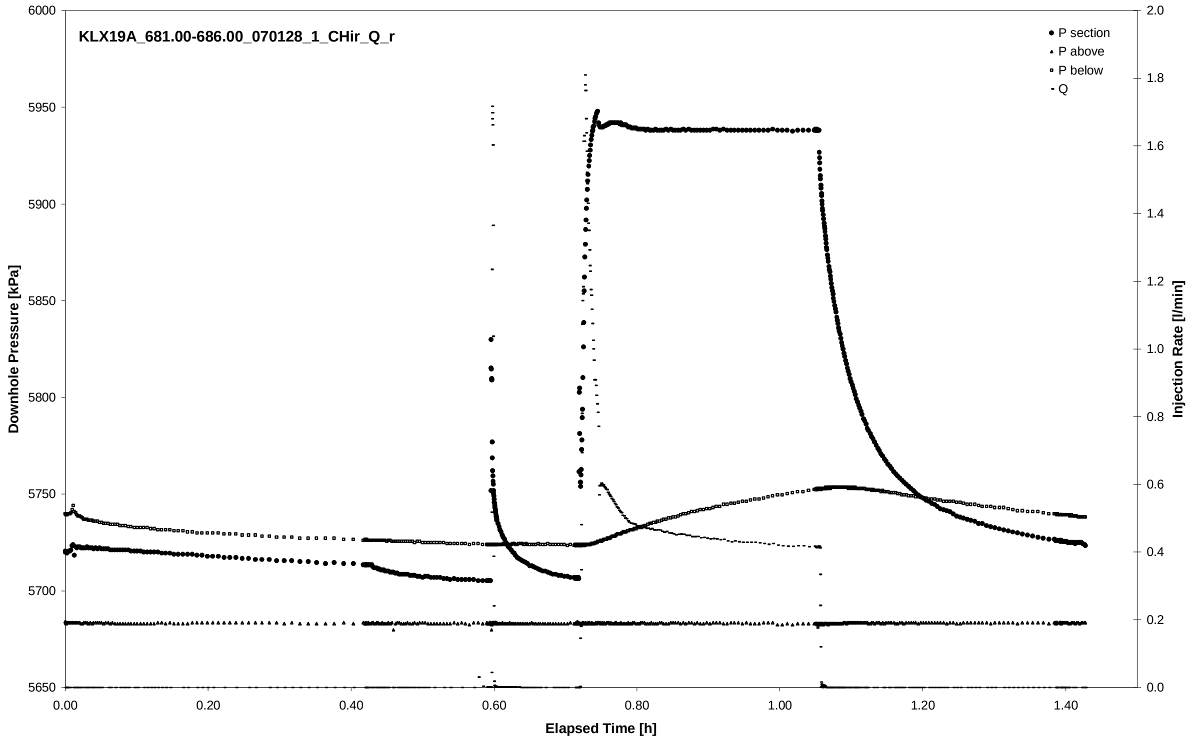


CHIR phase; HORNER match

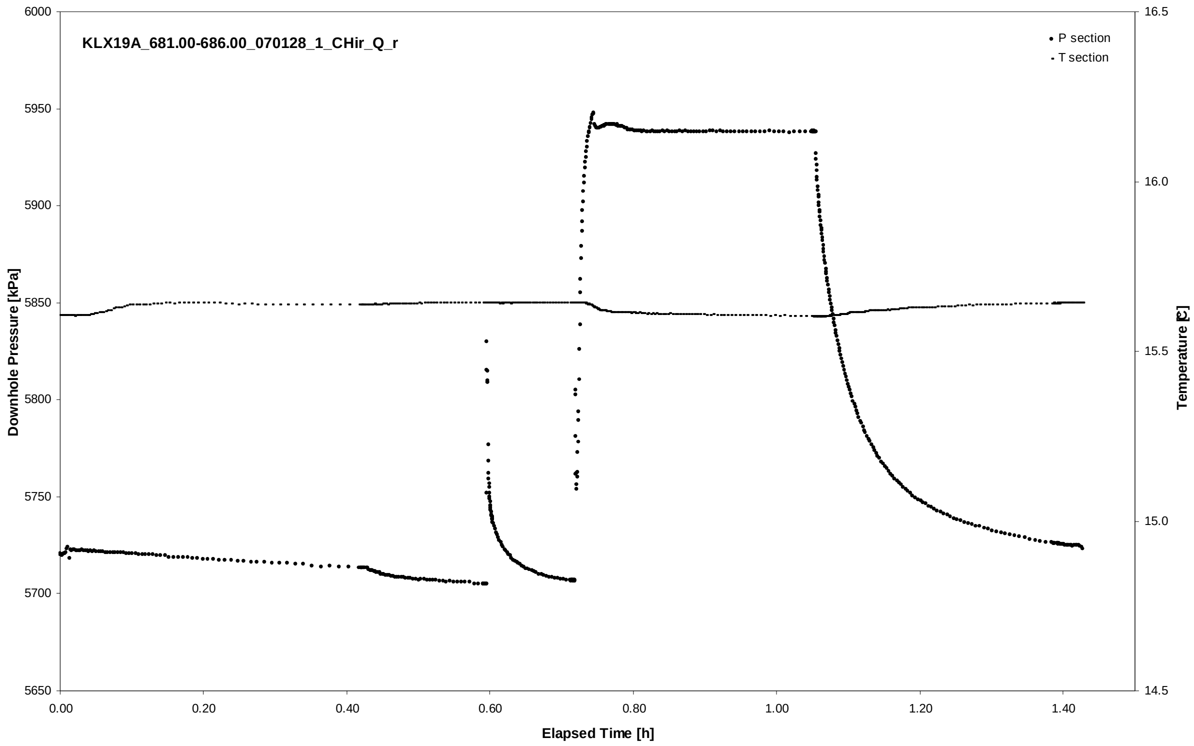
APPENDIX 2-61

Test 681.00 – 686.00 m

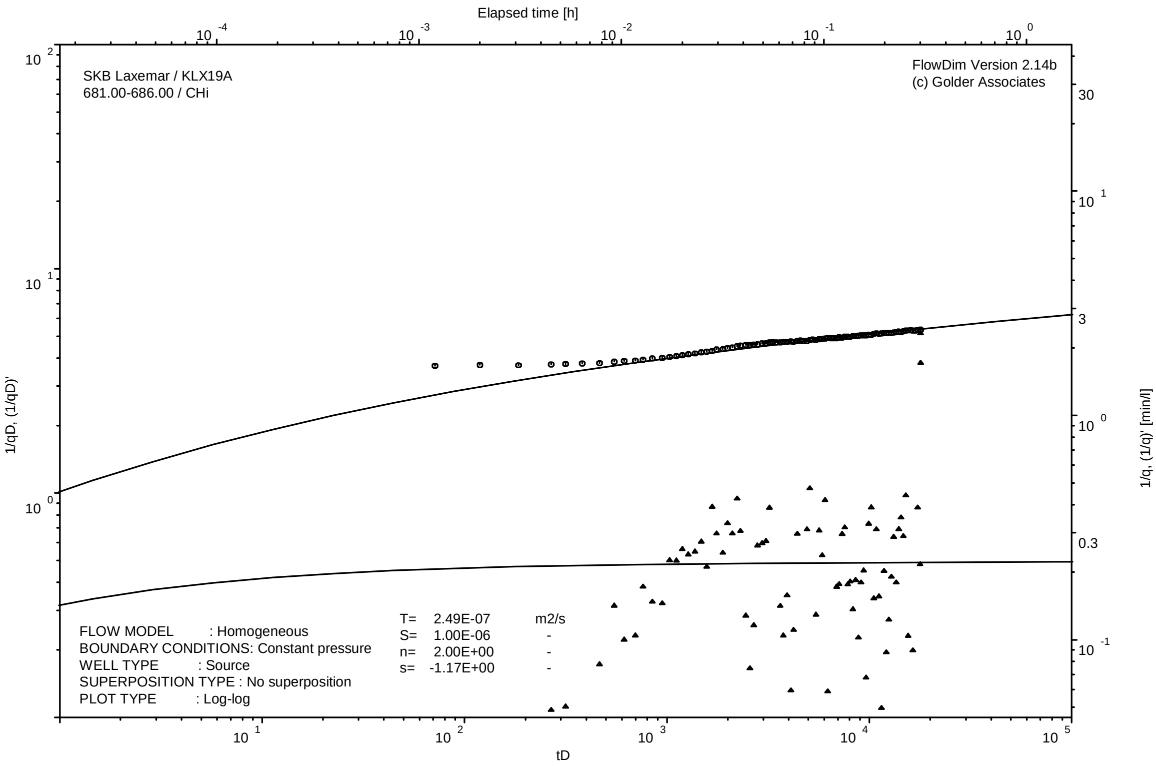
Analysis diagrams



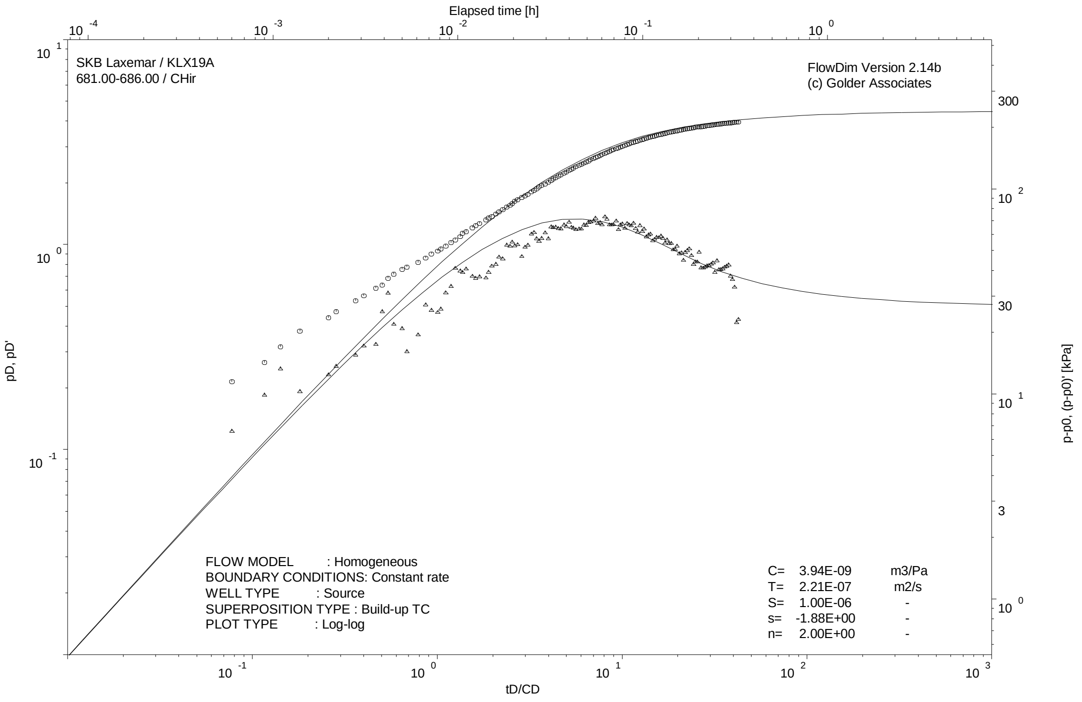
Pressure and flow rate vs. time; cartesian plot



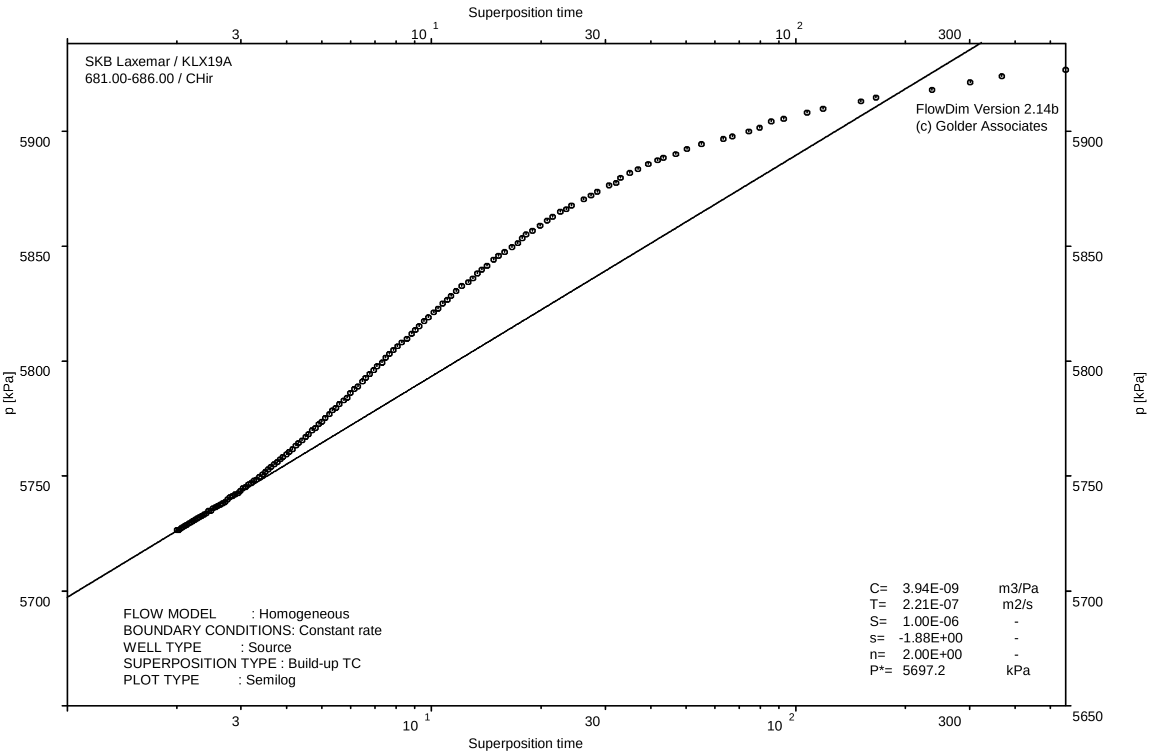
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

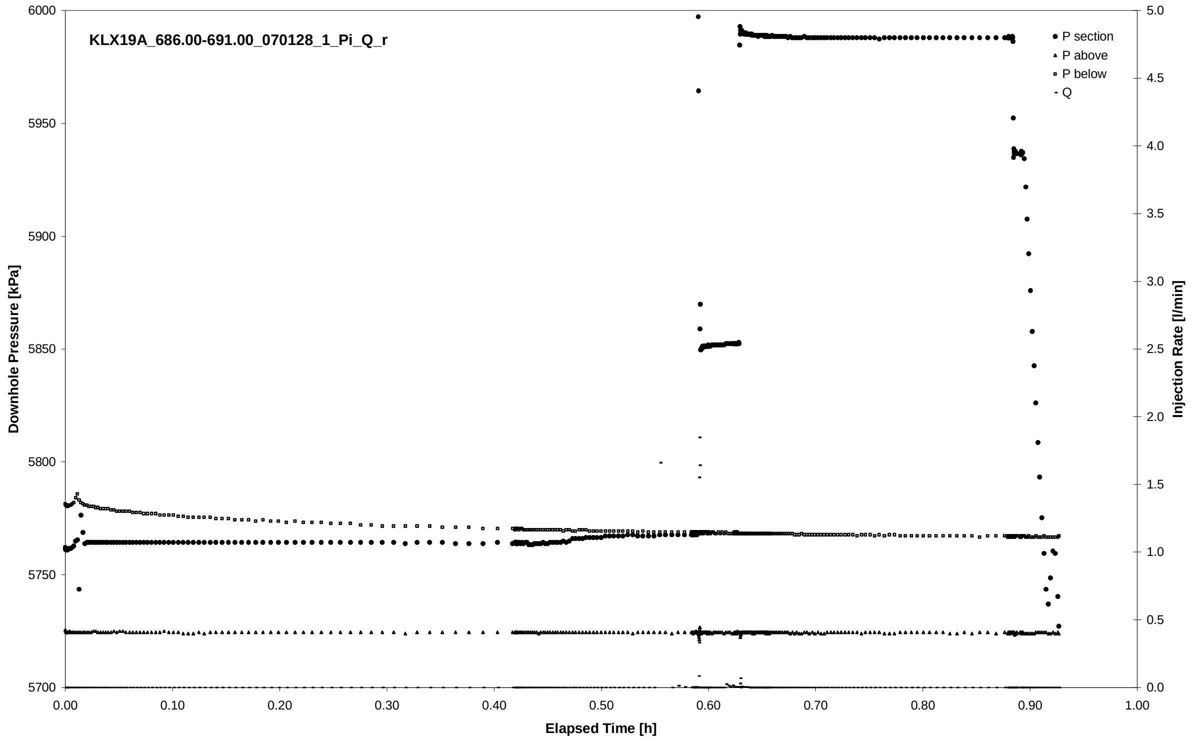


CHIR phase; HORNER match

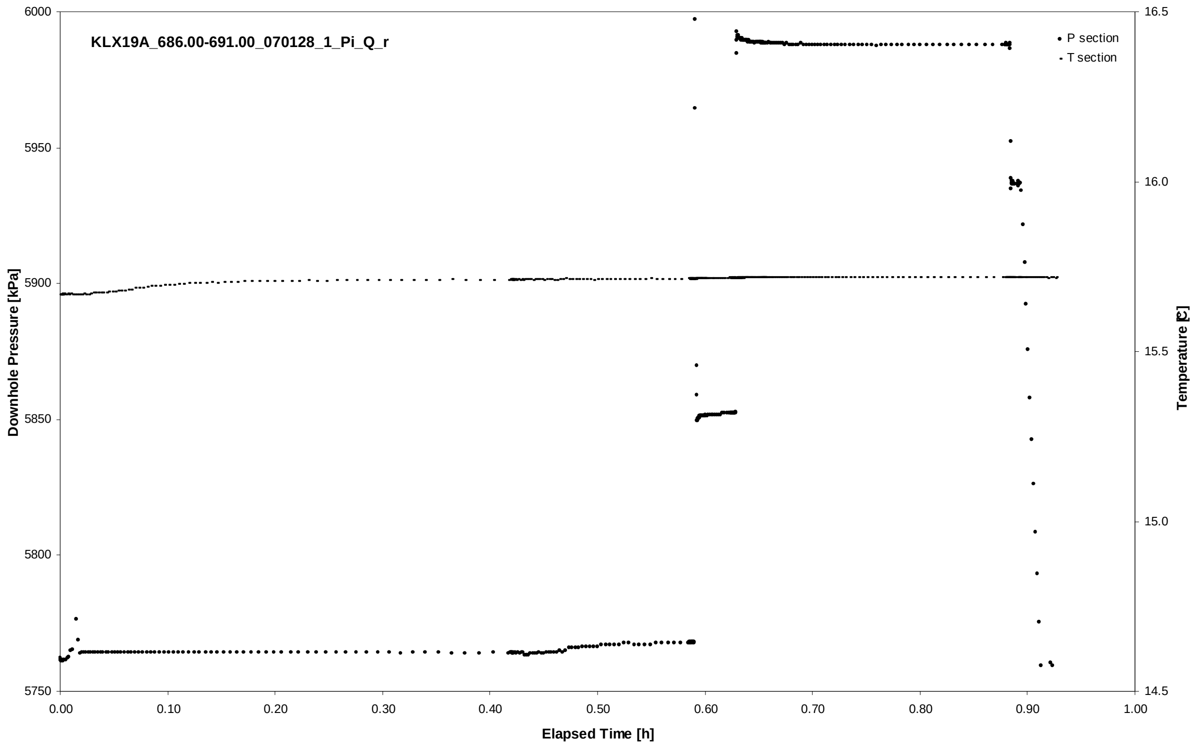
APPENDIX 2-62

Test 686.00 – 691.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

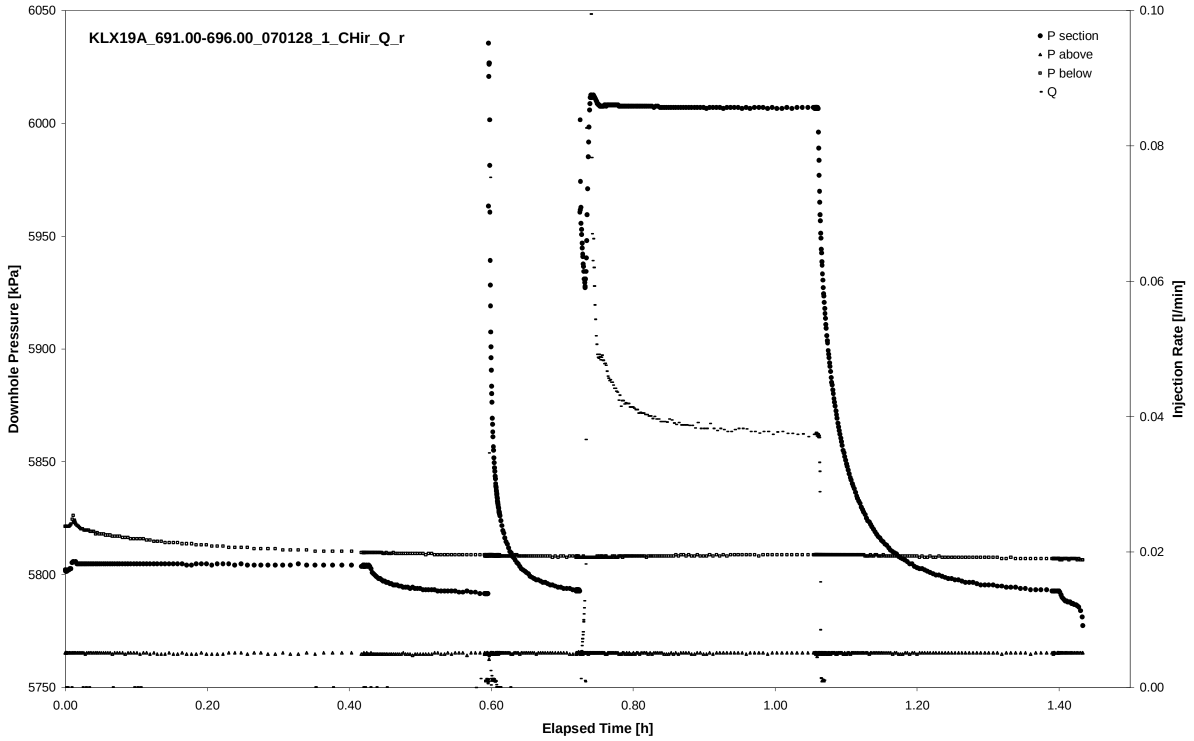
Not Analysed

CHIR phase; HORNER match

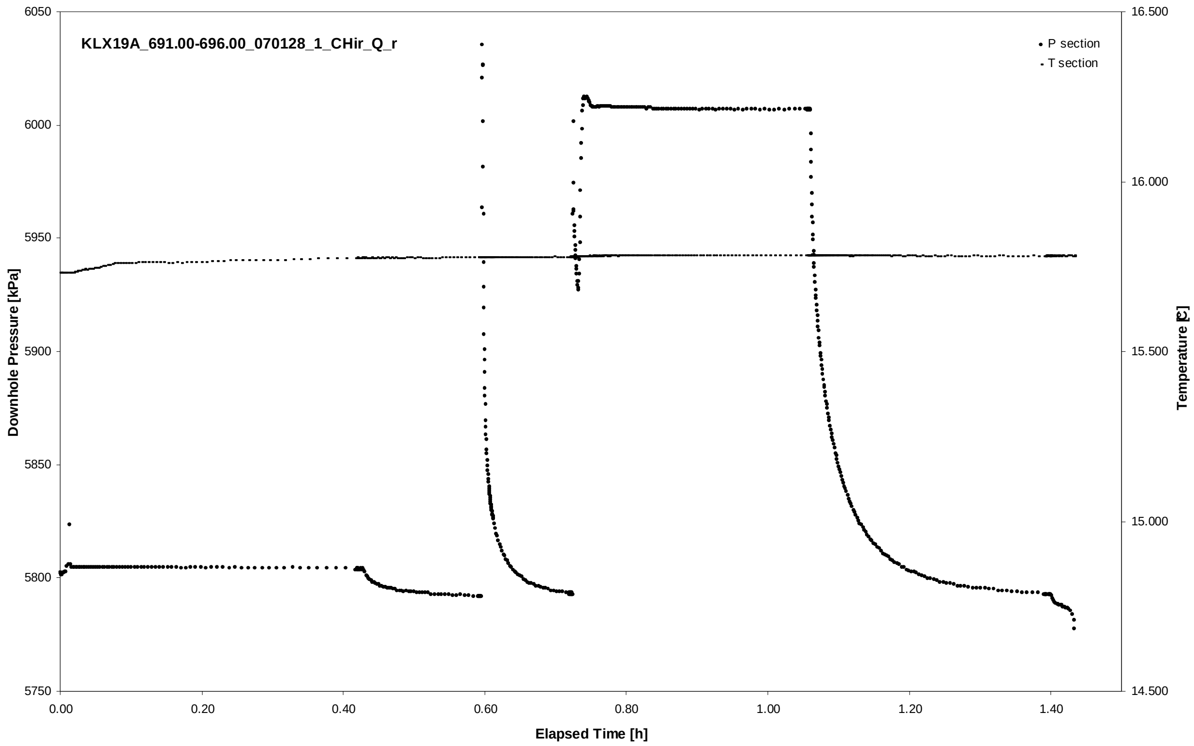
APPENDIX 2-63

Test 691.00 – 696.00 m

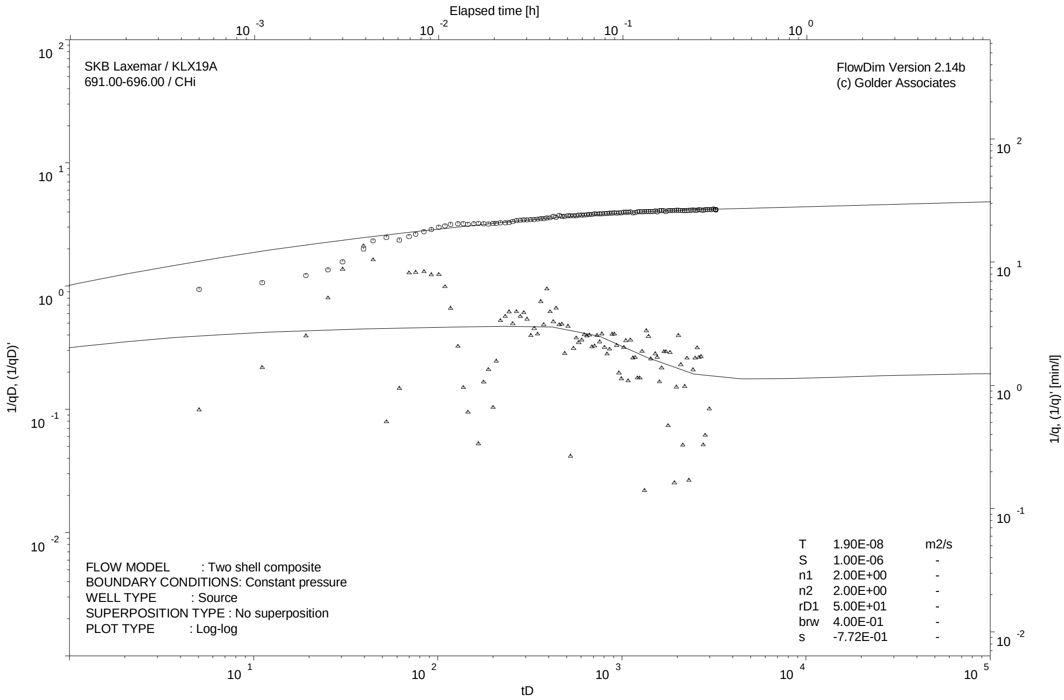
Analysis diagrams



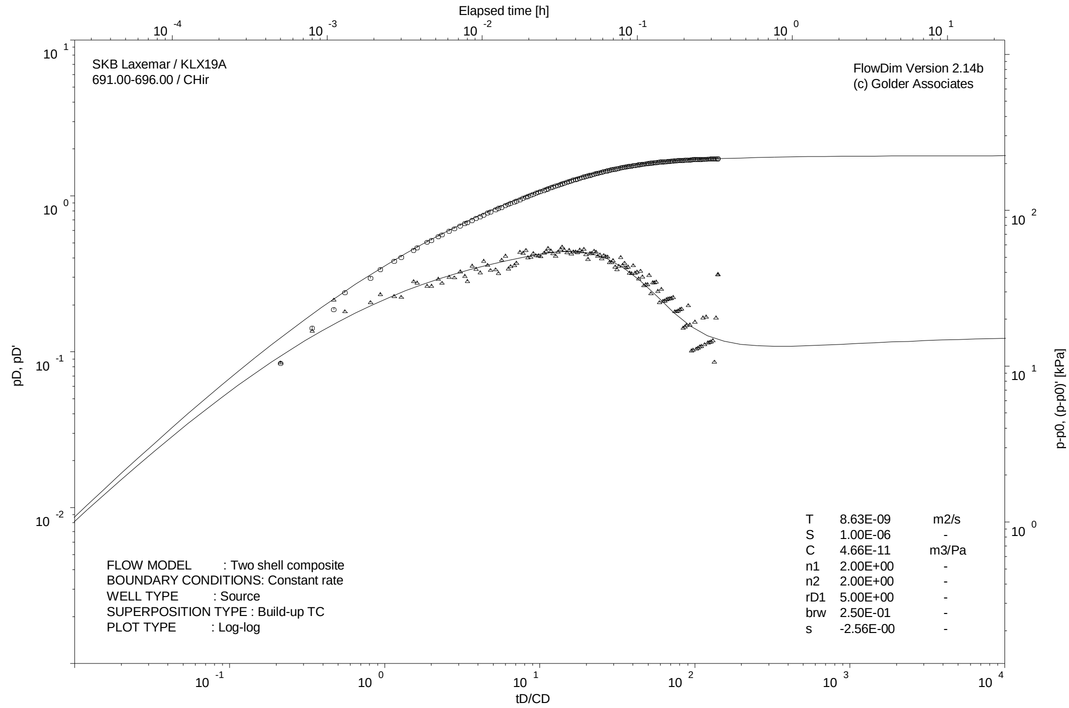
Pressure and flow rate vs. time; cartesian plot



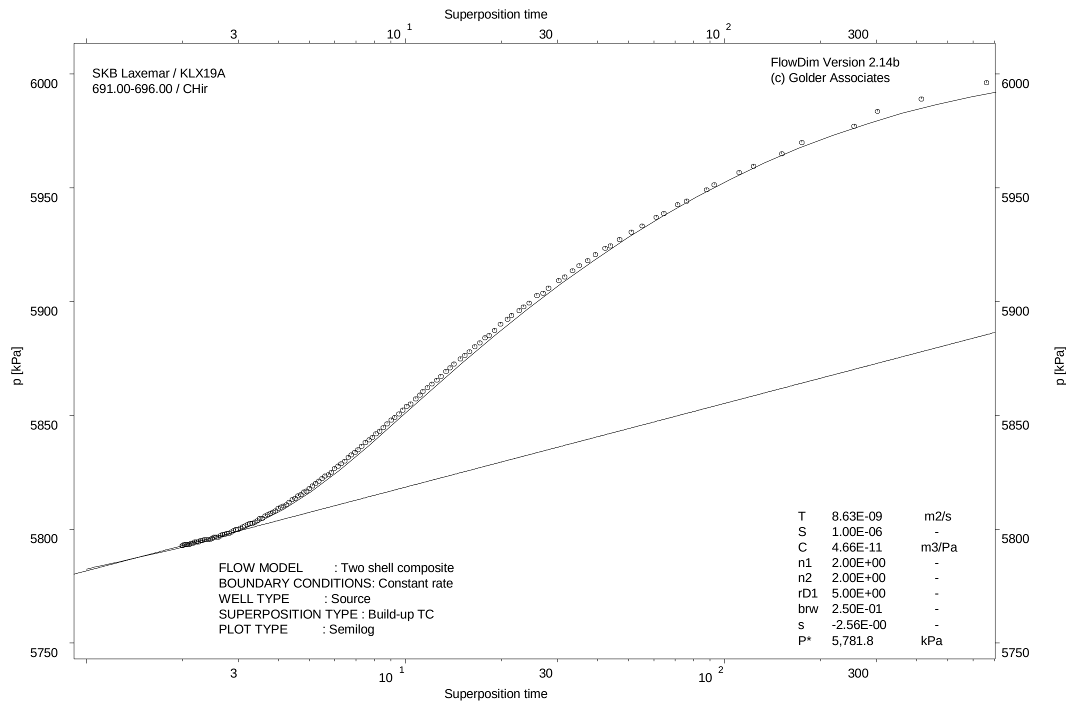
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

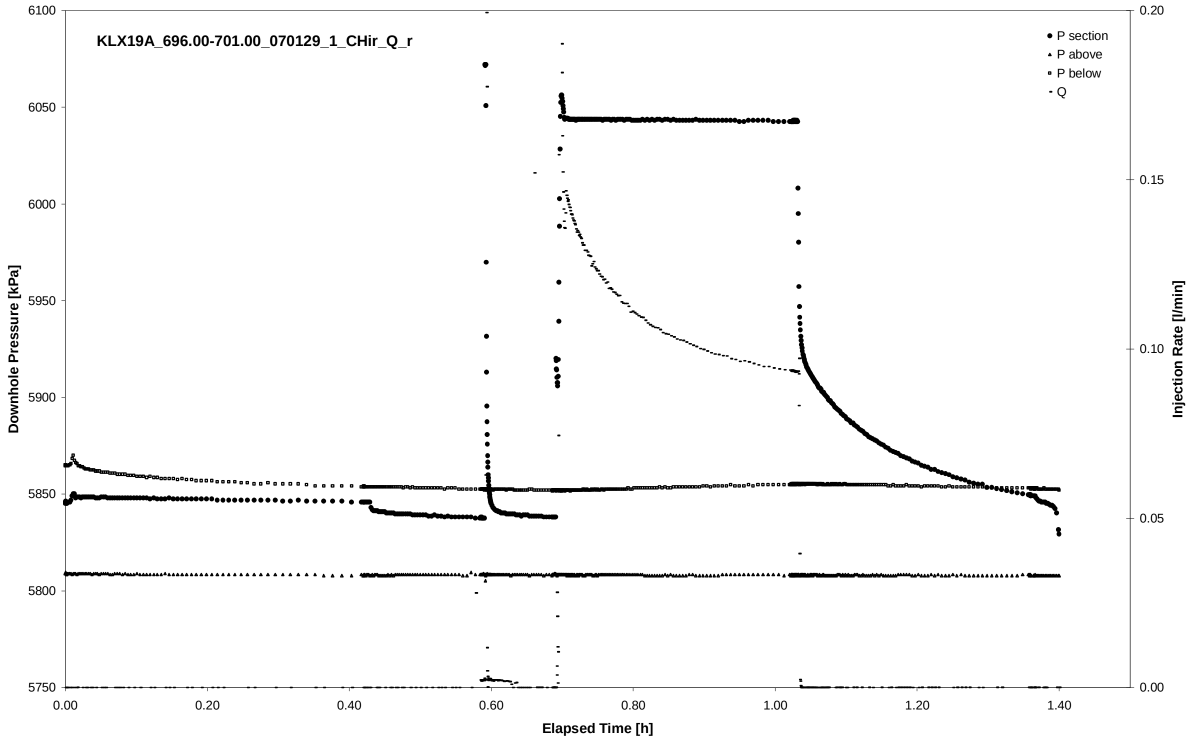


CHIR phase; HORNER match

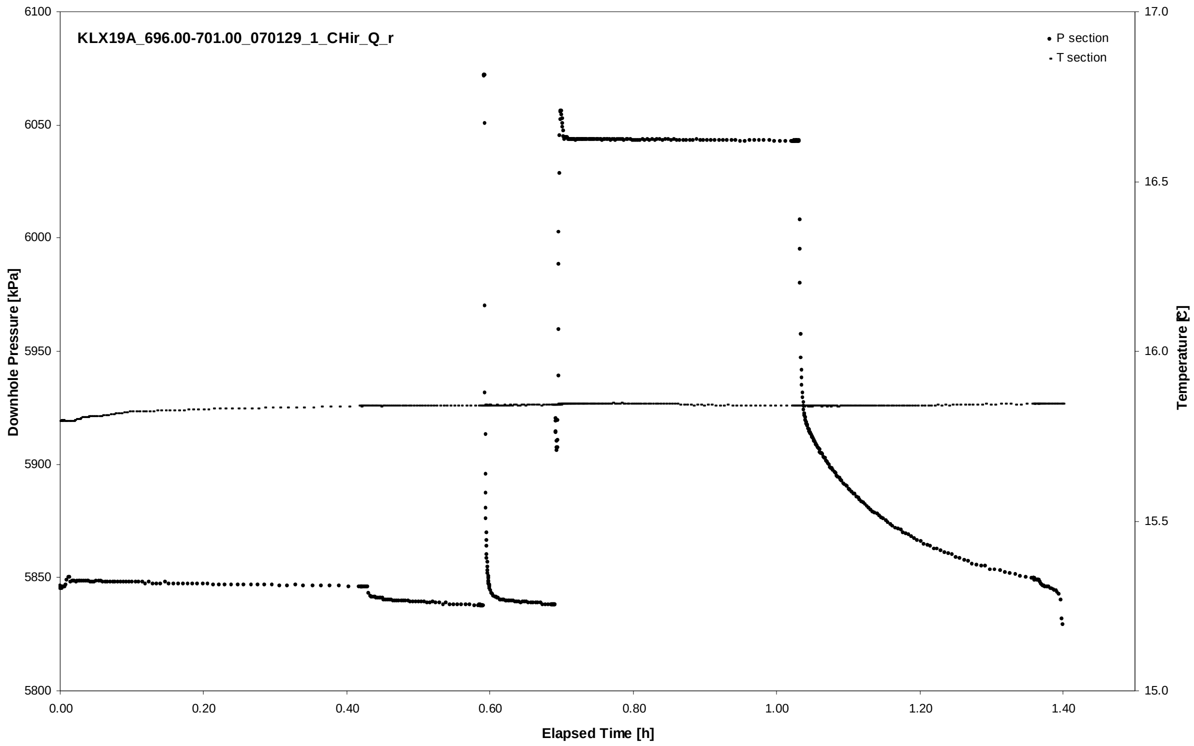
APPENDIX 2-64

Test 696.00 – 701.00 m

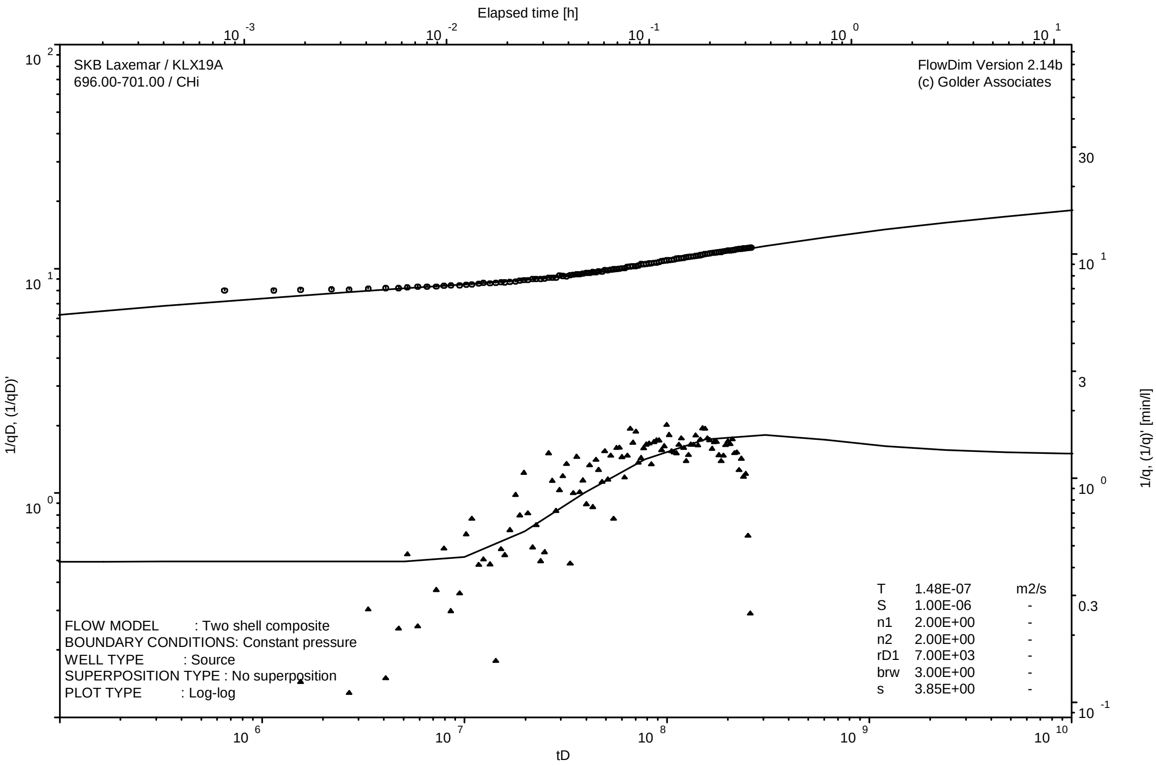
Analysis diagrams



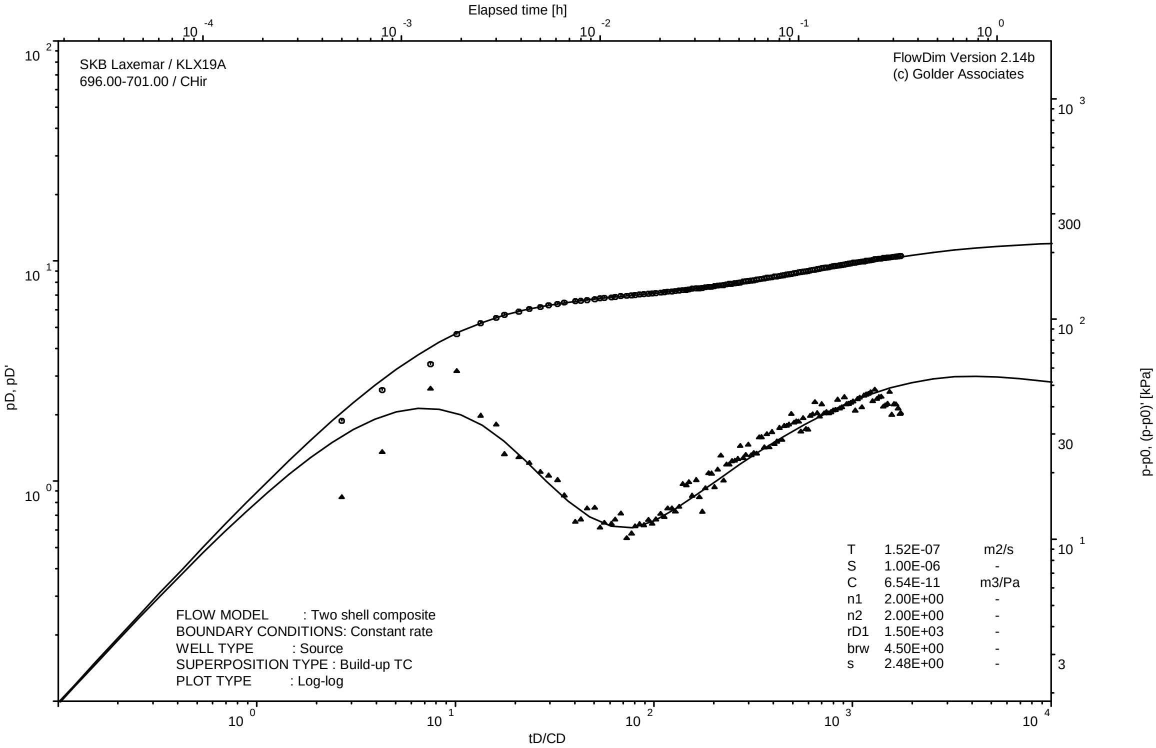
Pressure and flow rate vs. time; cartesian plot



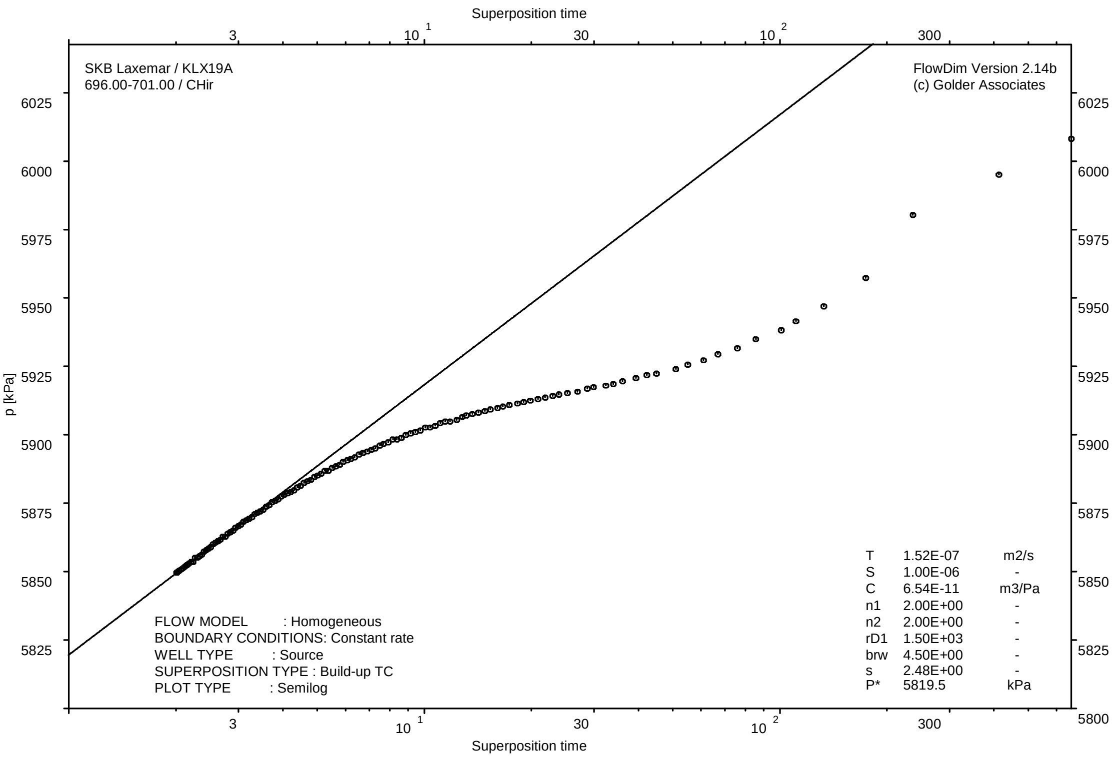
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

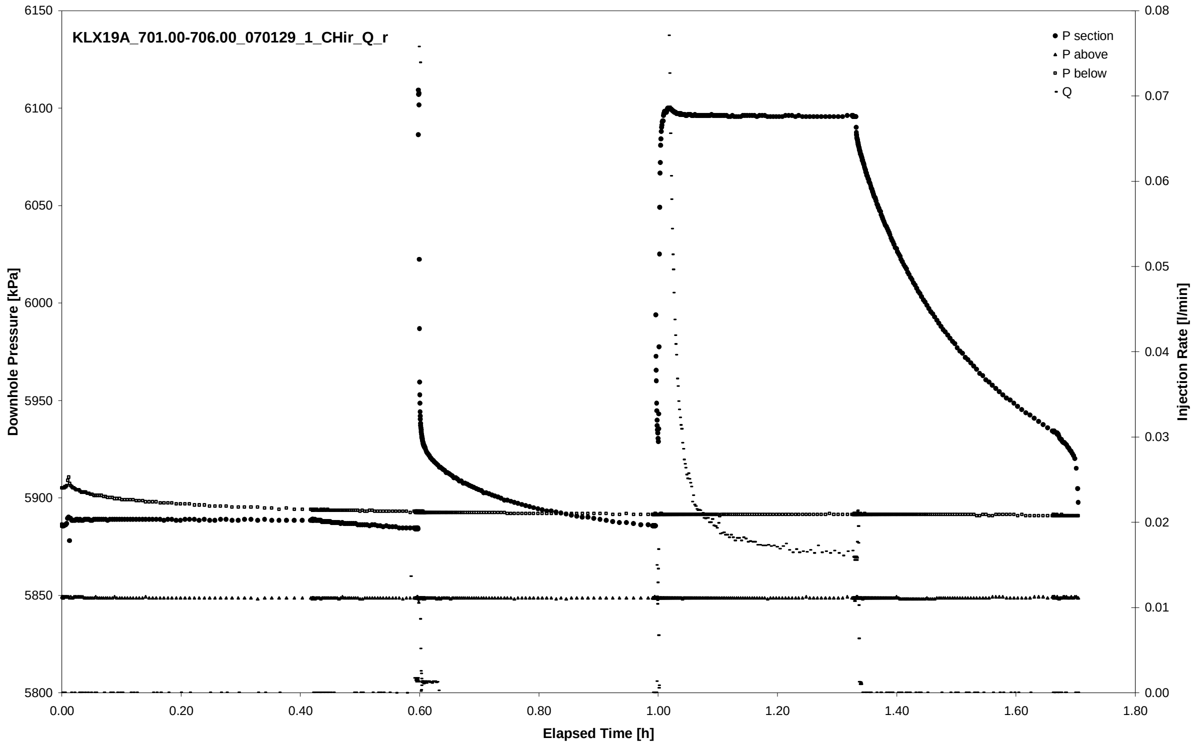


CHIR phase; HORNER match

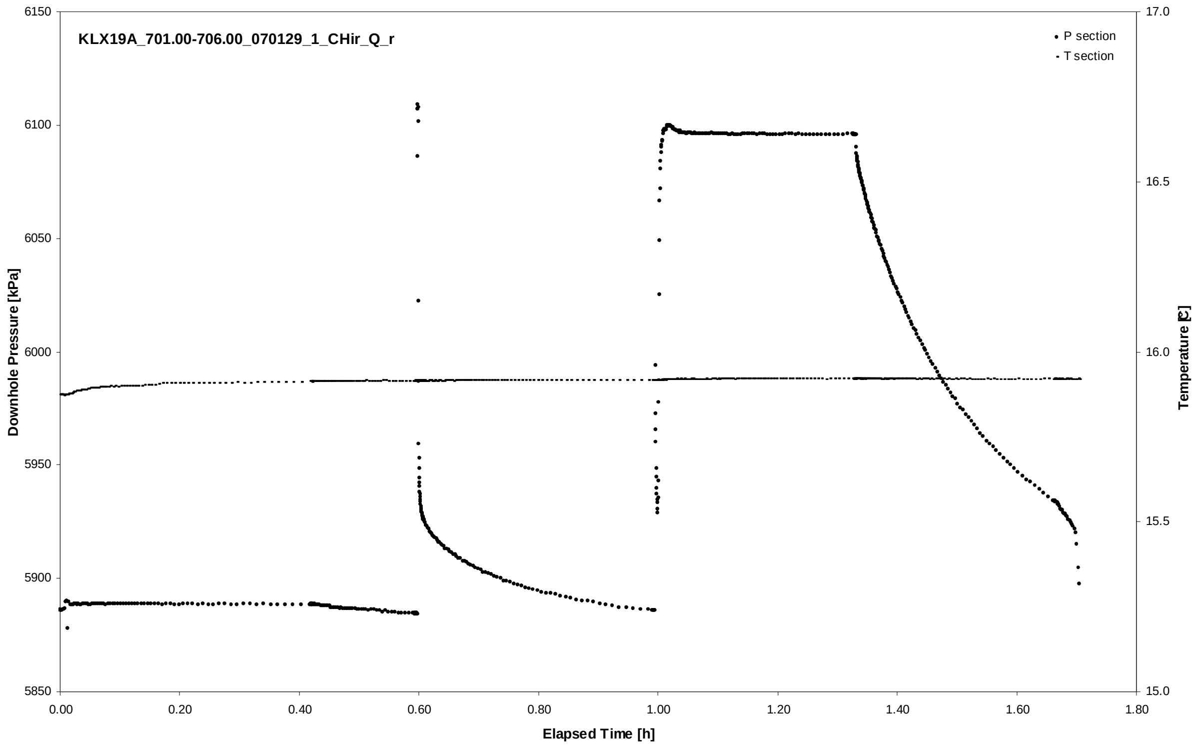
APPENDIX 2-65

Test 701.00 – 706.00 m

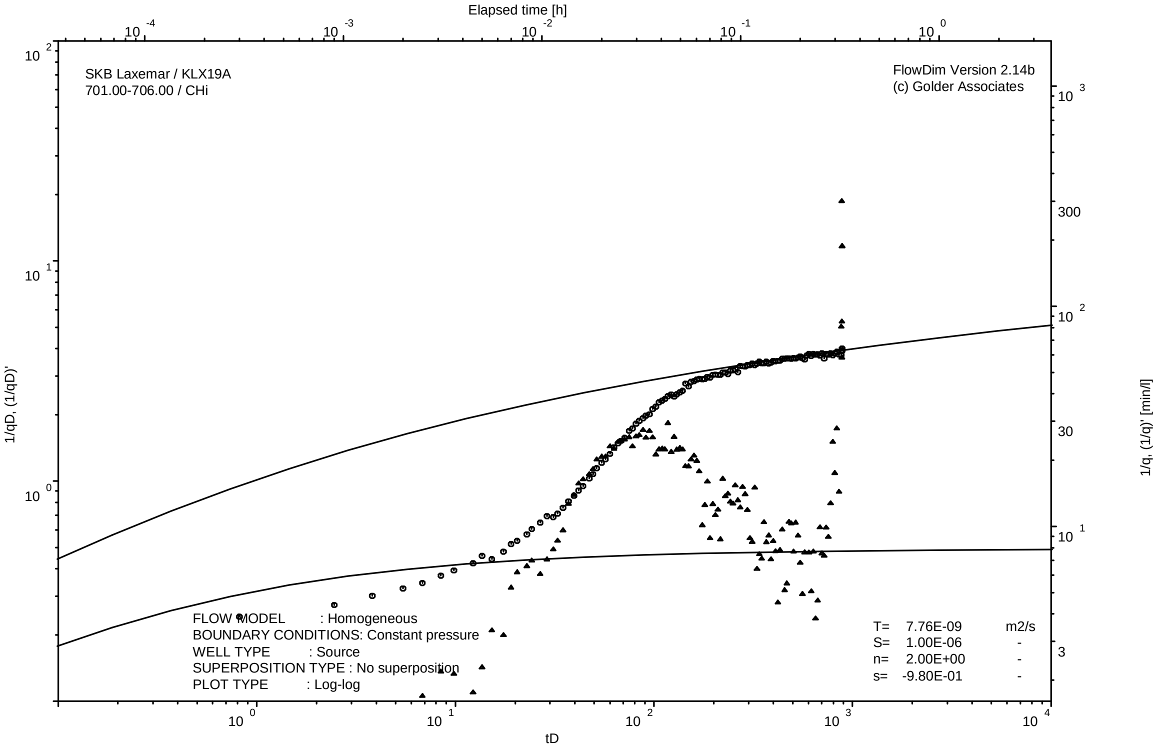
Analysis diagrams



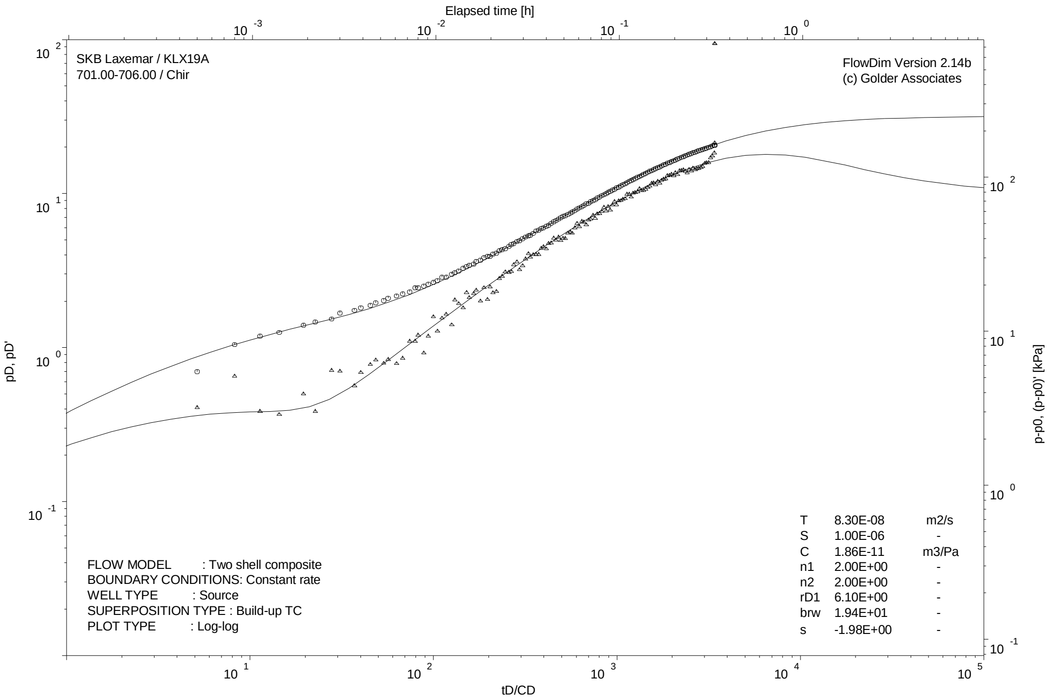
Pressure and flow rate vs. time; cartesian plot



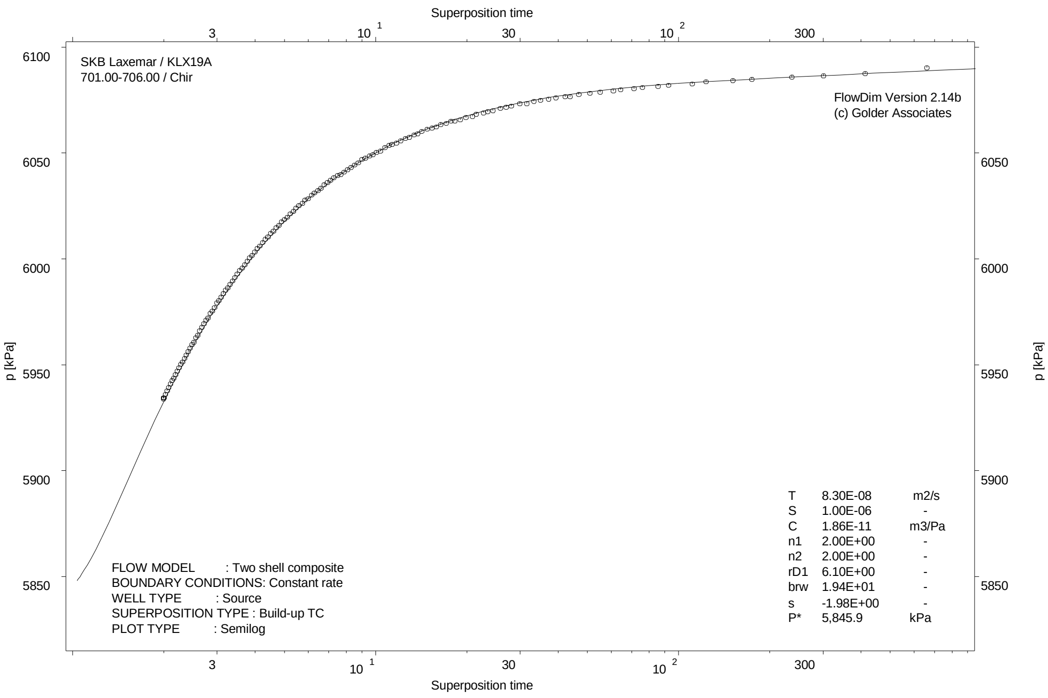
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

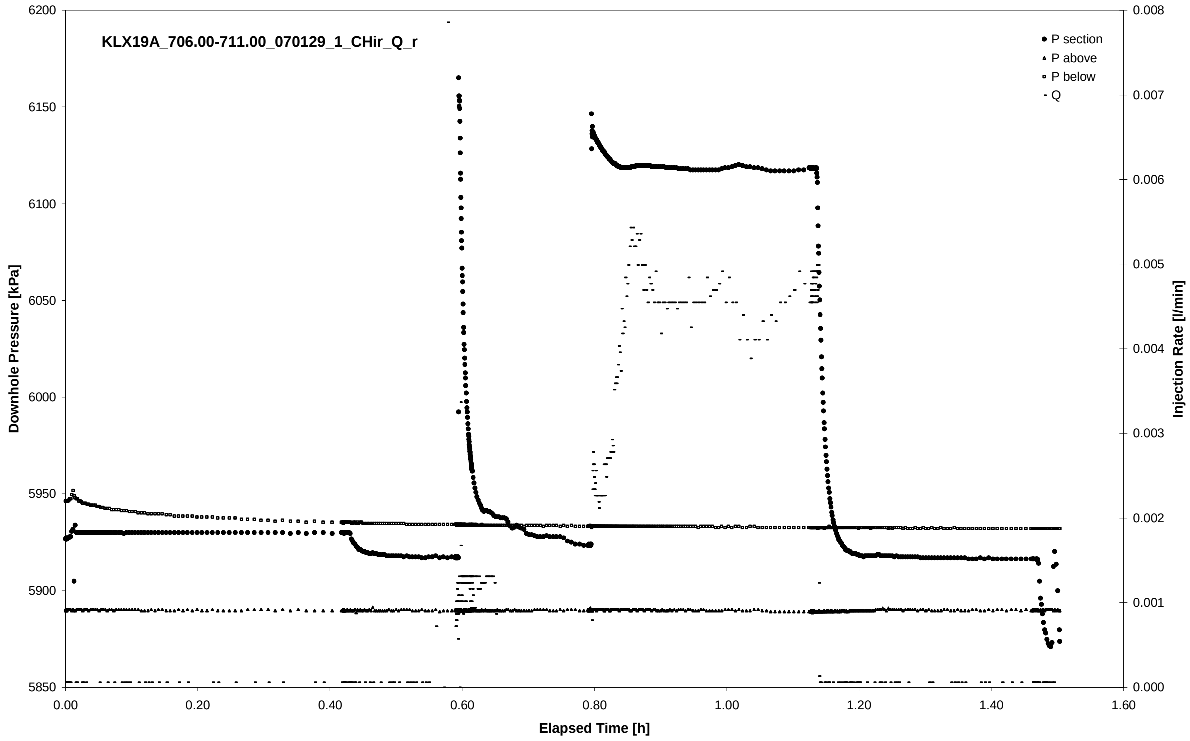


CHIR phase; HORNER match

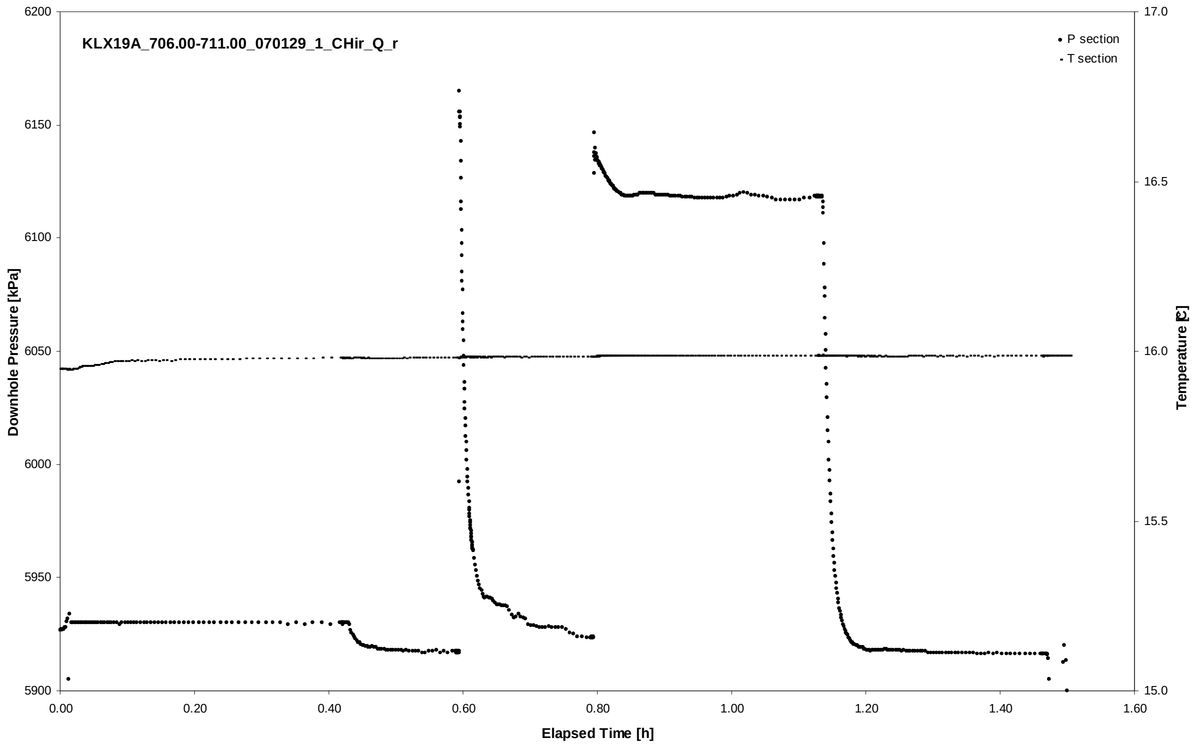
APPENDIX 2-66

Test 706.00 – 711.00 m

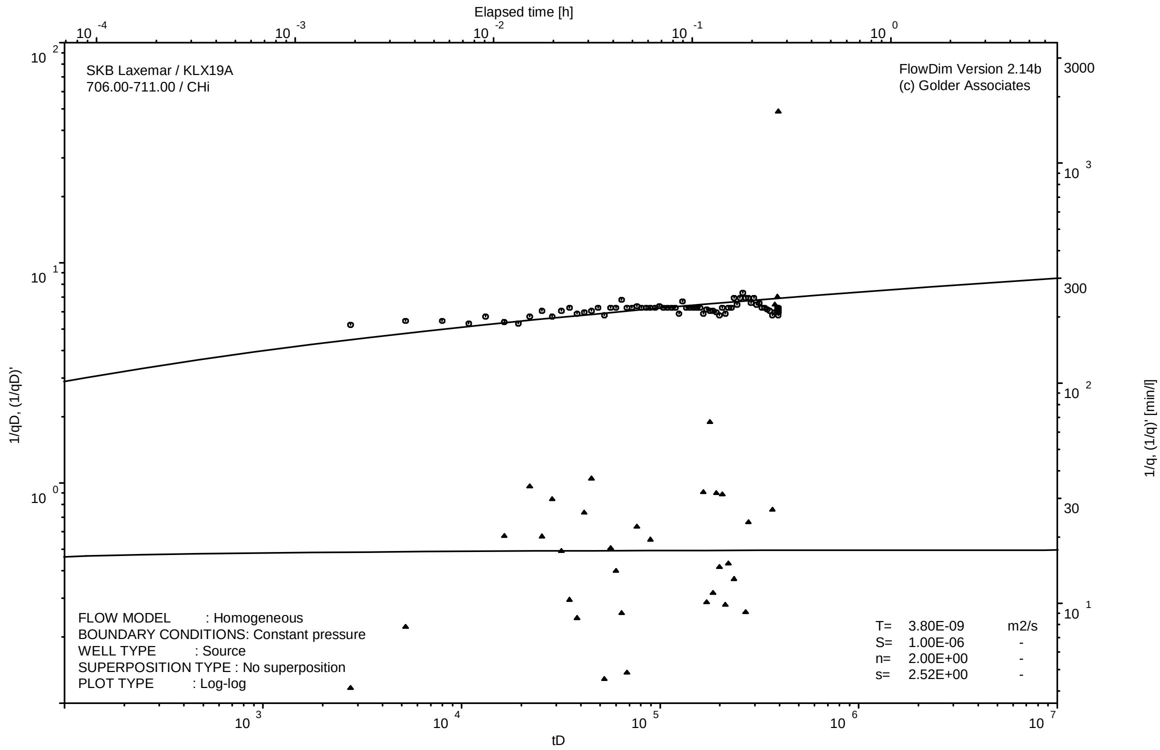
Analysis diagrams



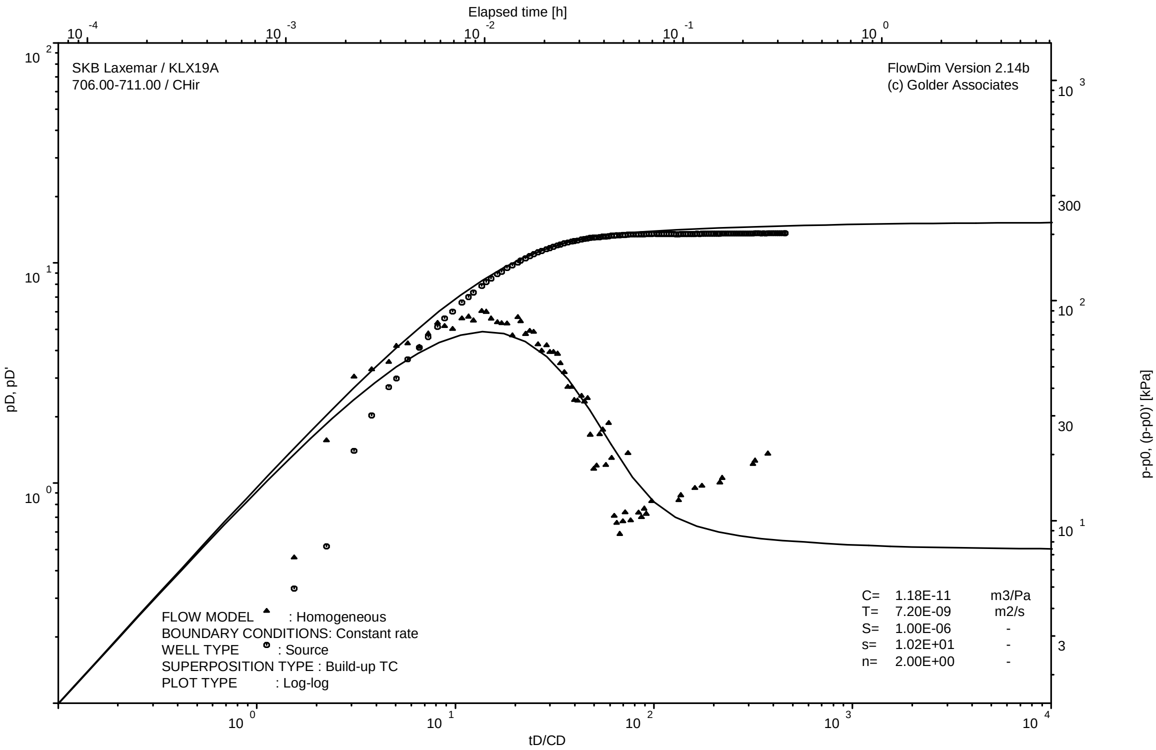
Pressure and flow rate vs. time; cartesian plot



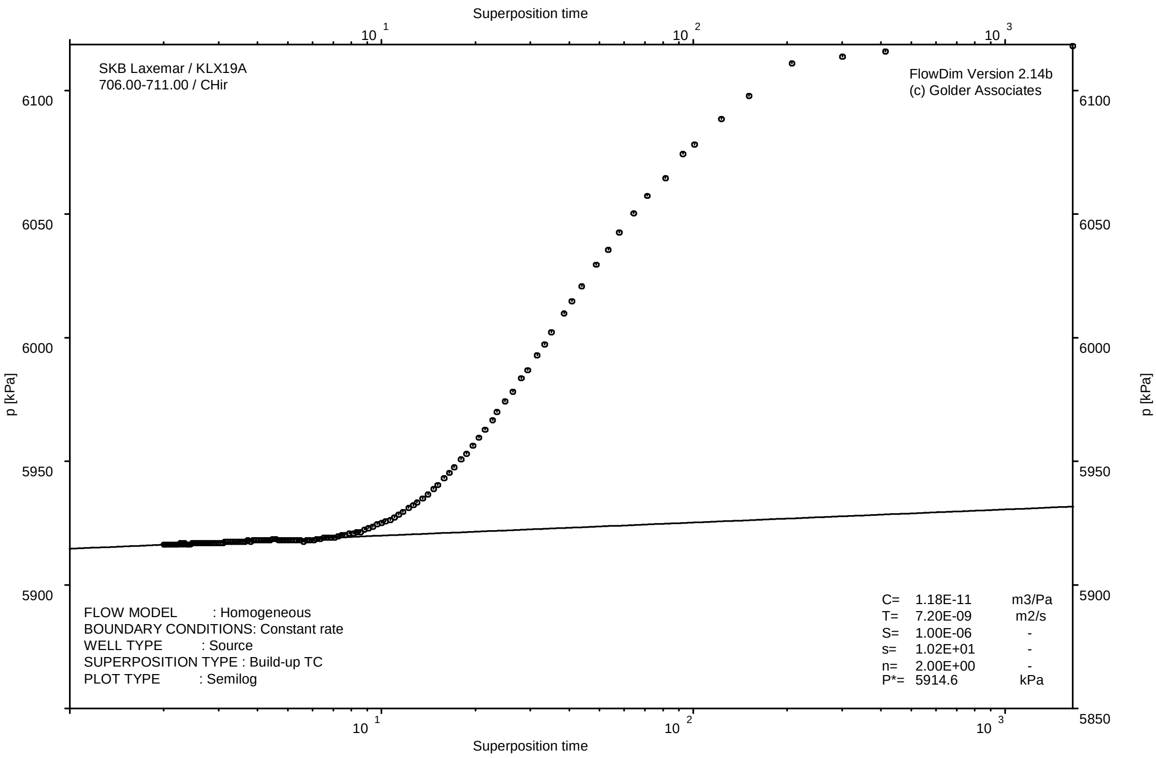
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

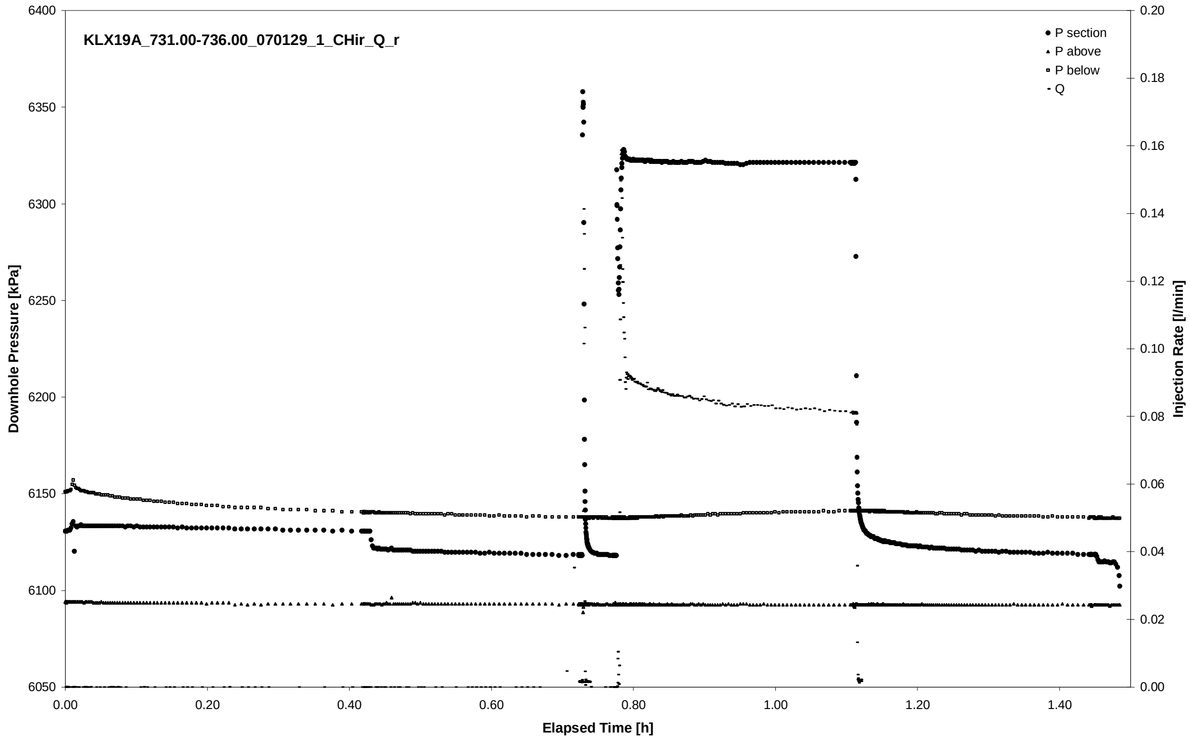


CHIR phase; HORNER match

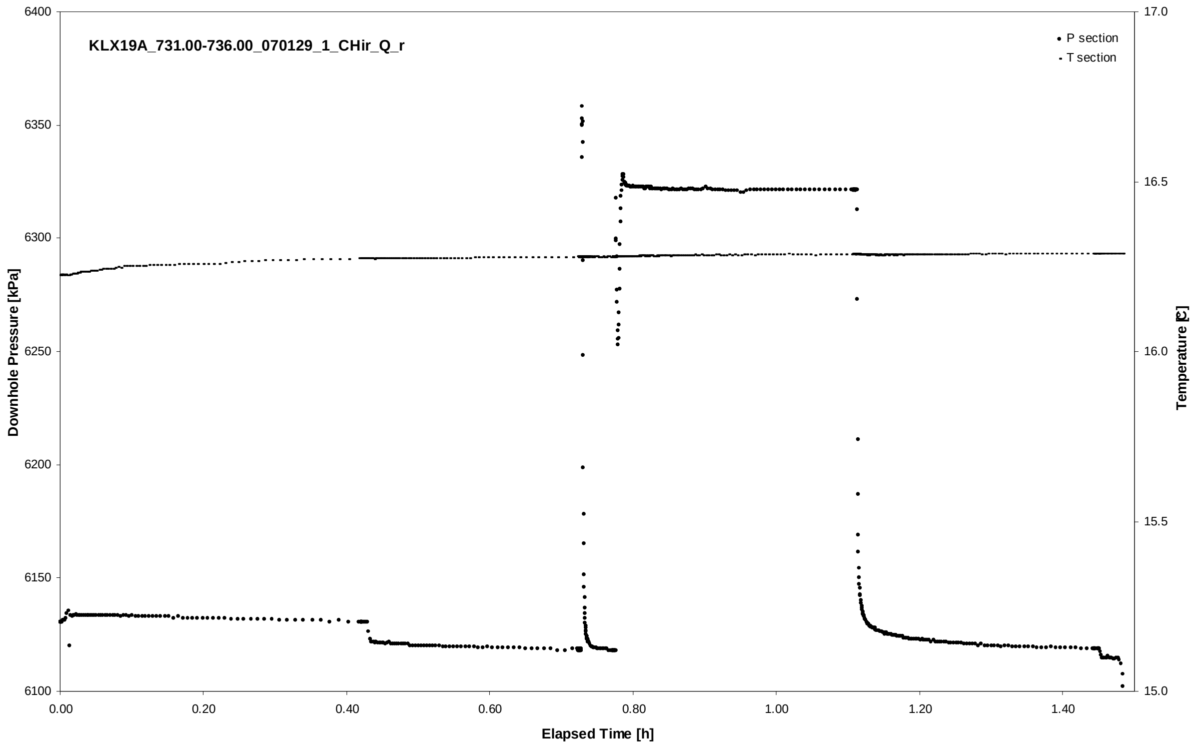
APPENDIX 2-67

Test 731.00 – 736.00 m

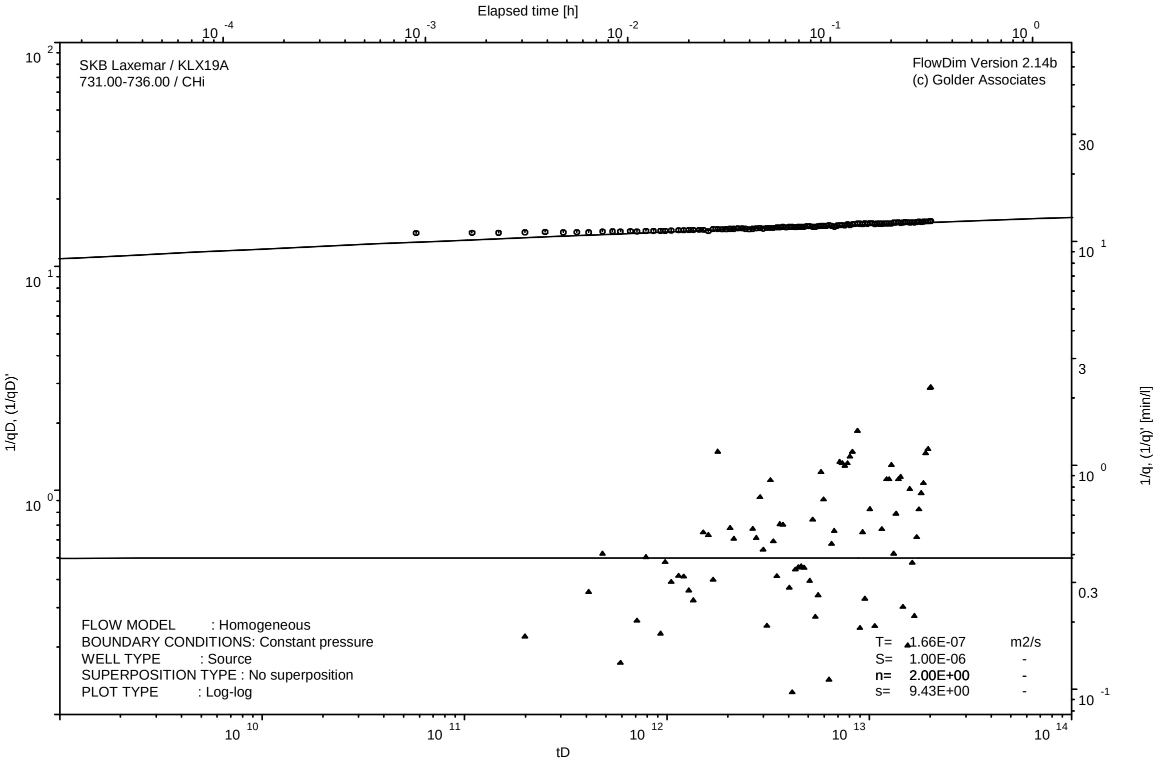
Analysis diagrams



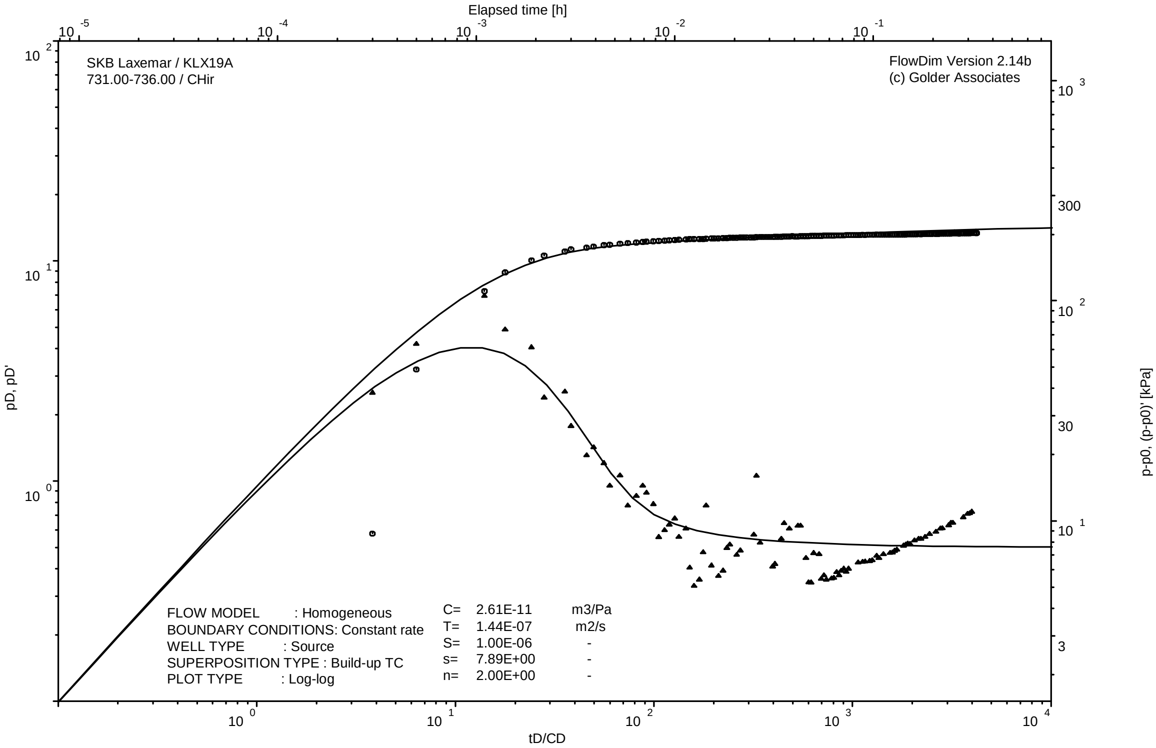
Pressure and flow rate vs. time; cartesian plot



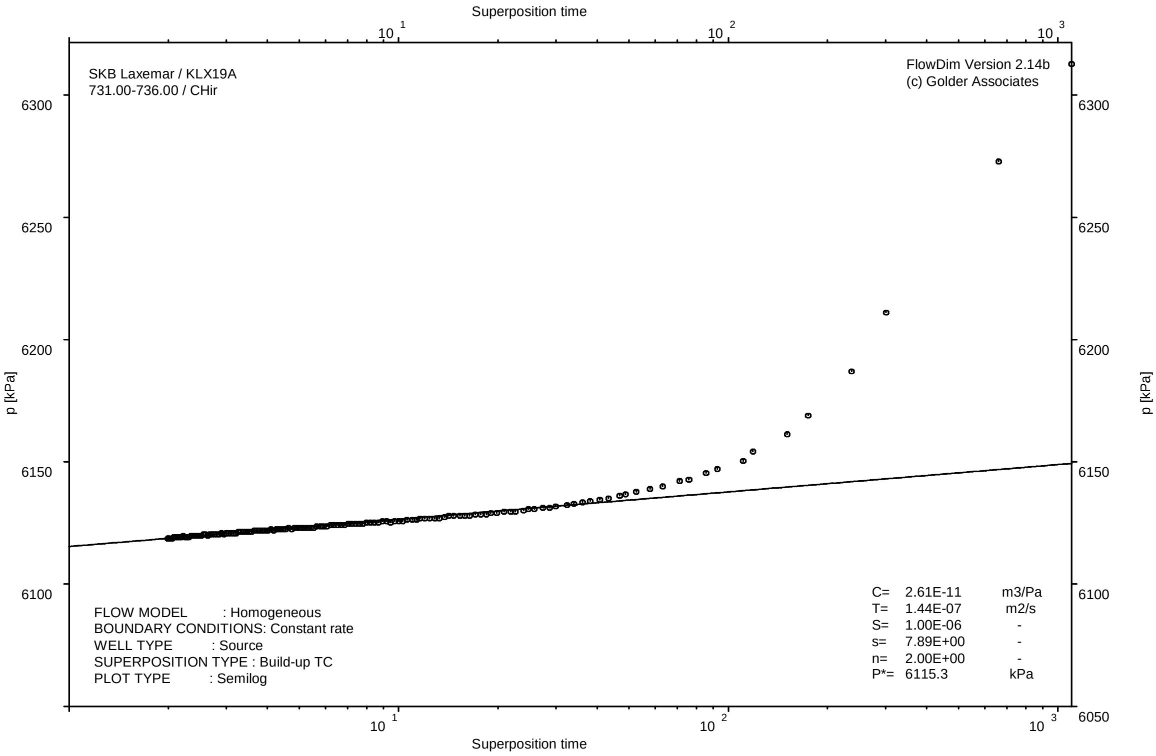
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

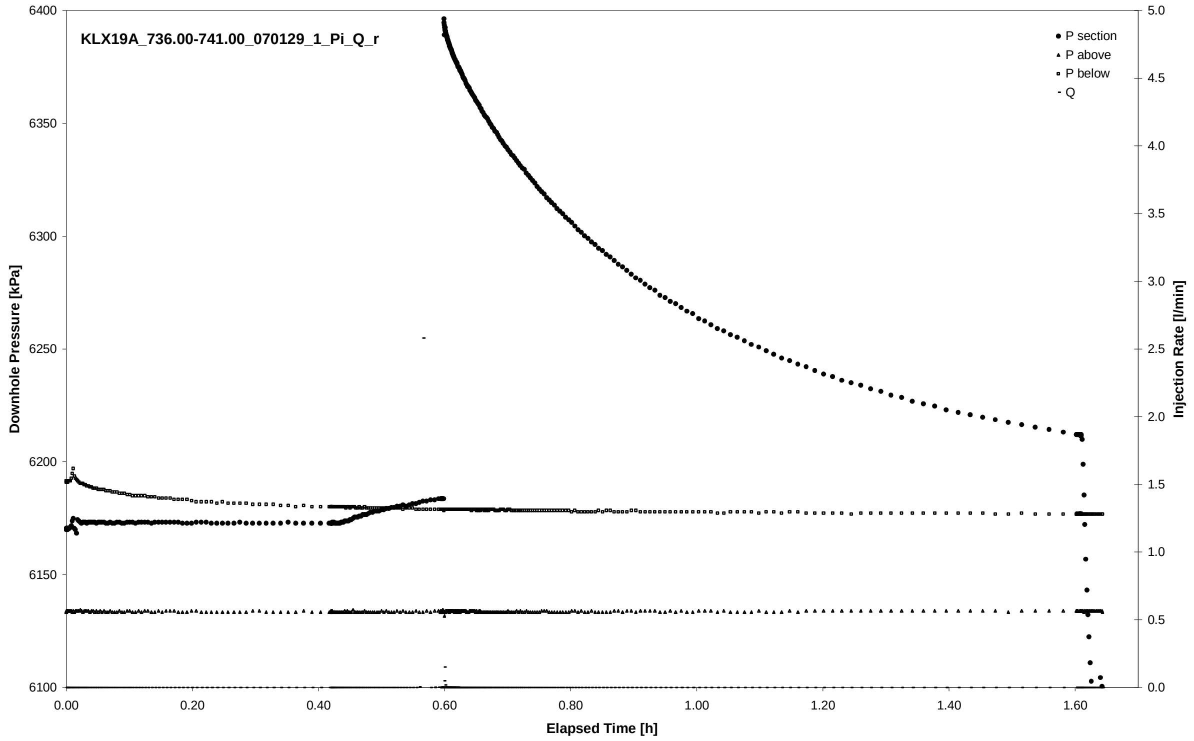


CHIR phase; HORNER match

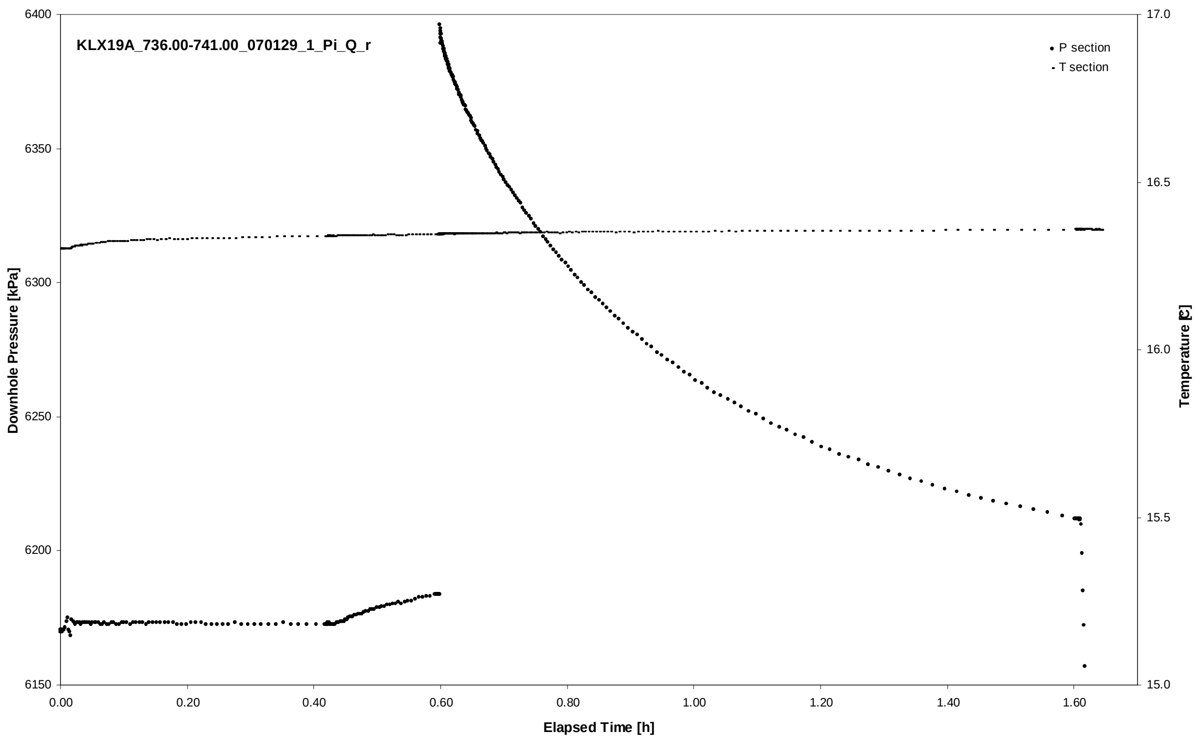
APPENDIX 2-68

Test 736.00 – 741.00 m

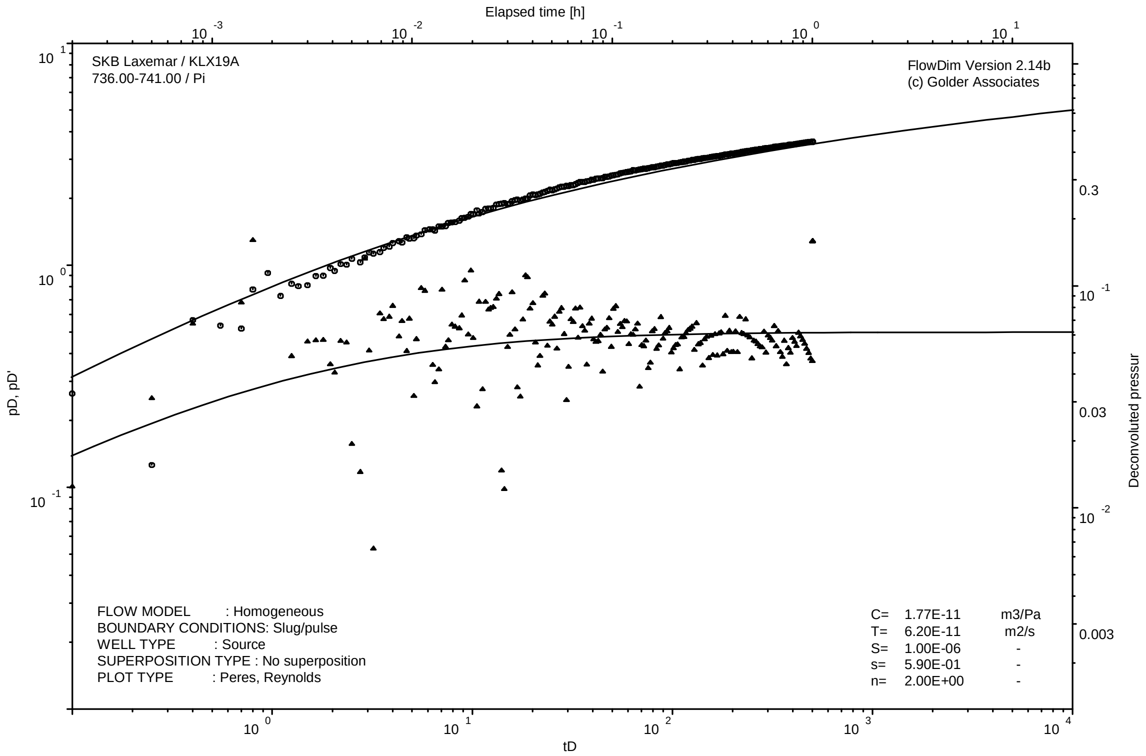
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

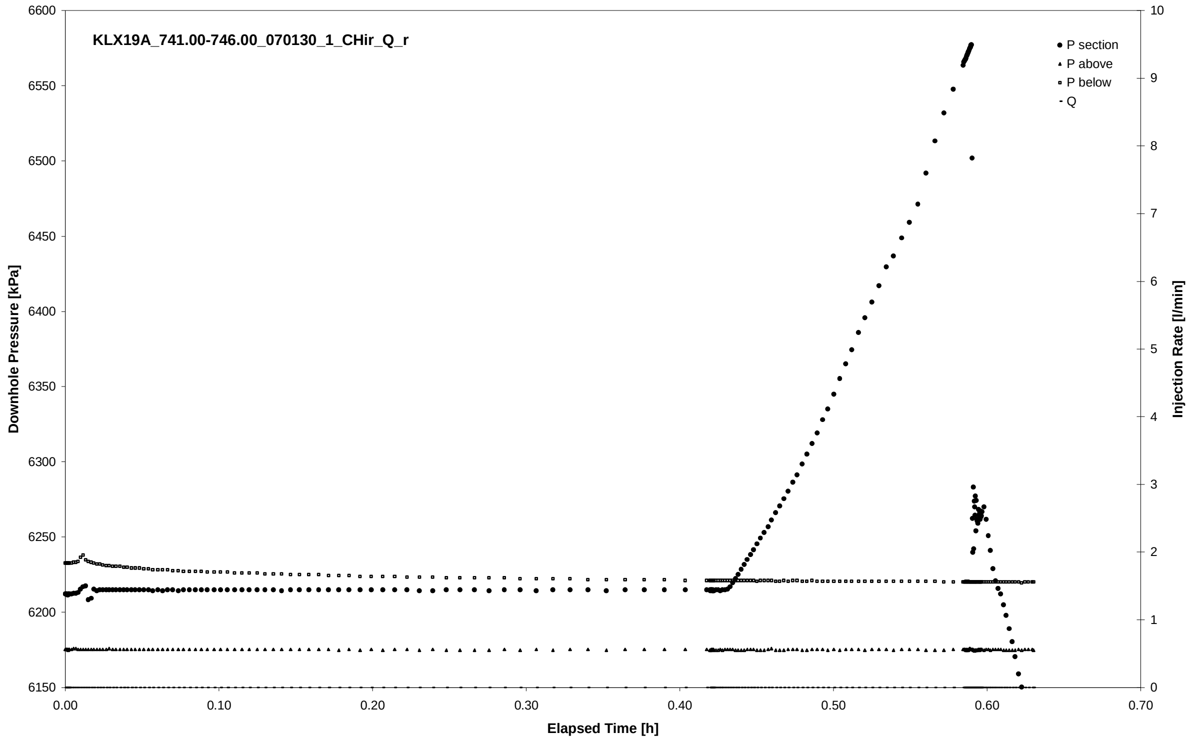


Pulse injection; deconvolution match

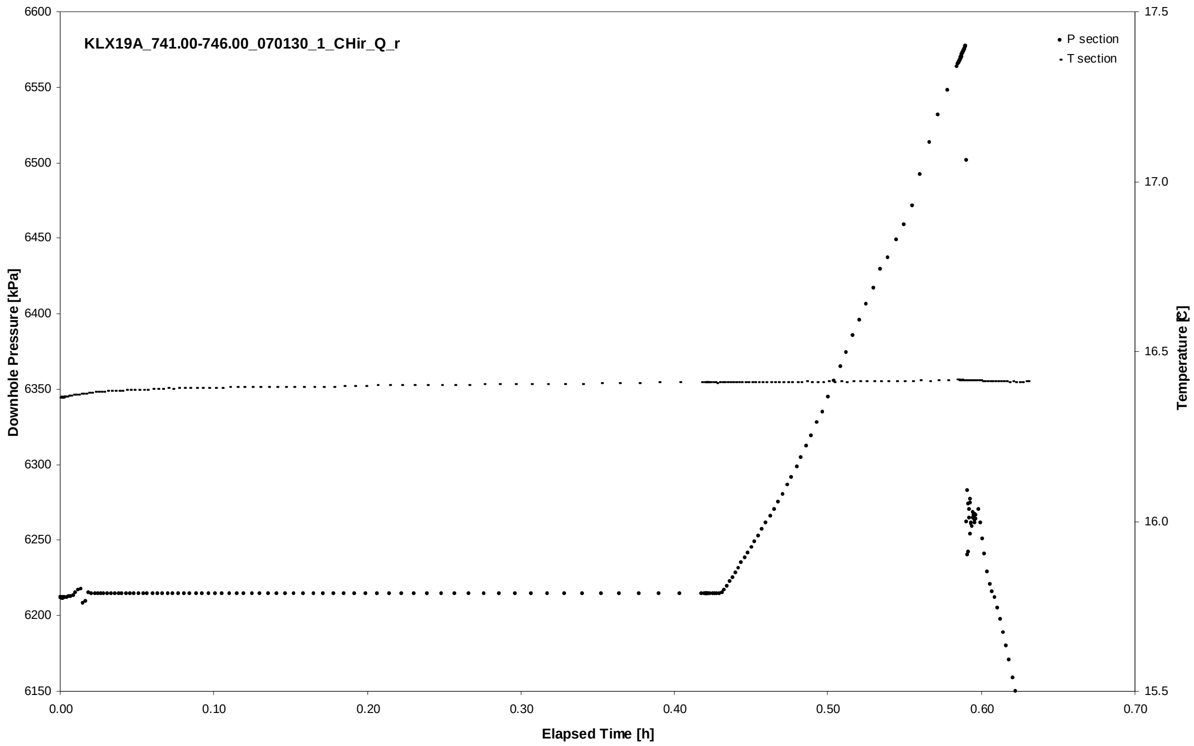
APPENDIX 2-69

Test 741.00 – 746.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

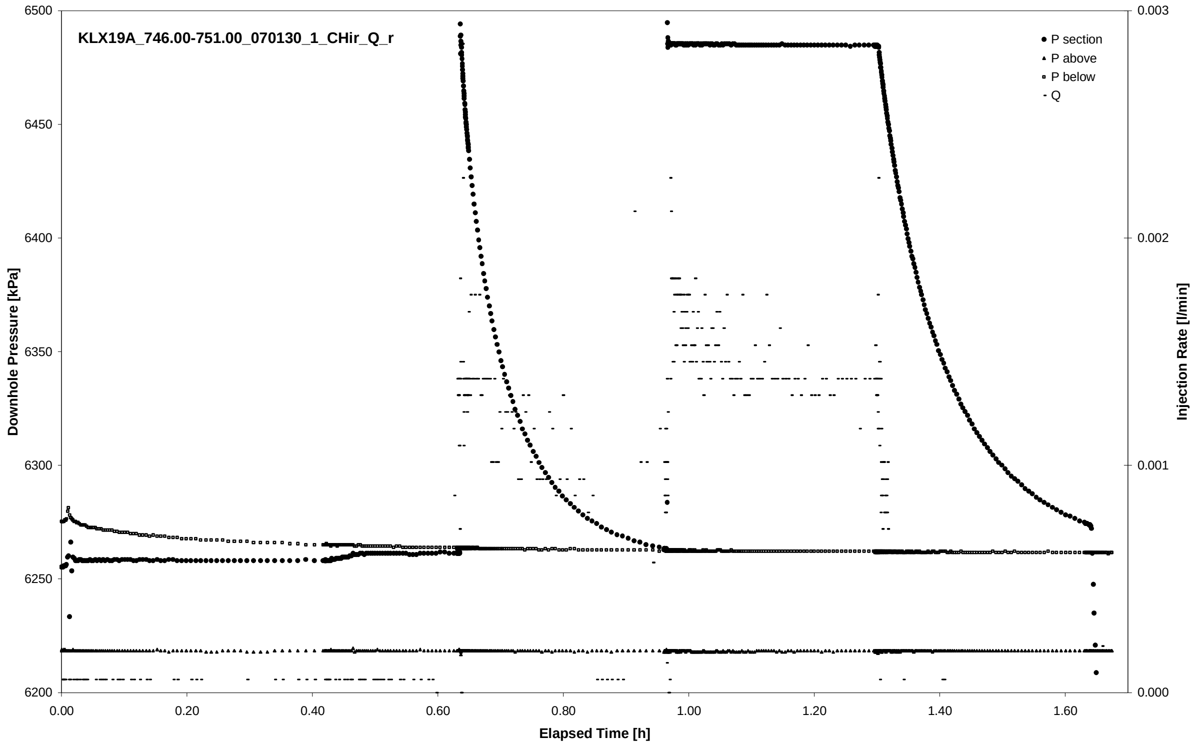
Not Analysed

CHIR phase; HORNER match

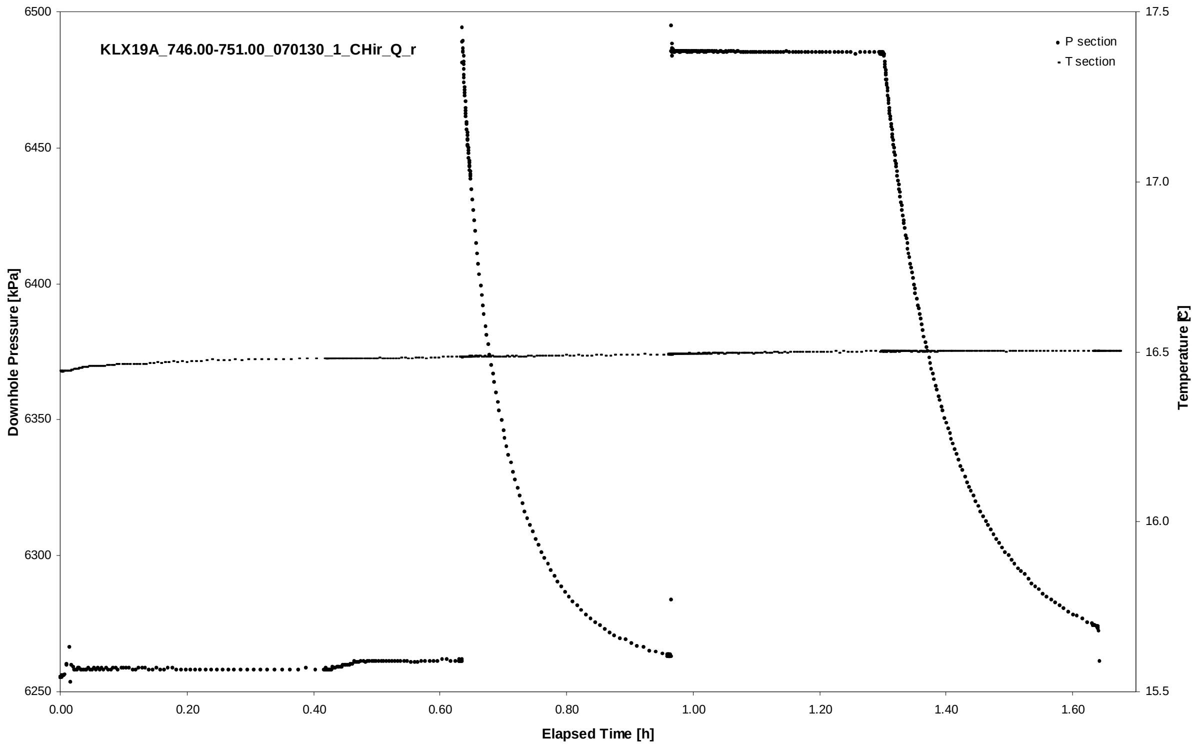
APPENDIX 2-70

Test 746.00 – 751.00 m

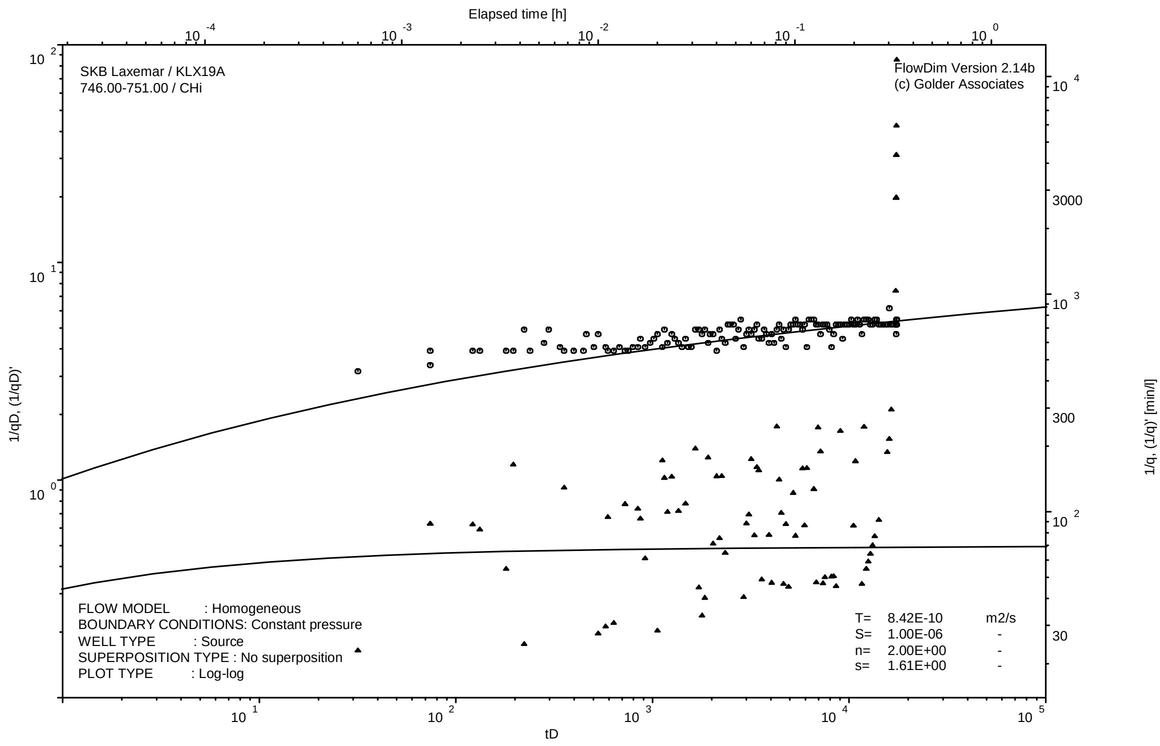
Analysis diagrams



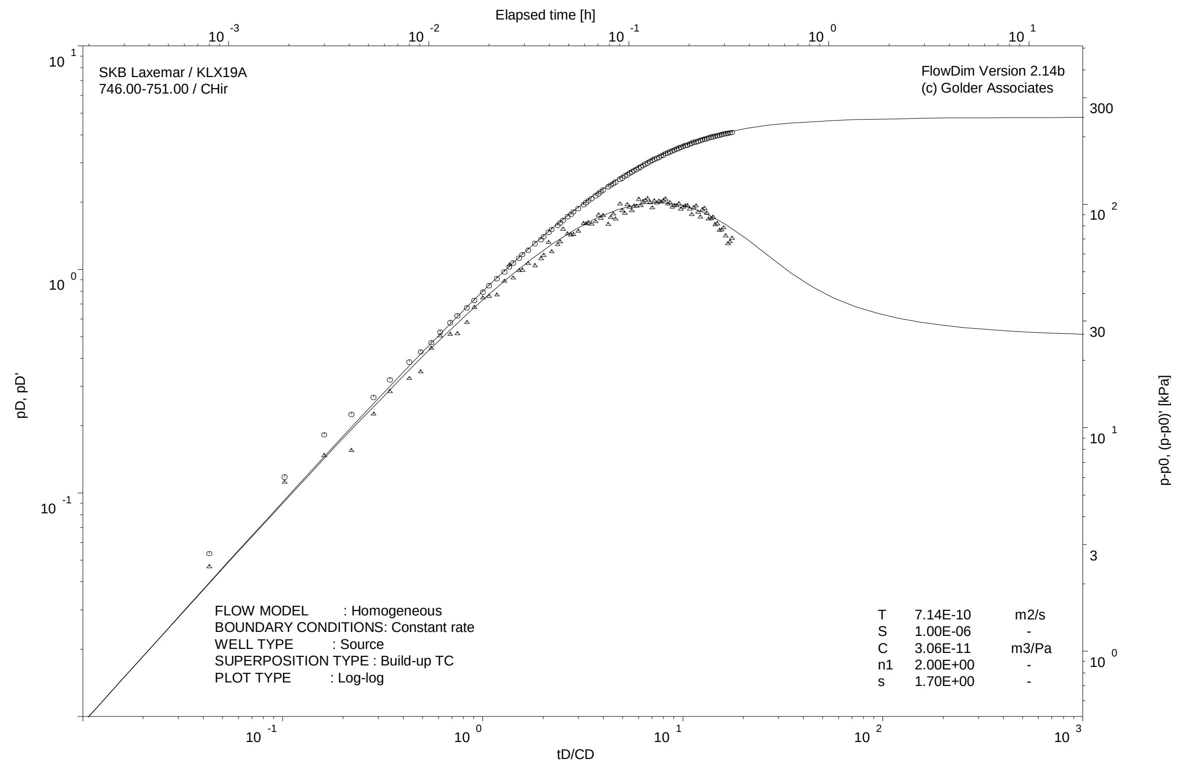
Pressure and flow rate vs. time; cartesian plot



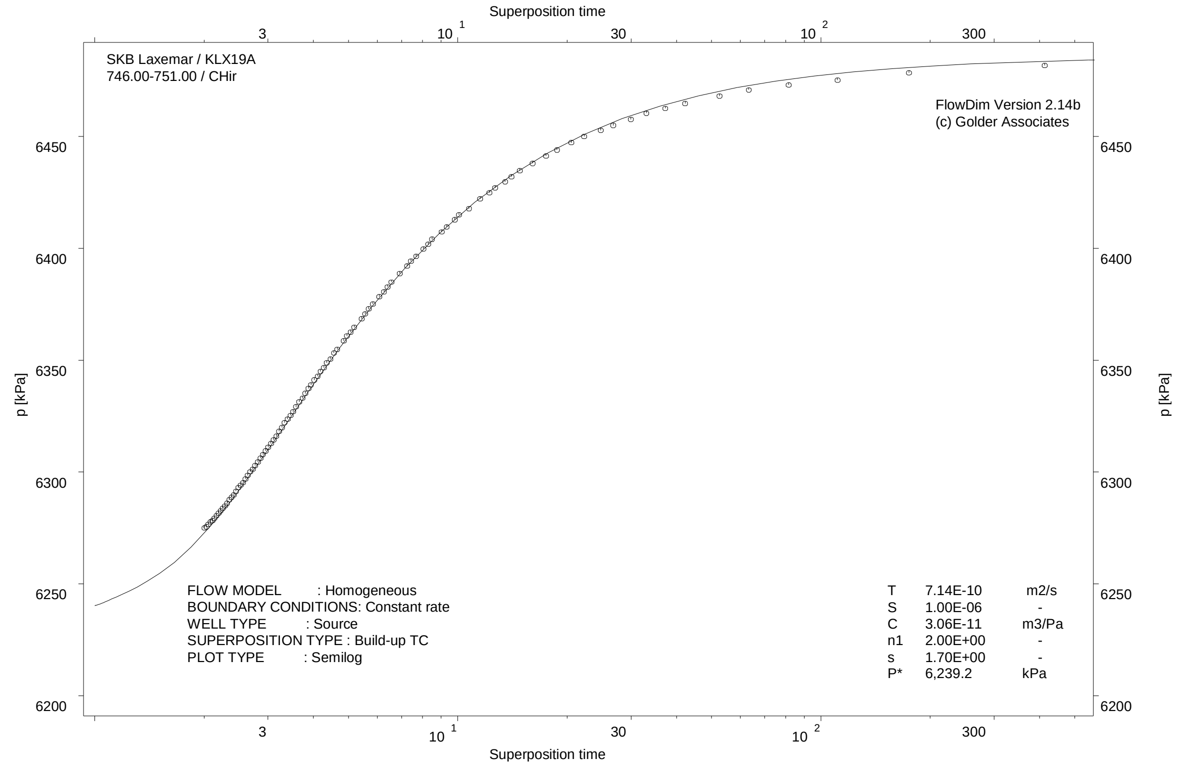
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

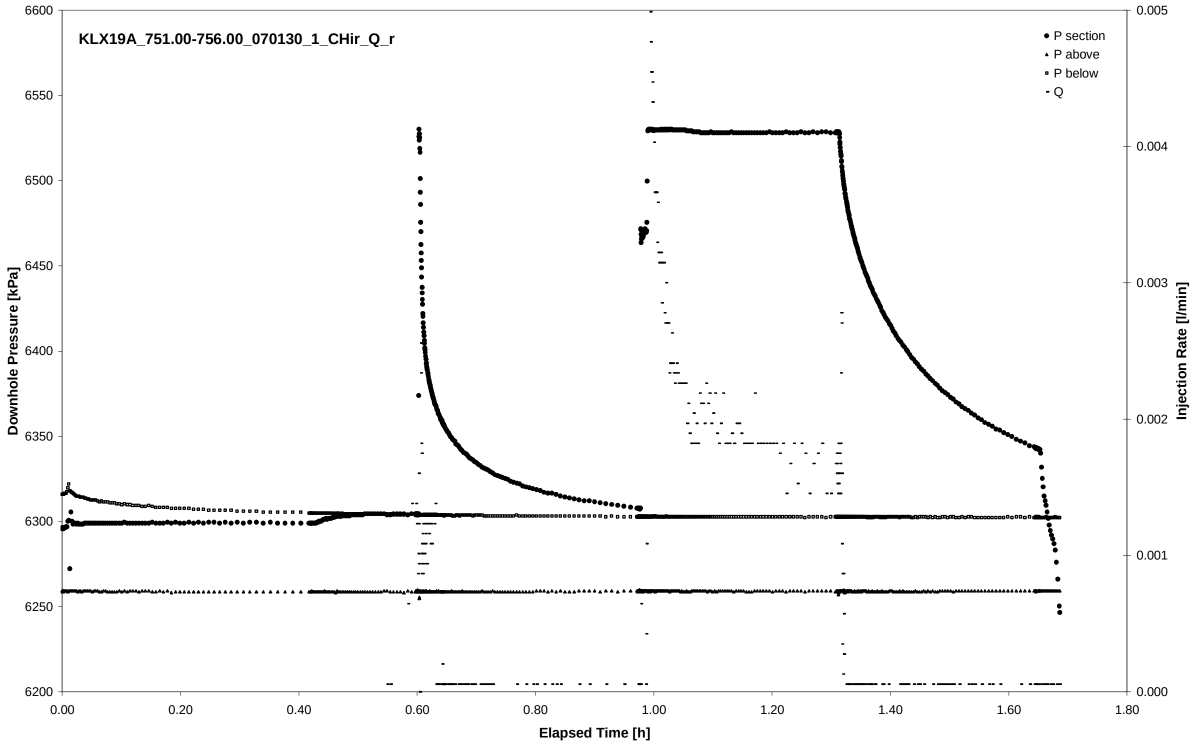


CHIR phase; HORNER match

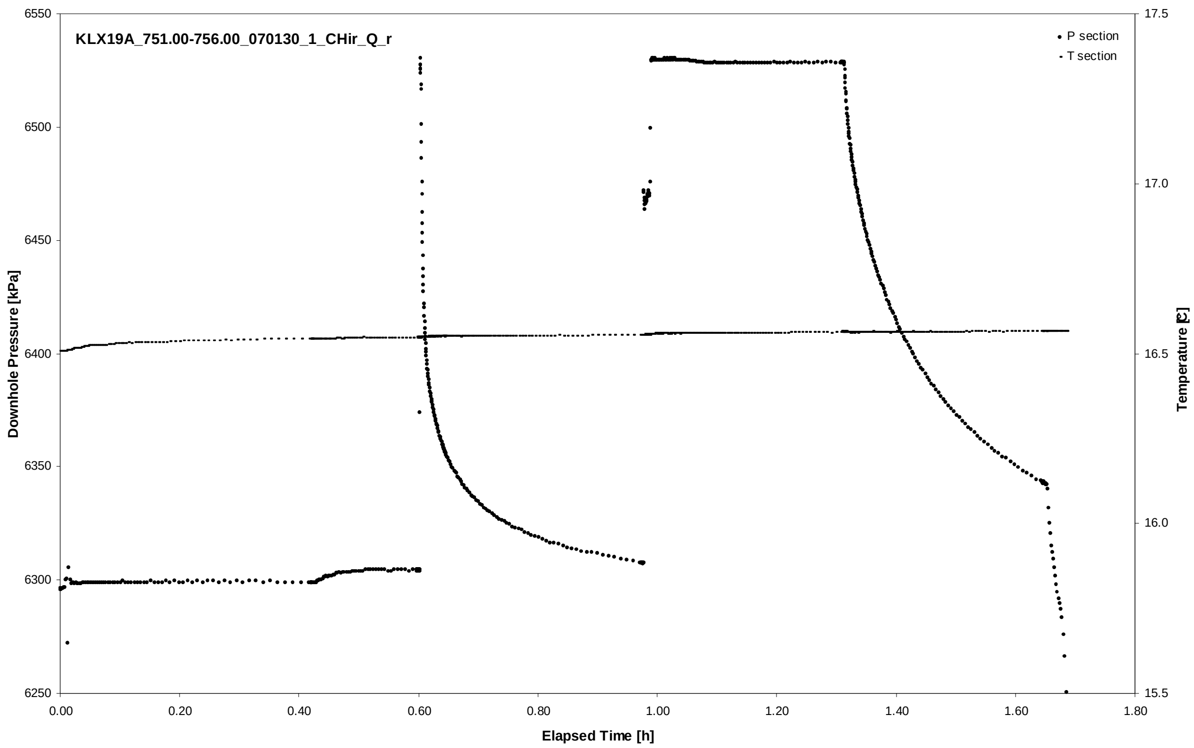
APPENDIX 2-71

Test 751.00 – 756.00 m

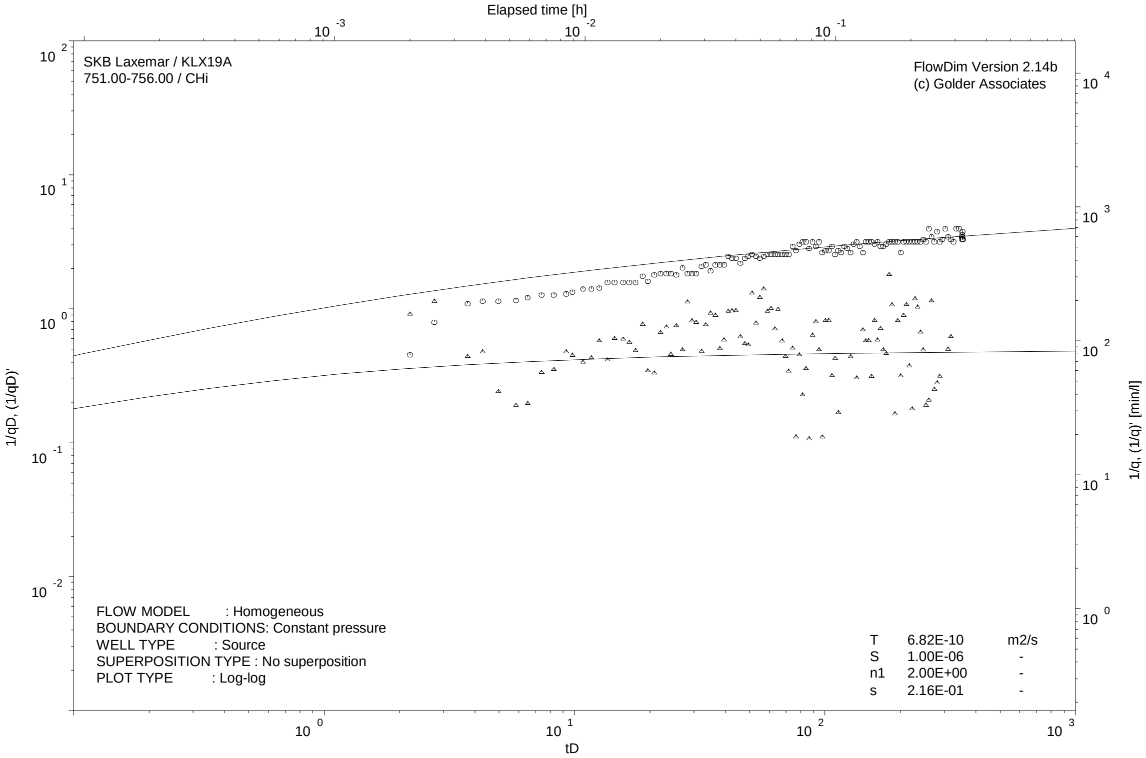
Analysis diagrams



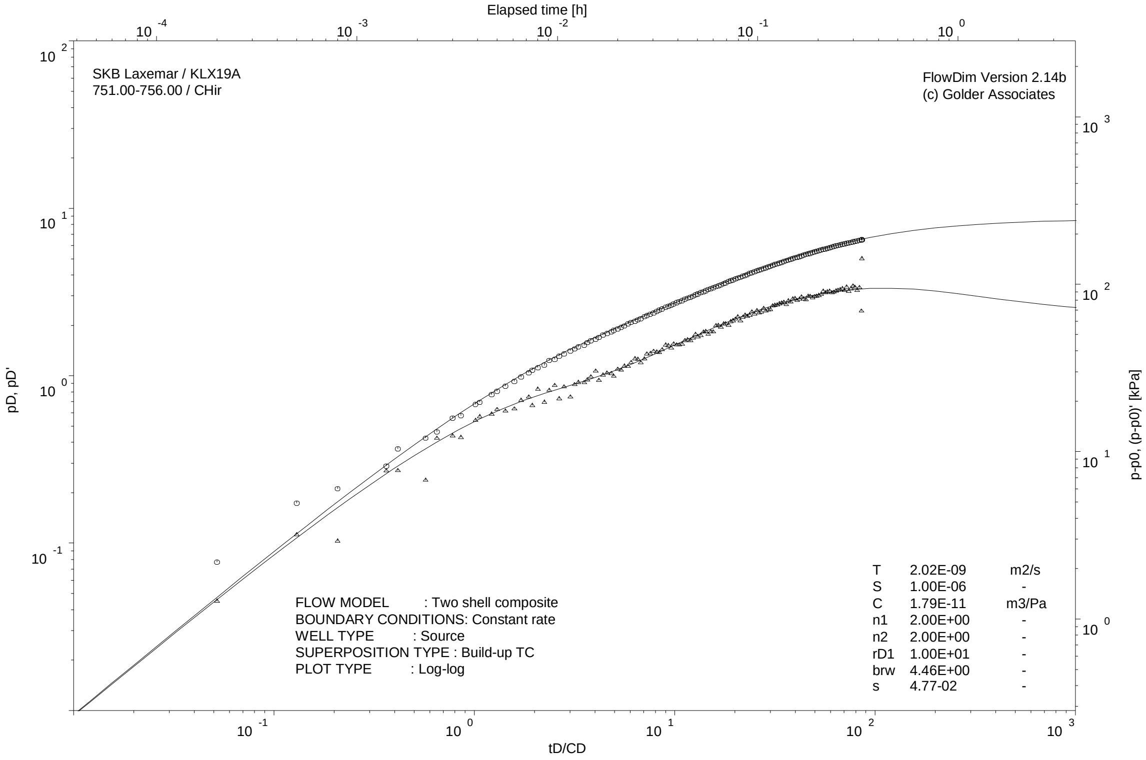
Pressure and flow rate vs. time; cartesian plot



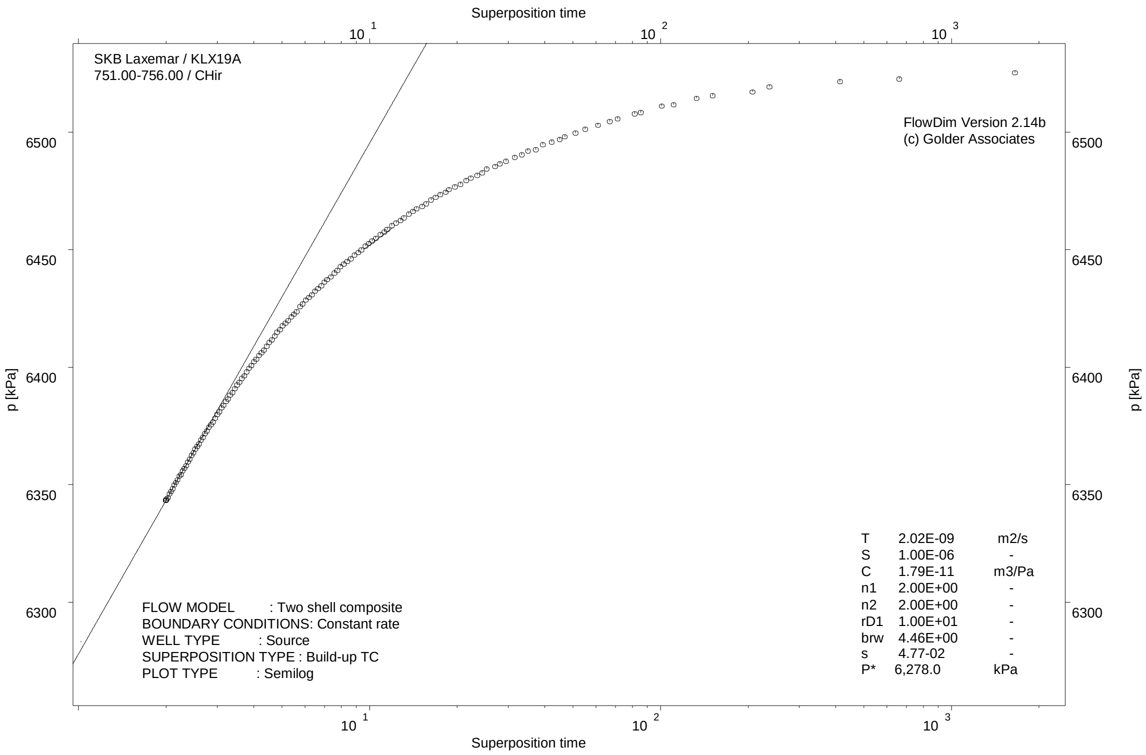
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

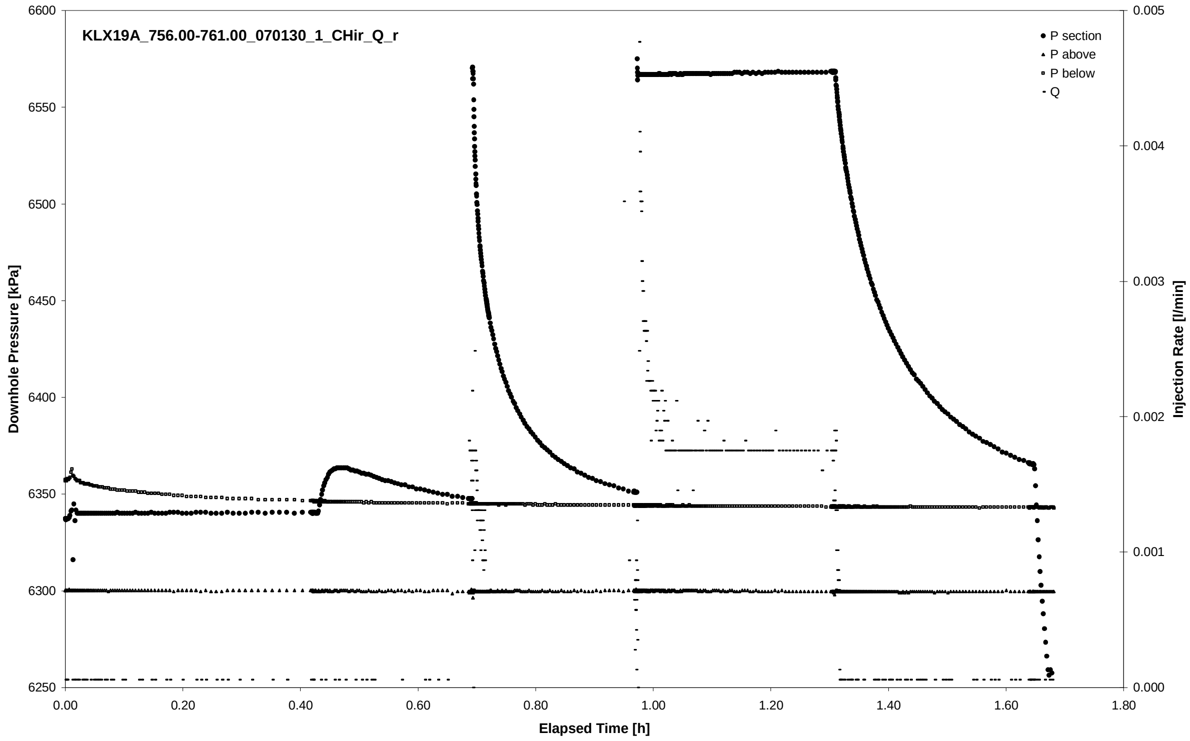


CHIR phase; HORNER match

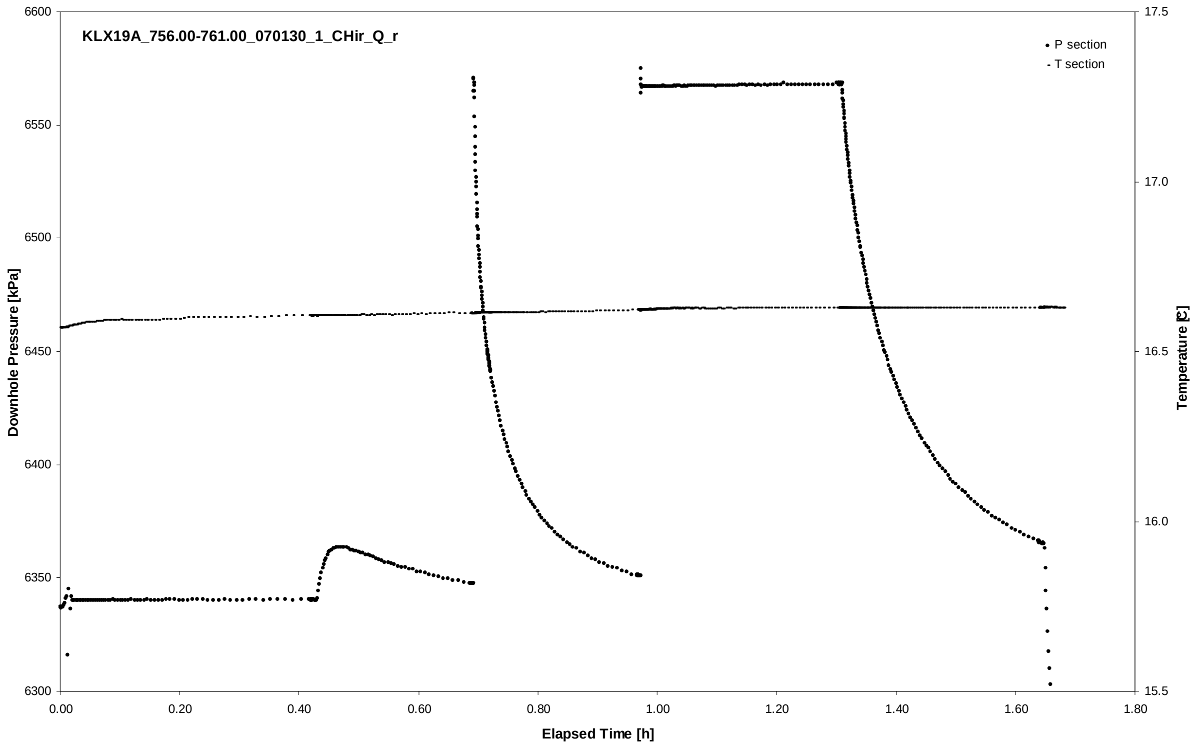
APPENDIX 2-72

Test 756.00 – 761.00 m

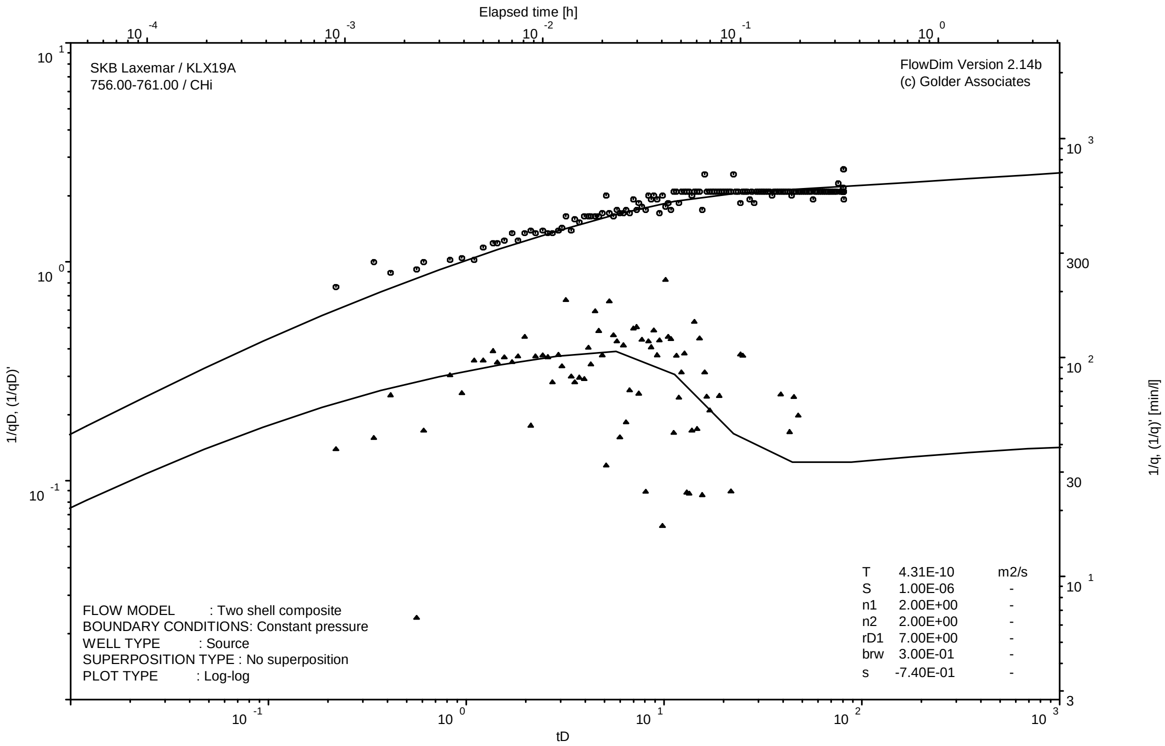
Analysis diagrams



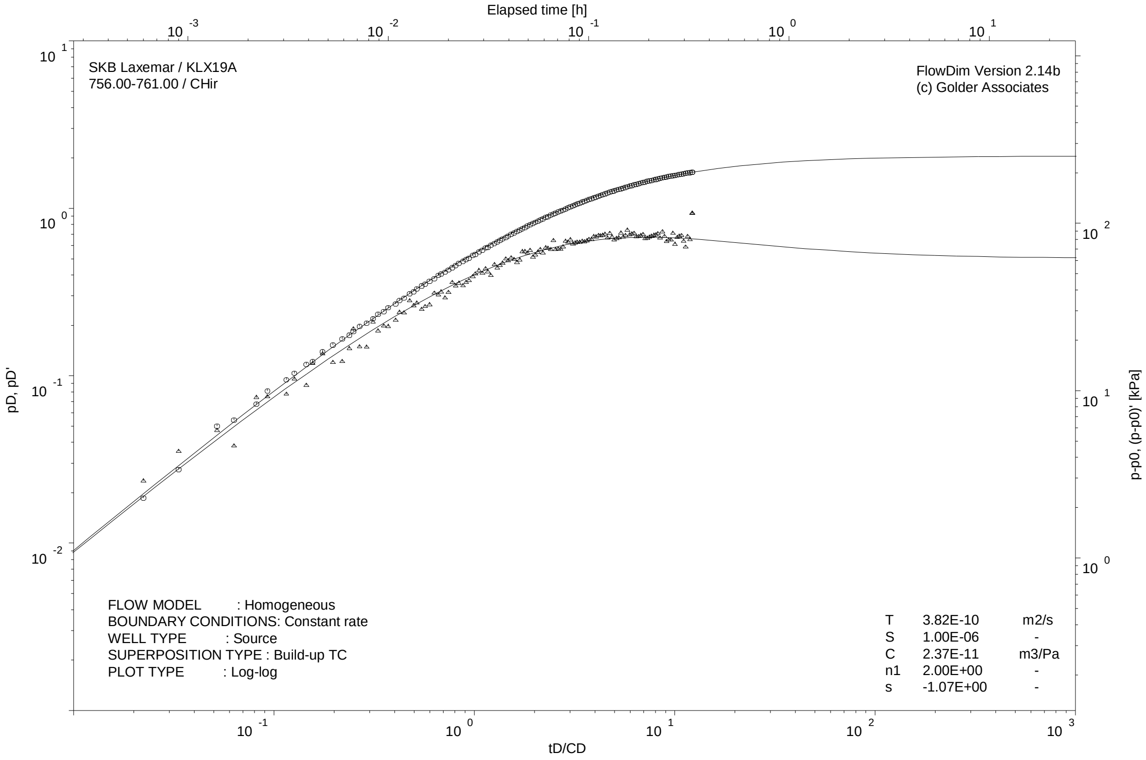
Pressure and flow rate vs. time; cartesian plot



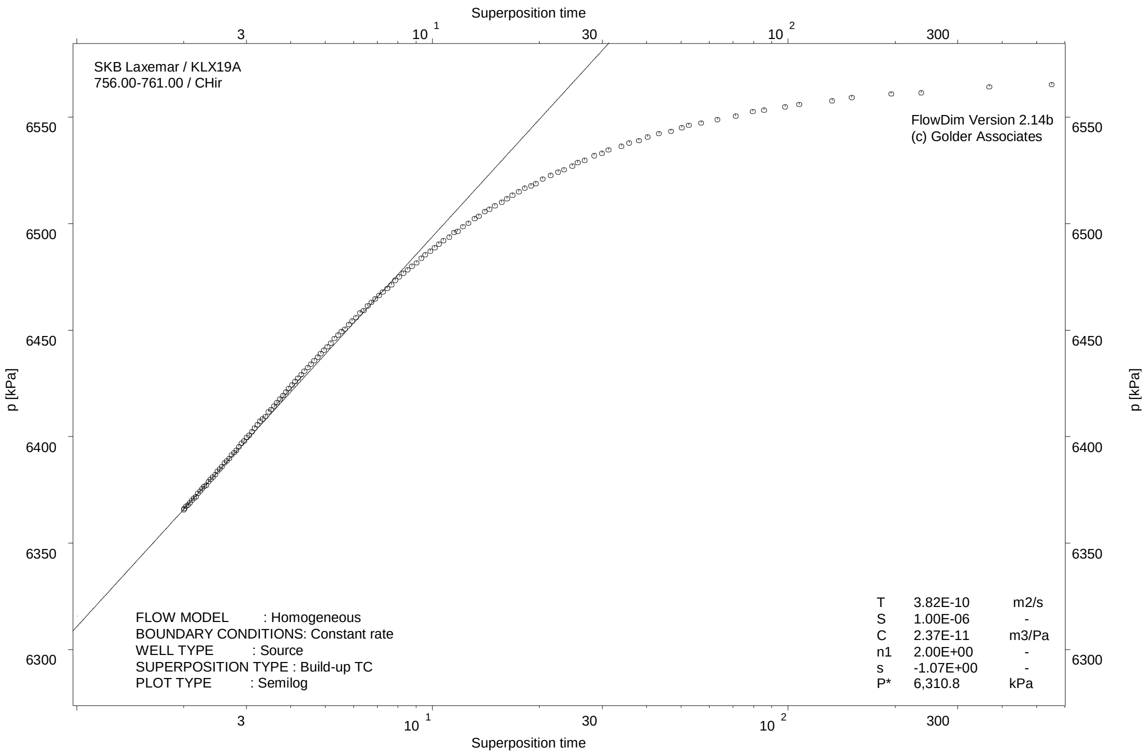
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

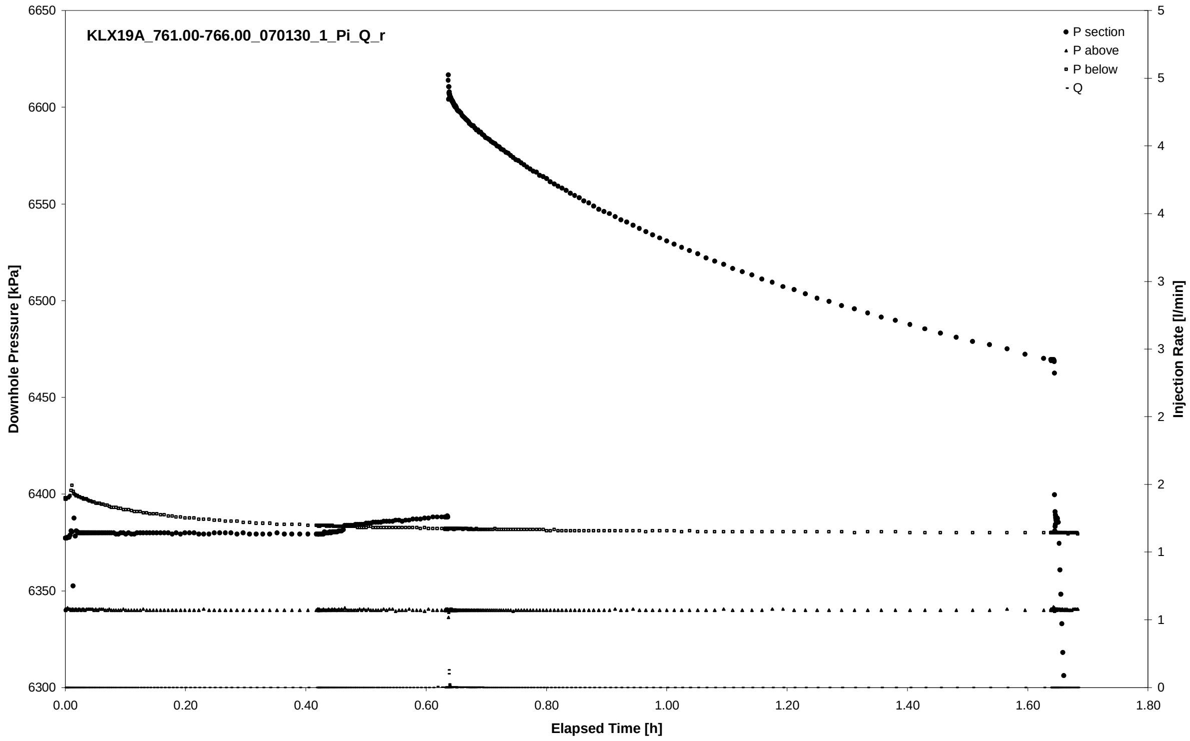


CHIR phase; HORNER match

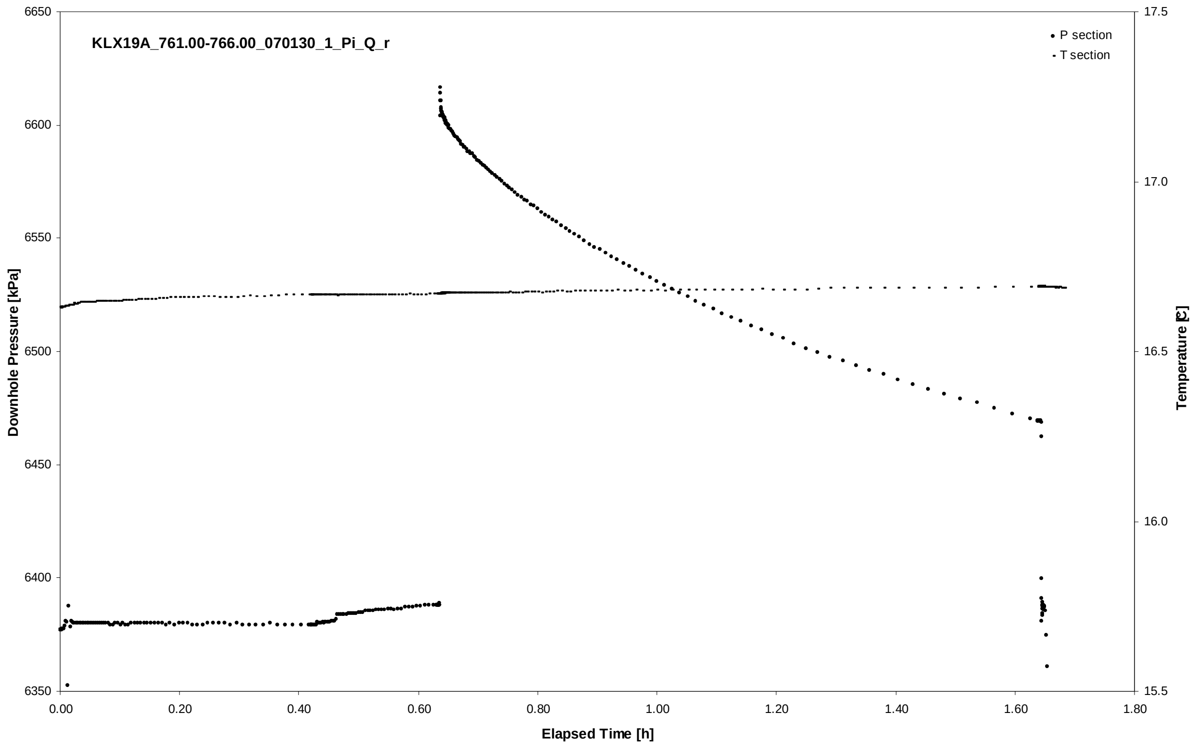
APPENDIX 2-73

Test 761.00 – 766.00 m

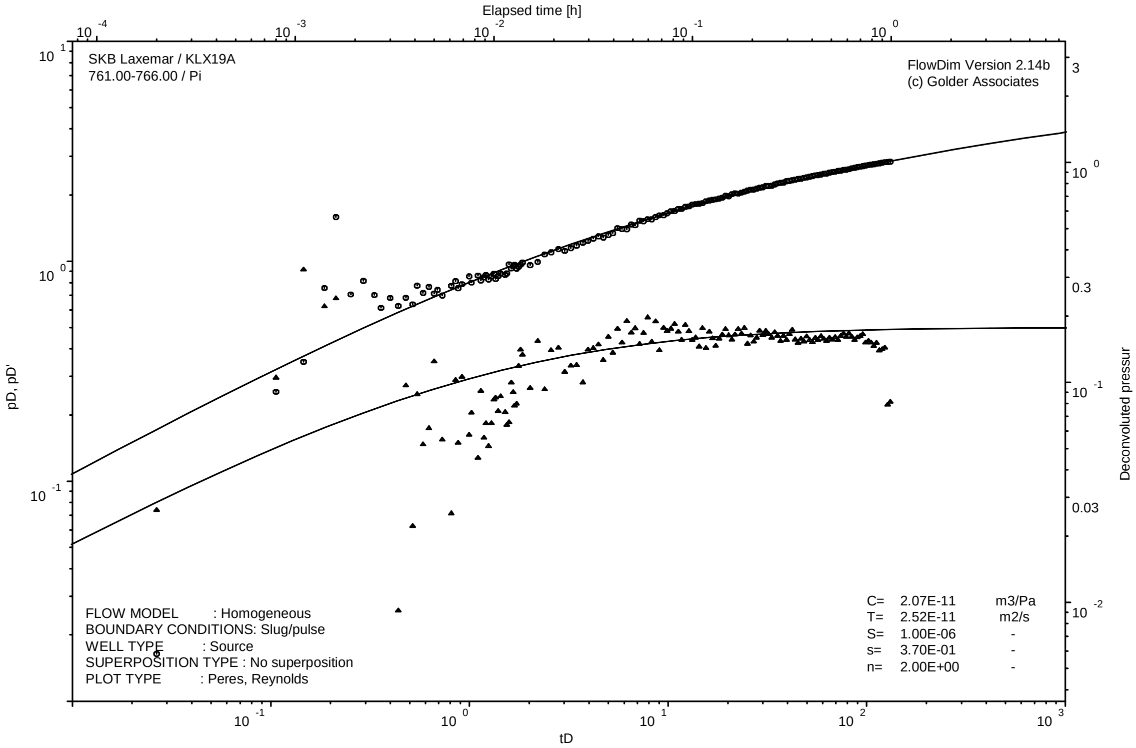
Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

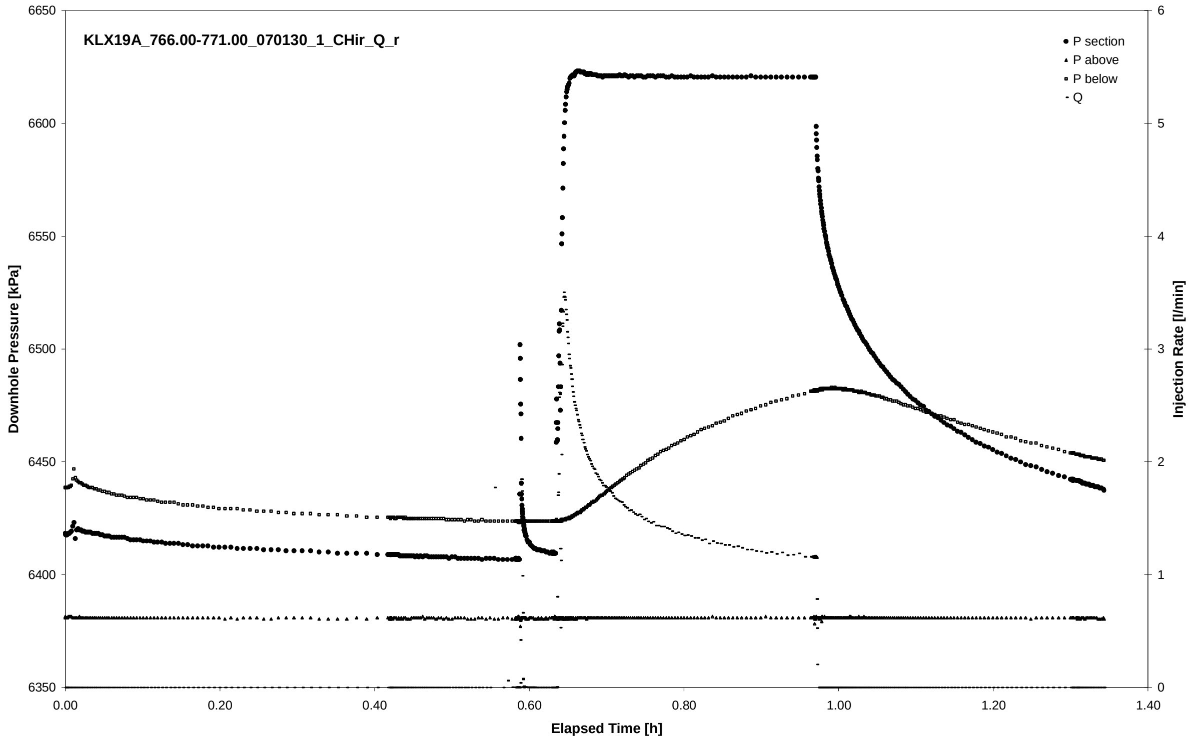


Pulse injection; deconvolution match

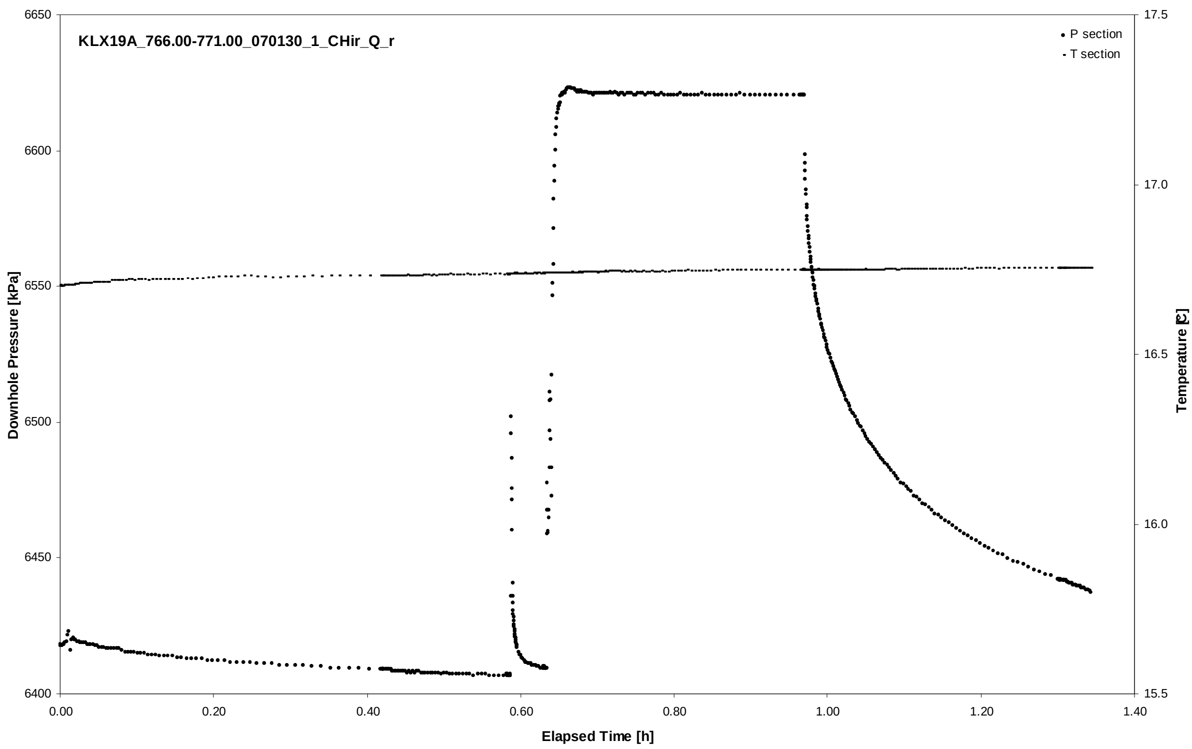
APPENDIX 2-74

Test 766.00 – 771.00 m

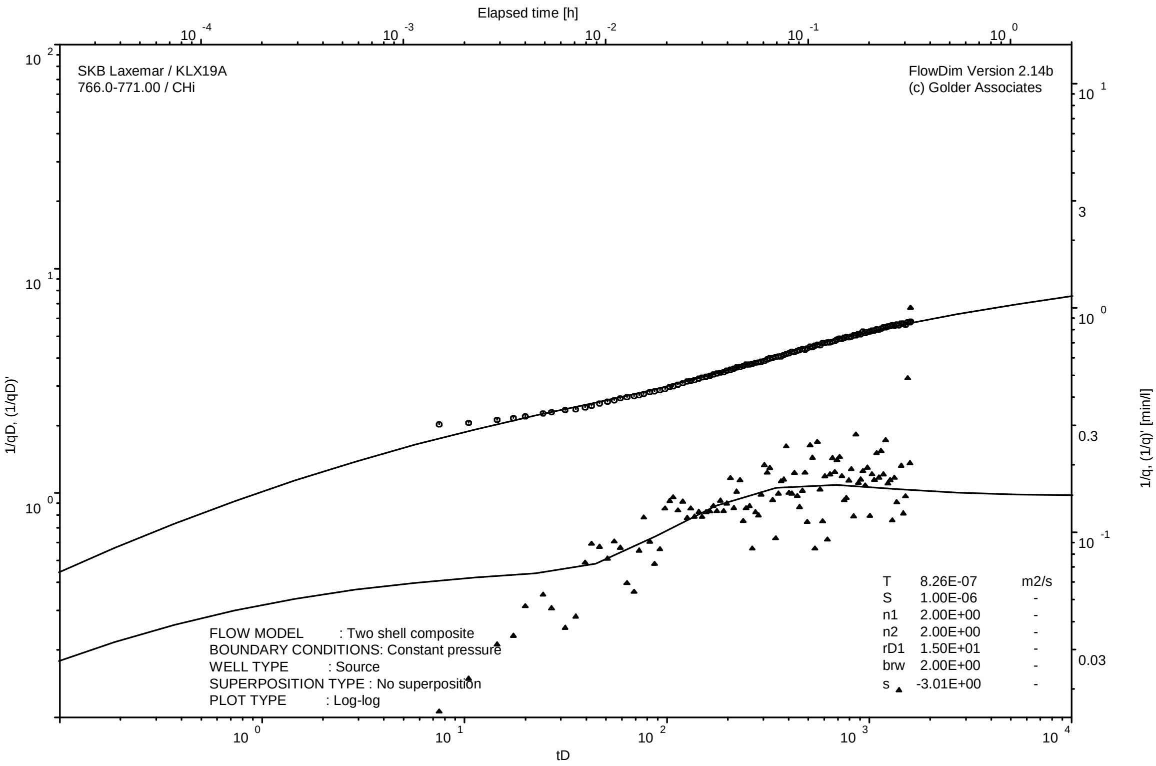
Analysis diagrams



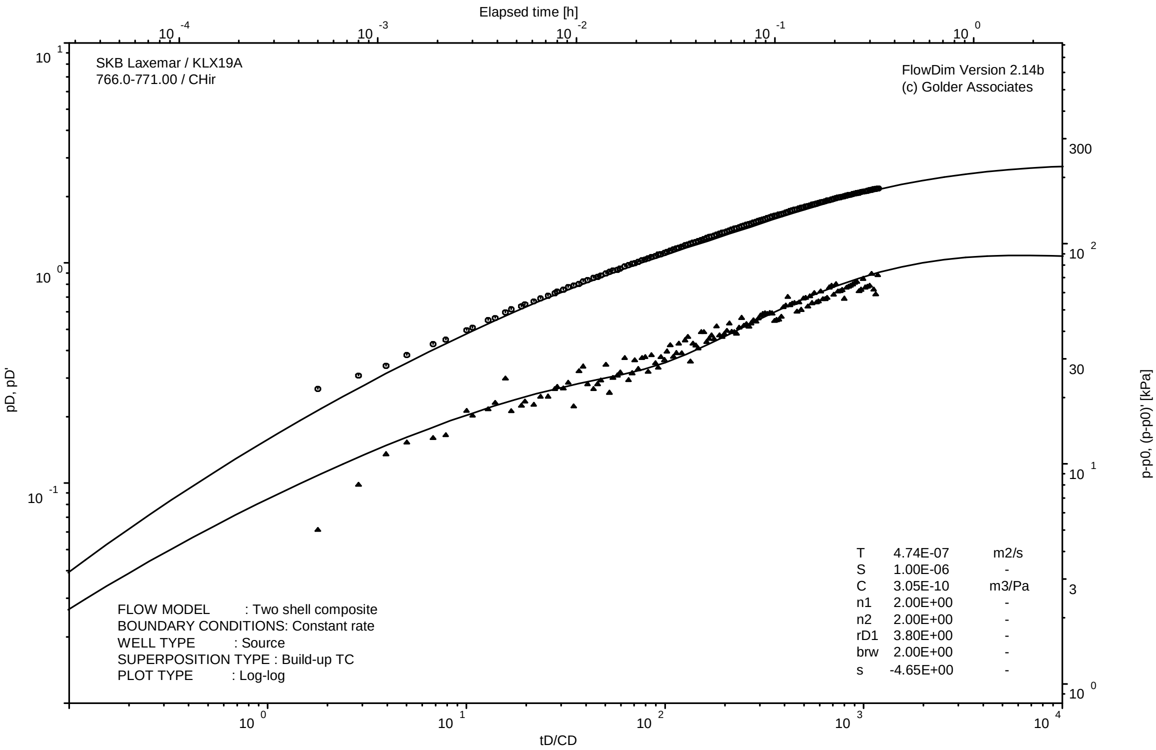
Pressure and flow rate vs. time; cartesian plot



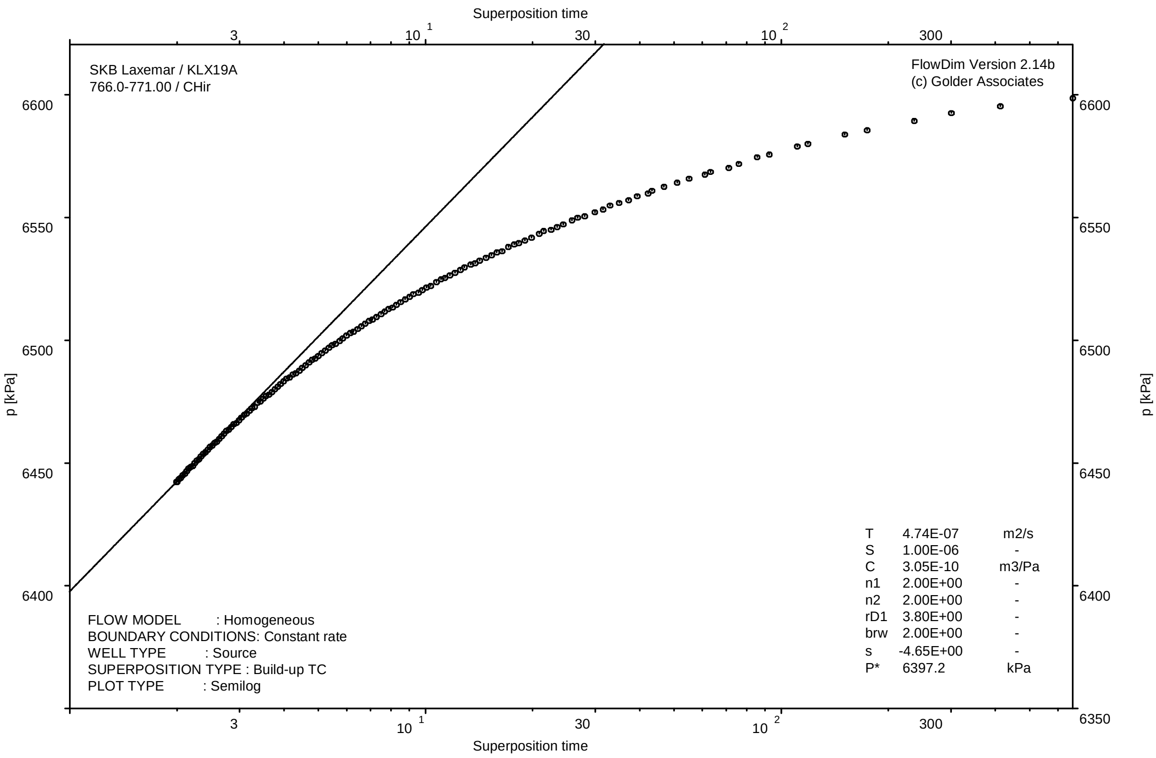
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

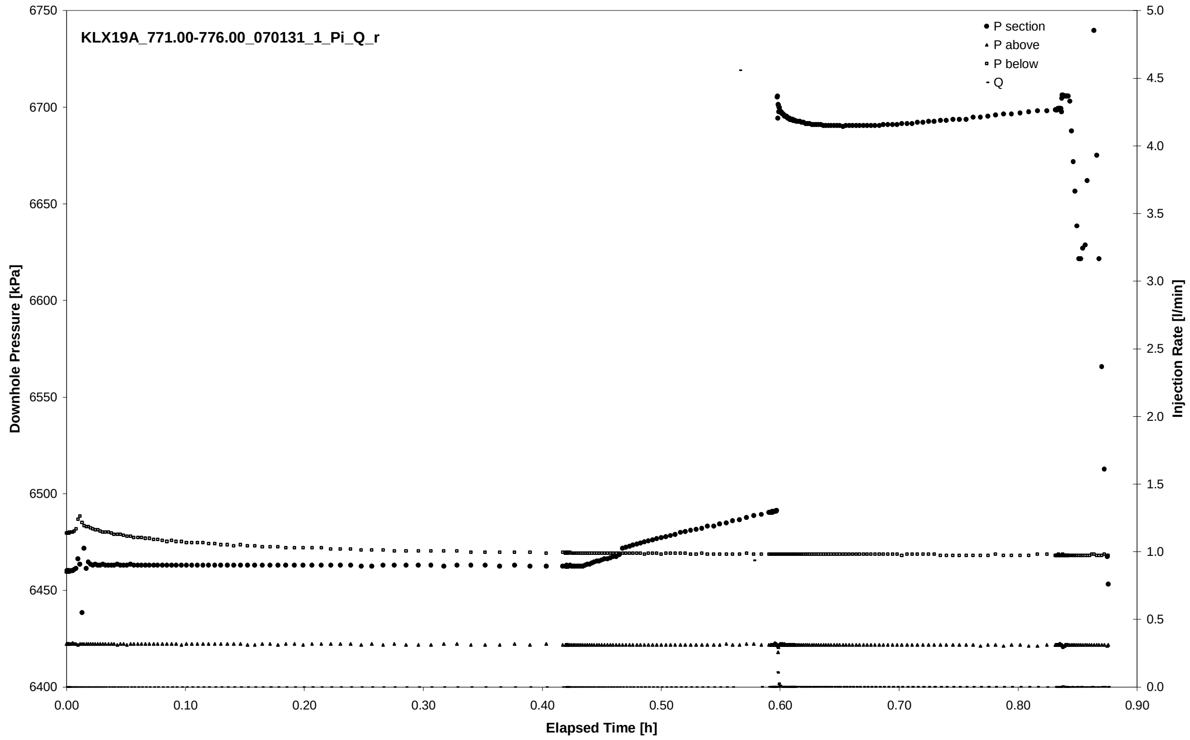


CHIR phase; HORNER match

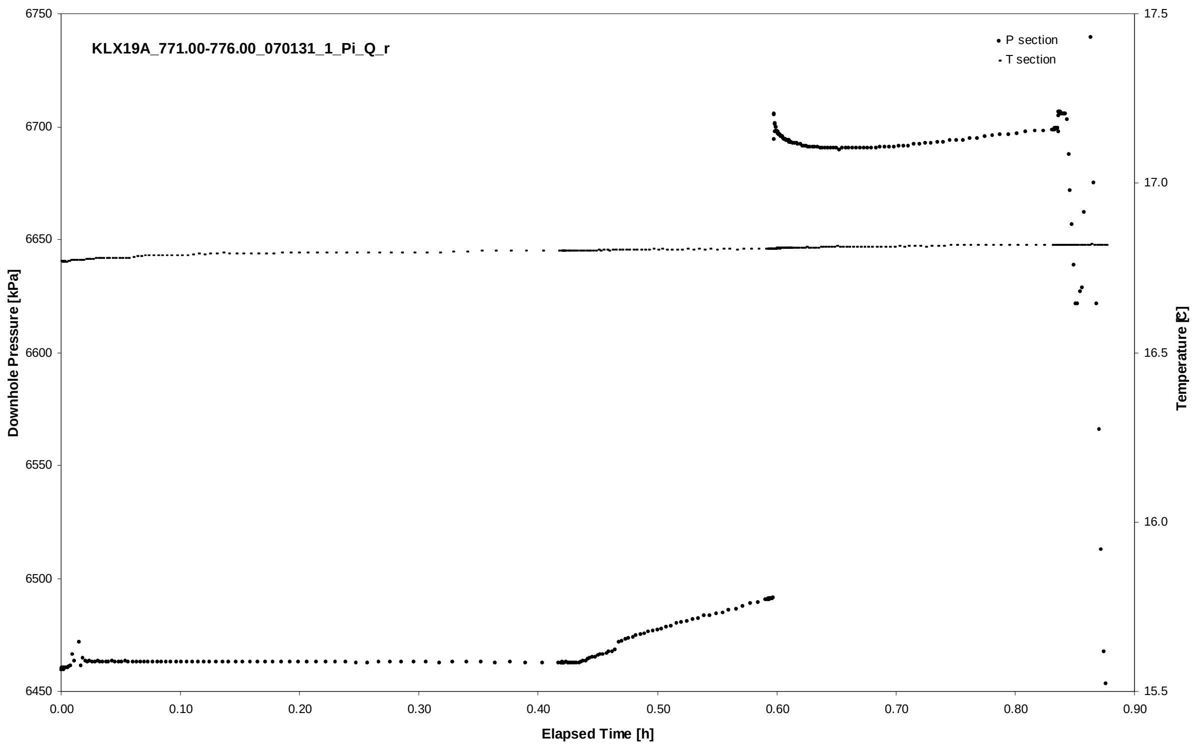
APPENDIX 2-75

Test 771.00 – 776.00 m

Analysis diagrams



Pressure and flow rate vs. time; cartesian plot



Interval pressure and temperature vs. time; cartesian plot

Not Analysed

CHI phase; log-log match

Not Analysed

CHIR phase; log-log match

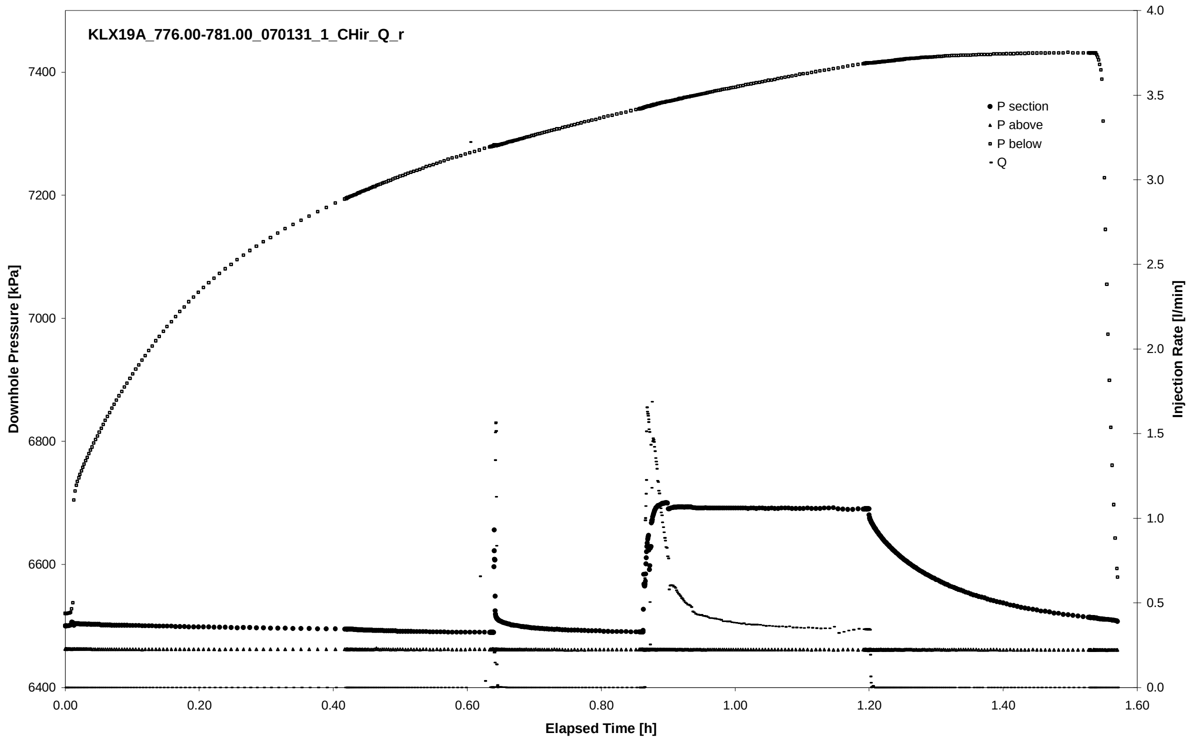
Not Analysed

CHIR phase; HORNER match

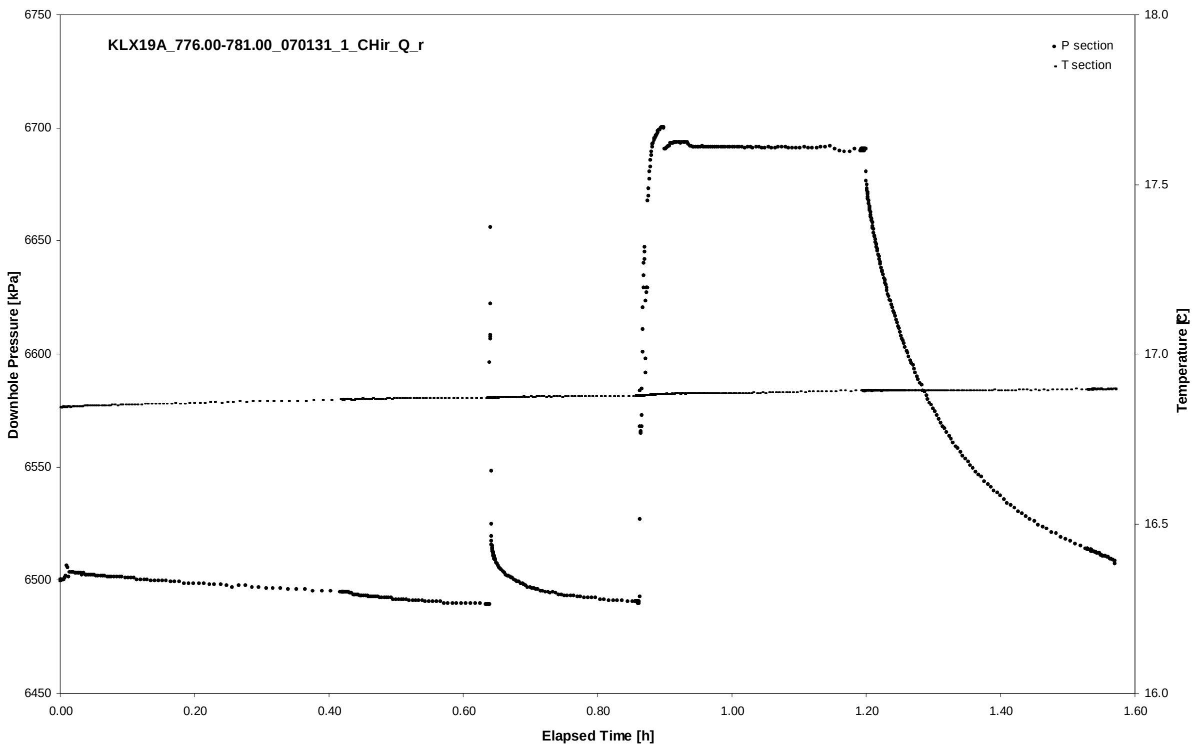
APPENDIX 2-76

Test 776.00 – 781.00 m

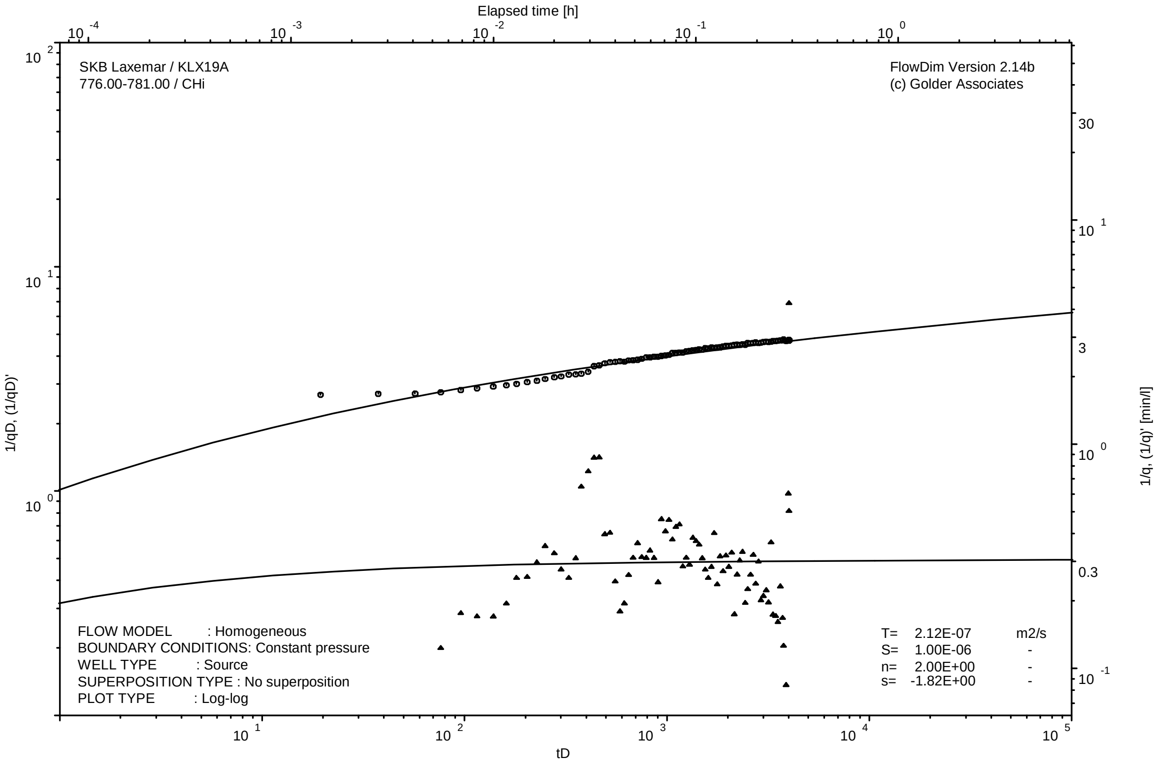
Analysis diagrams



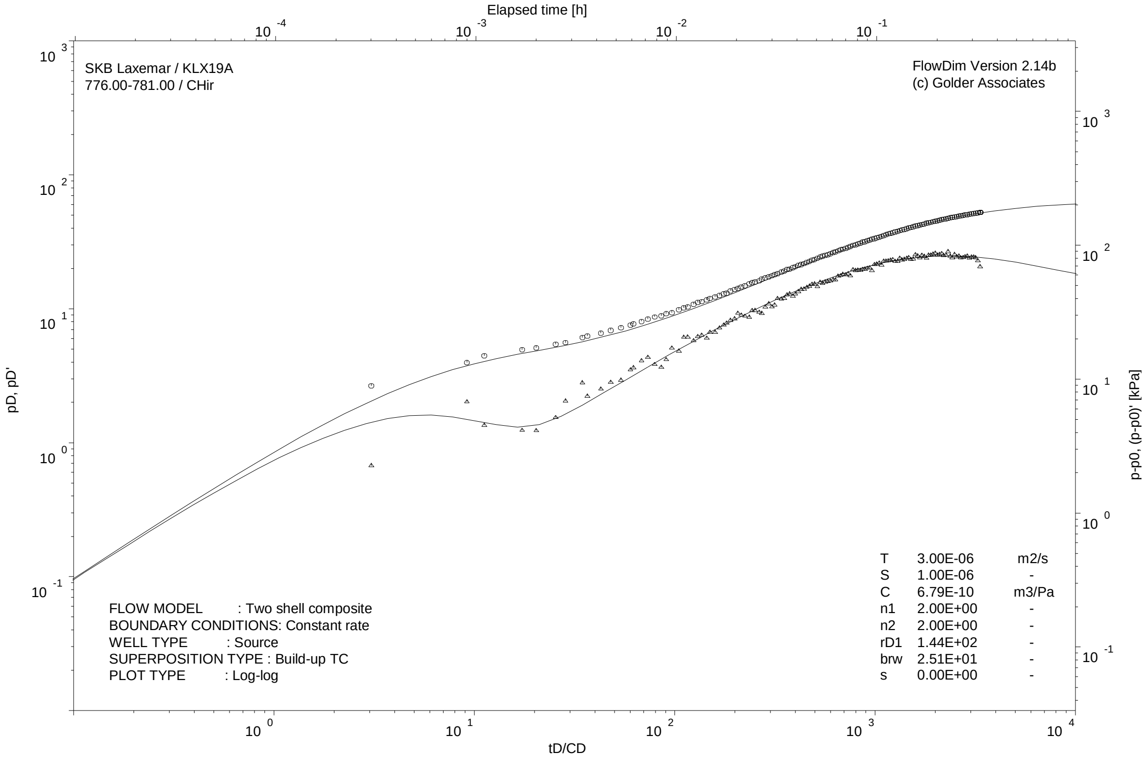
Pressure and flow rate vs. time; cartesian plot



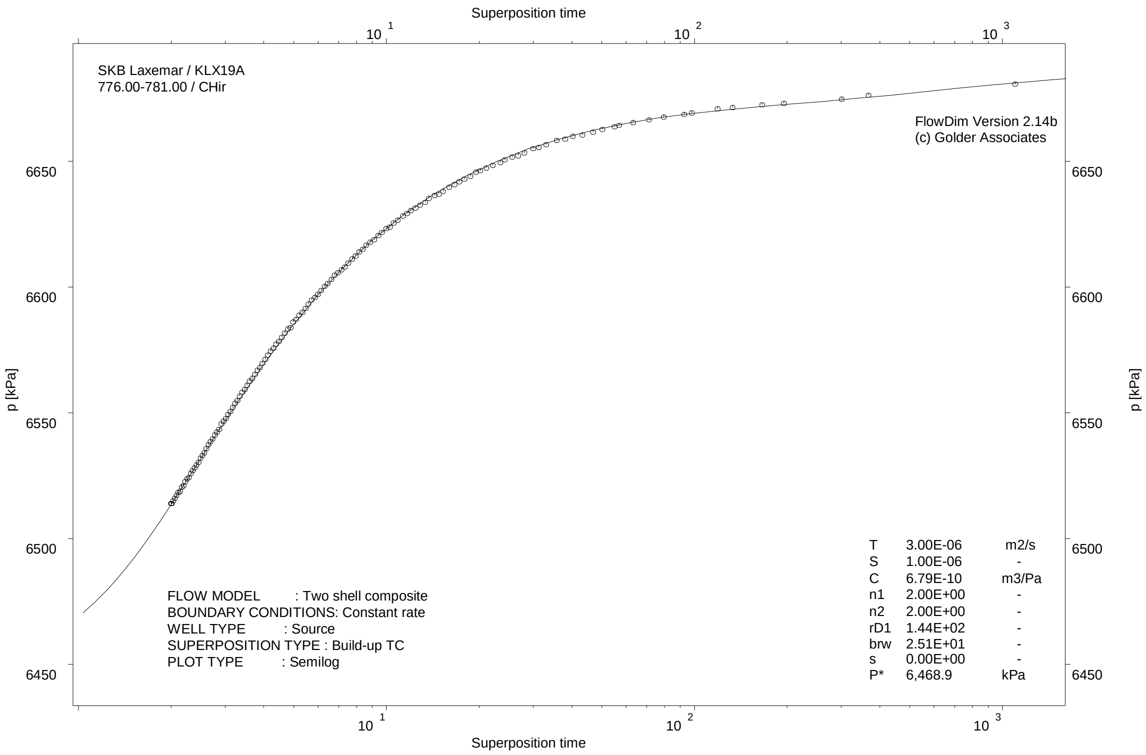
Interval pressure and temperature vs. time; cartesian plot



CHI phase; log-log match



CHIR phase; log-log match

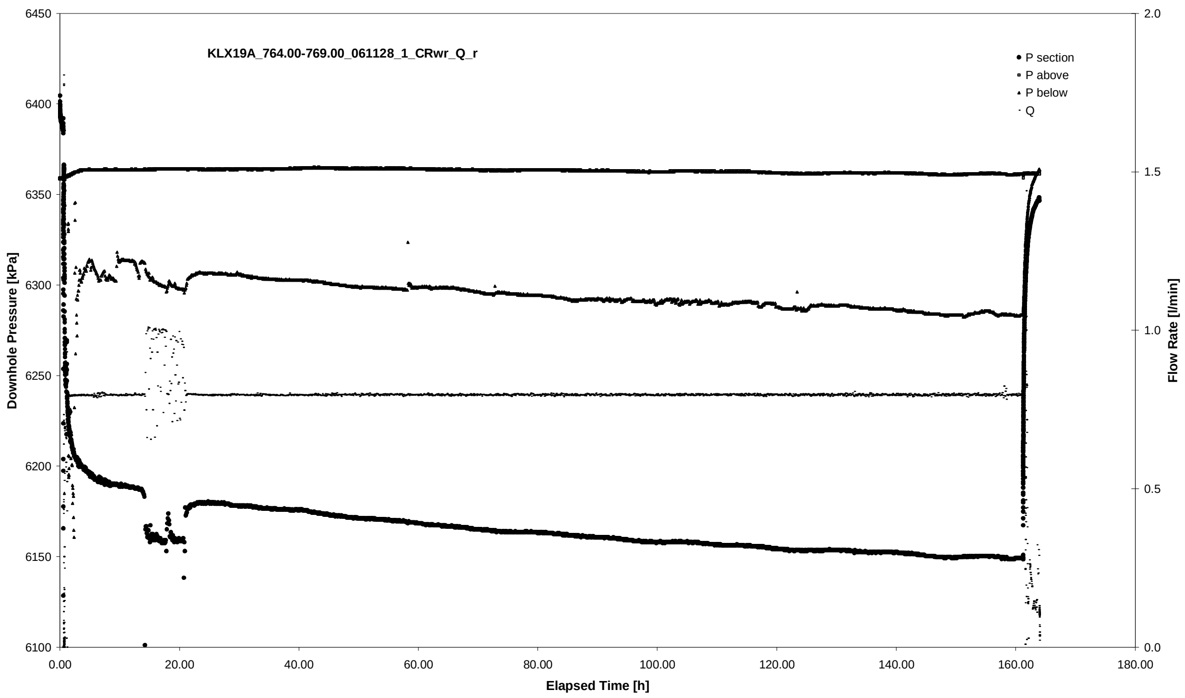


CHIR phase; HORNER match

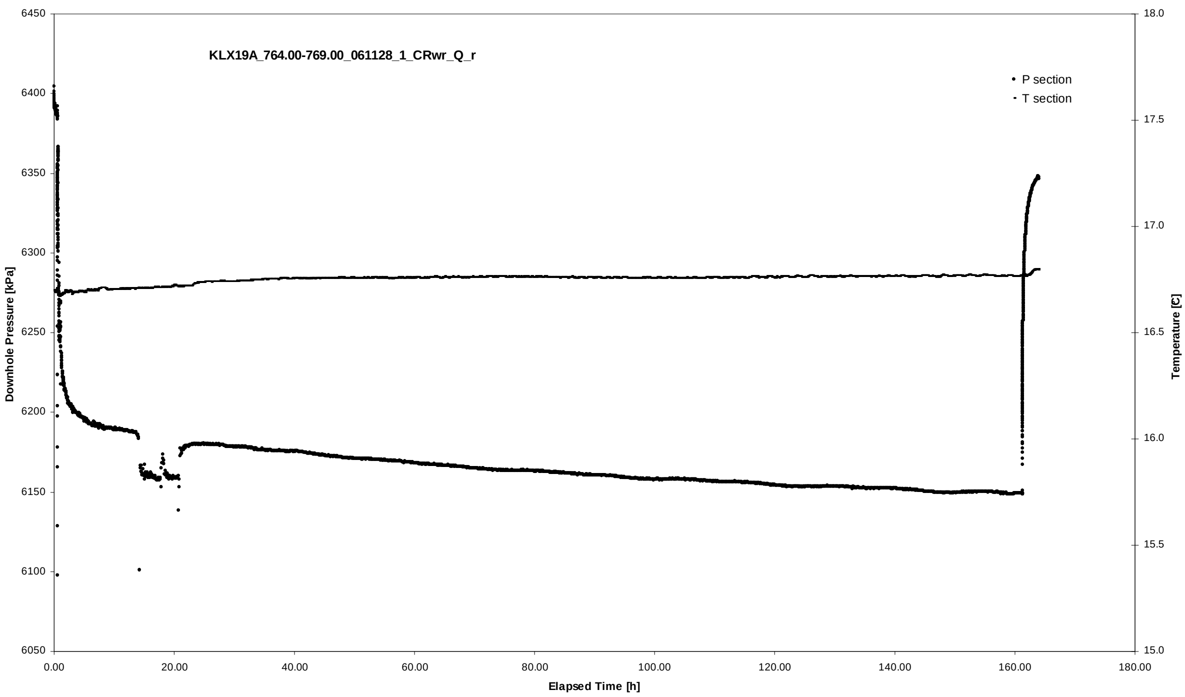
APPENDIX 2-77

Test 764.00 – 769.00 m

Pump Test Analysis diagrams



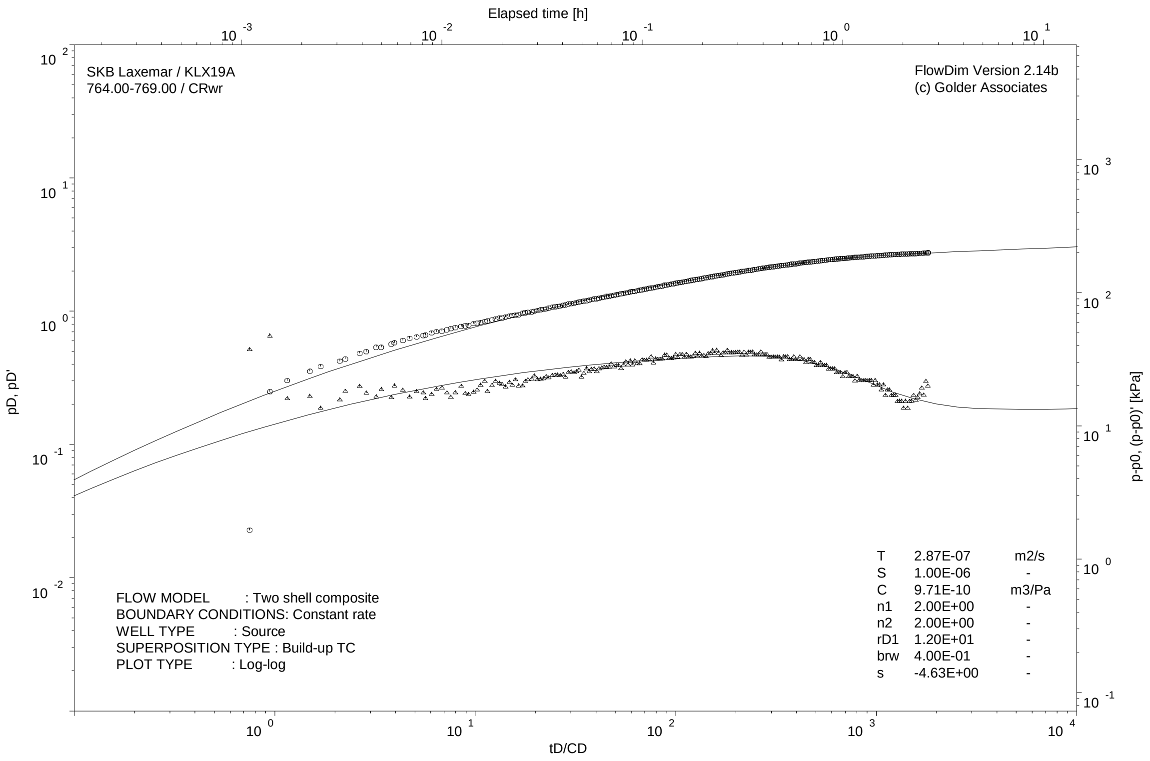
Pressure and flow rate vs. time; cartesian plot



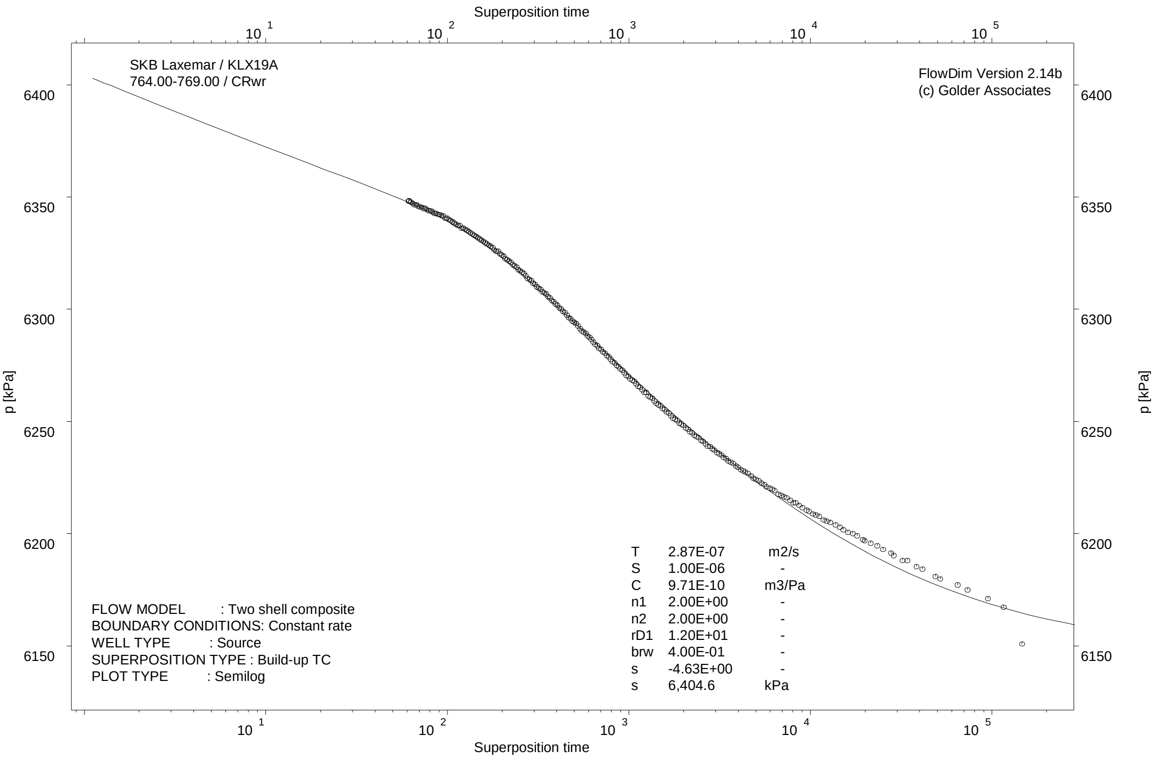
Pressure and Temperature vs. time; cartesian plot

Not analysed

CRw phase; log-log match



CRwr phase; log-log match

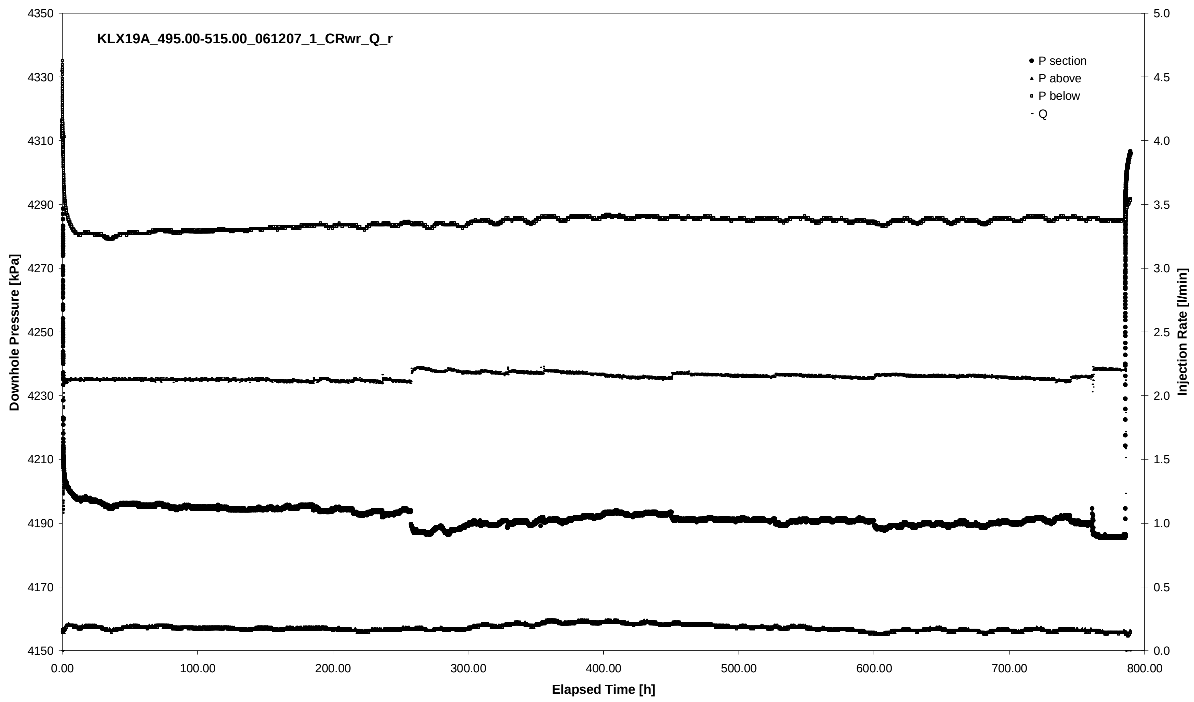


CRwr phase; HORNER match

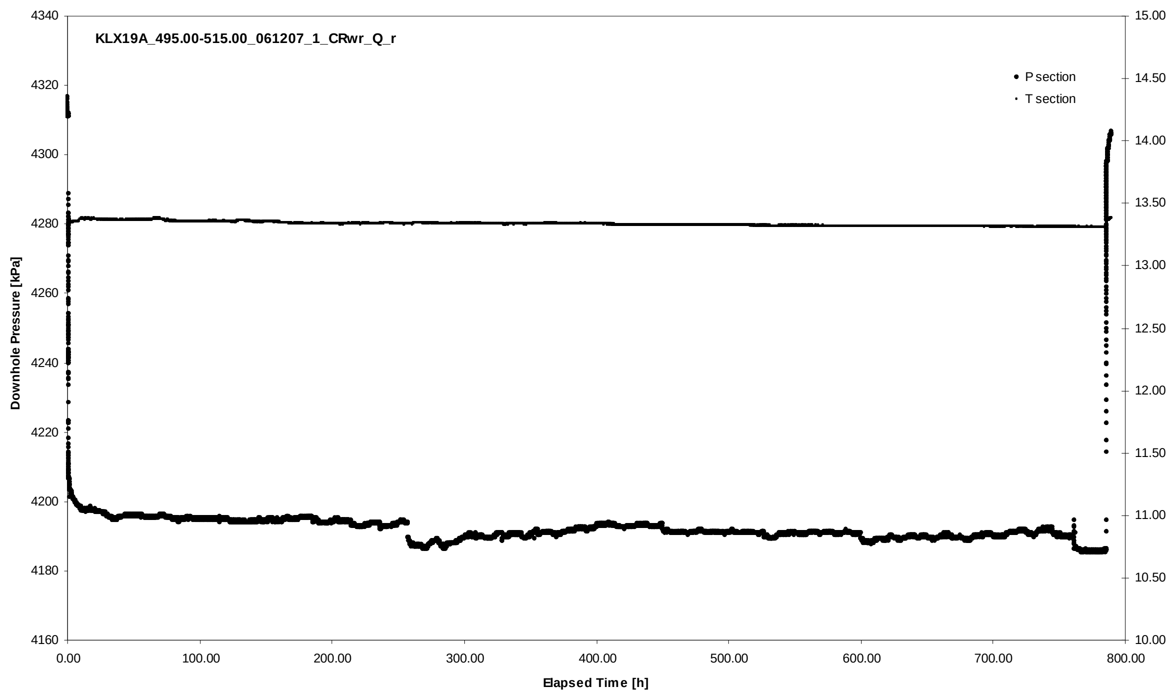
APPENDIX 2-78

Test 495.00 – 515.00 m

Pump Test Analysis diagrams



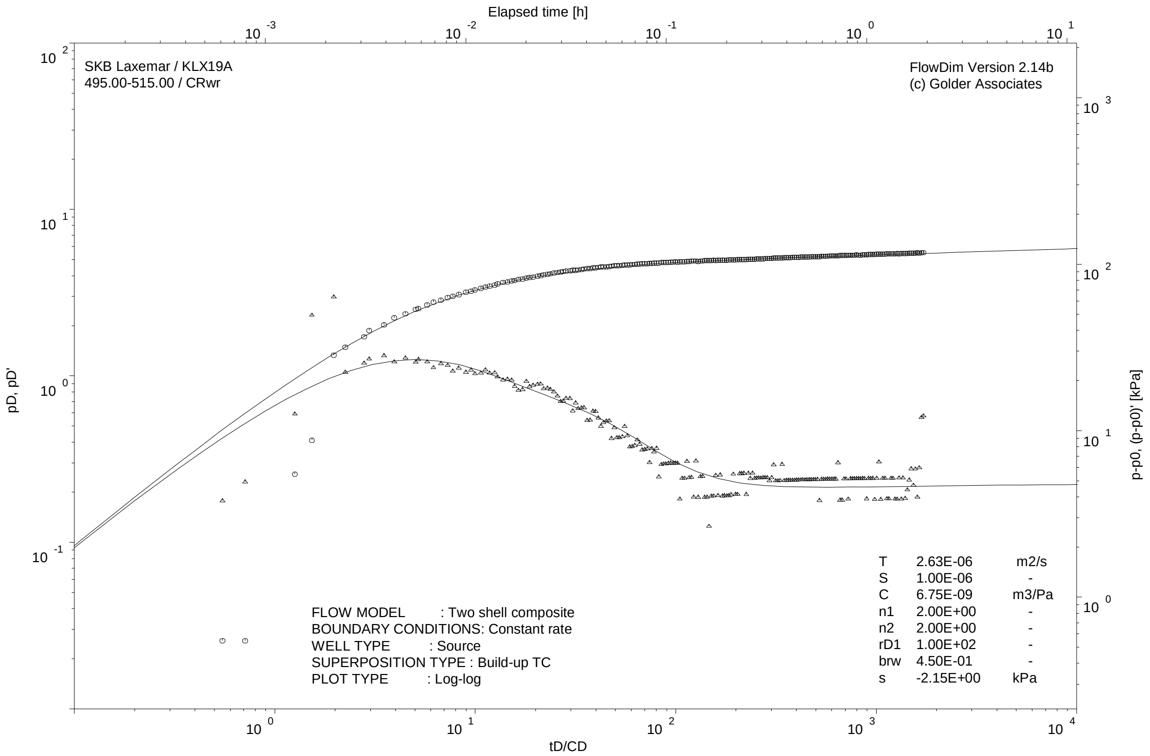
Pressure and flow rate vs. time; cartesian plot



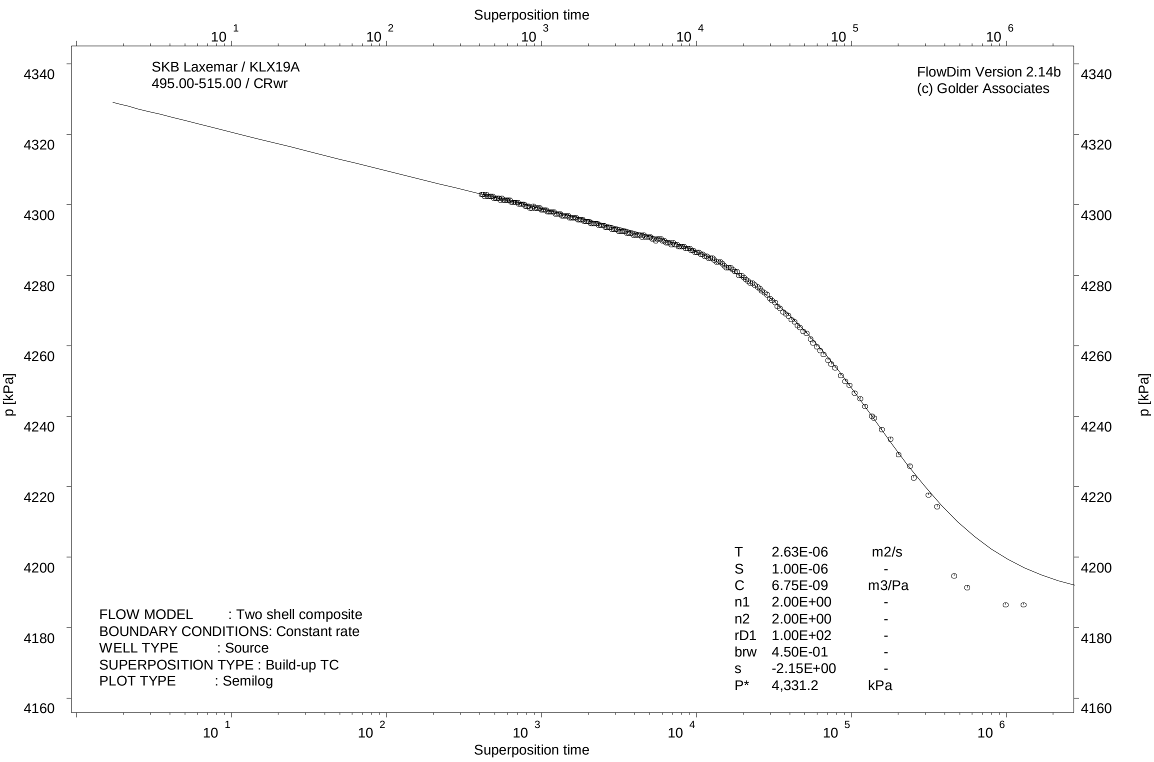
Pressure and Temperature vs. time; cartesian plot

Not analysed

CRw phase; log-log match



CRwr phase; log-log match



CRwr phase; HORNER match

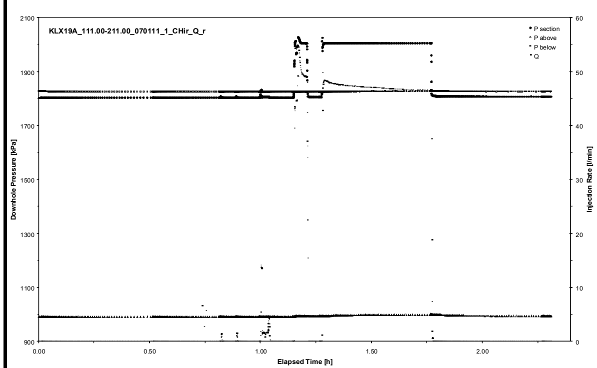
APPENDIX 3

Test Summary Sheets

Test Summary Sheet

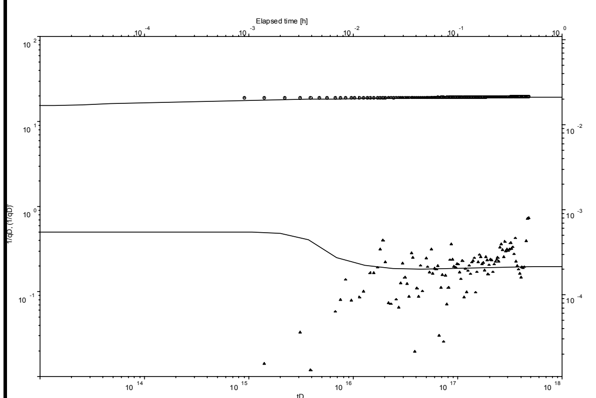
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070111 08:17
Test section from - to (m):	111.00-211.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

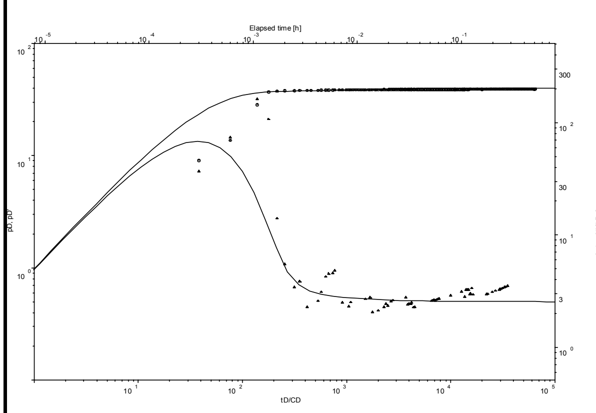


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1801		
p_i (kPa) =	1804		
p_p(kPa) =	2004	p_F (kPa) =	1806
Q_p (m^3/s)=	7.77E-04		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.5		
Derivative fact.=	0.05	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	3.8E-05		
T_M (m^2/s)=	5.0E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.02	dt_1 (min) =	0.43
dt_2 (min) =	22.27	dt_2 (min) =	16.72
T (m^2/s) =	3.0E-04	T (m^2/s) =	2.4E-04
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.0E-06	K_s (m/s) =	2.4E-06
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.4E-09
C_D (-) =	NA	C_D (-) =	1.2E-01
ξ (-) =	11.0	ξ (-) =	30.3
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.43	C (m^3/Pa) =	4.4E-09
dt_2 (min) =	16.72	C_D (-) =	1.2E-01
T_T (m^2/s) =	2.4E-04	ξ (-) =	30.3
S (-) =	1.0E-06		
K_s (m/s) =	2.4E-06		
S_s (1/m) =	1.0E-08		

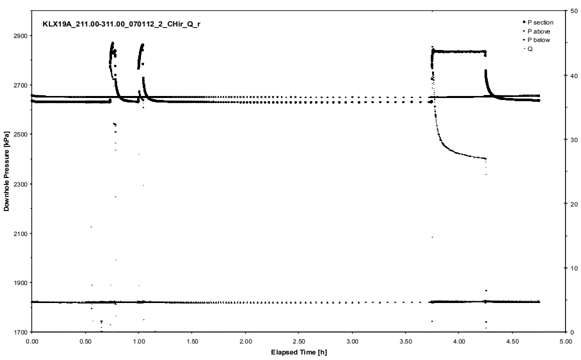
Comments:

The recommended transmissivity of 2.4E-4 m2/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 7.0E-5 m2/s to 5.0E-4 m2/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 1,806.1 kPa.

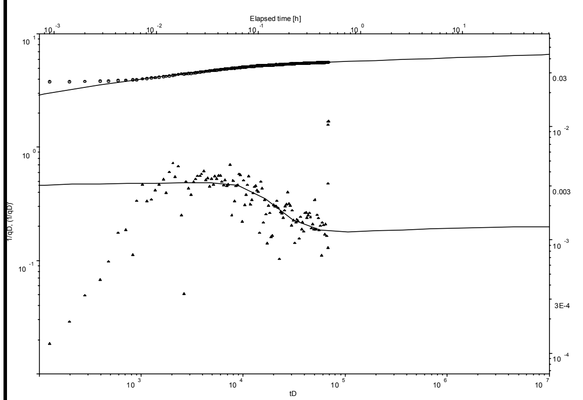
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070112 09:13
Test section from - to (m):	211.00-311.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

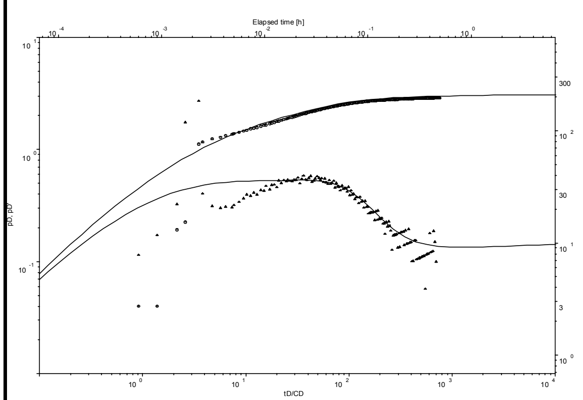
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2632		
p_i (kPa) =	2630		
p_p(kPa) =	2834	p_F (kPa) =	2637
Q_p (m^3/s)=	4.50E-04		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.8		
Derivative fact.=	0.02	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	2.2E-05		
T_M (m^2/s)=	2.8E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.62	dt_1 (min) =	0.92
dt_2 (min) =	3.16	dt_2 (min) =	2.65
T (m^2/s) =	1.9E-05	T (m^2/s) =	1.1E-05
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.9E-07	K_s (m/s) =	1.1E-07
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.7E-08
C_D (-) =	NA	C_D (-) =	1.9E+00
ξ (-) =	-2.9	ξ (-) =	-4.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	0.92	C (m^3/Pa) =	1.7E-08
dt_2 (min) =	2.65	C_D (-) =	1.9E+00
T_T (m^2/s) =	1.1E-05	ξ (-) =	-4.9
S (-) =	1.0E-06		
K_s (m/s) =	1.1E-07		
S_s (1/m) =	1.0E-08		

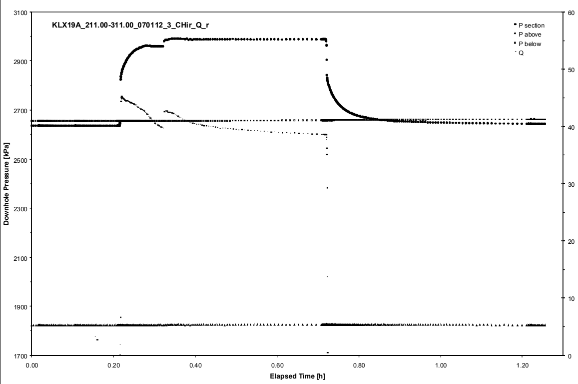
Comments:

The recommended transmissivity of 1.1E-5 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the better data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-6 m2/s to 5.0E-5 m2/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 2,630.9 kPa.

Test Summary Sheet

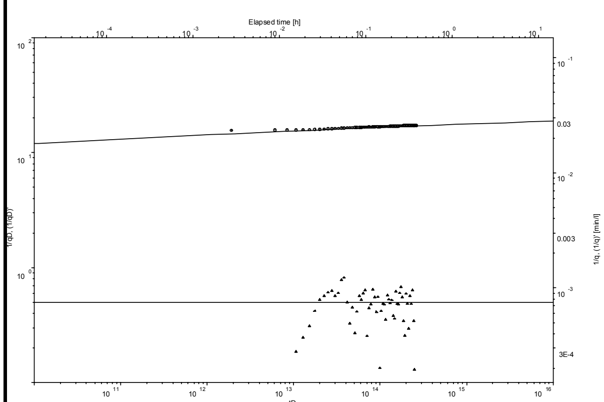
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	3
Borehole ID:	KLX19A	Test start:	070112 14:03
Test section from - to (m):	211.00-311.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

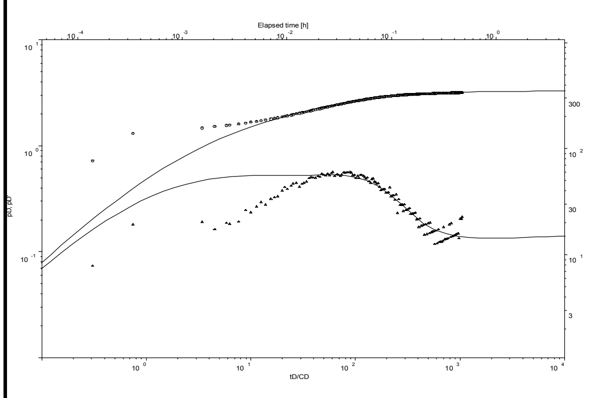


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2637		
p_i (kPa) =	2636		
p_p(kPa) =	2989	p_F (kPa) =	2643
Q_p (m^3/s)=	6.43E-04		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.8		
Derivative fact.=	0.03	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	1.8E-05		
T_M (m^2/s)=	2.3E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.68	dt_1 (min) =	1.03
dt_2 (min) =	20.82	dt_2 (min) =	3.20
T (m^2/s) =	4.9E-05	T (m^2/s) =	9.7E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.9E-07	K_s (m/s) =	9.7E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.0E-08
C_D (-) =	NA	C_D (-) =	1.1E+00
ξ (-) =	7.8	ξ (-) =	-4.6
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.03	C (m^3/Pa) =	1.0E-08
dt_2 (min) =	3.20	C_D (-) =	1.1E+00
T_T (m^2/s) =	9.7E-06	ξ (-) =	-4.6
S (-) =	1.0E-06		
K_s (m/s) =	9.7E-08		
S_s (1/m) =	1.0E-08		

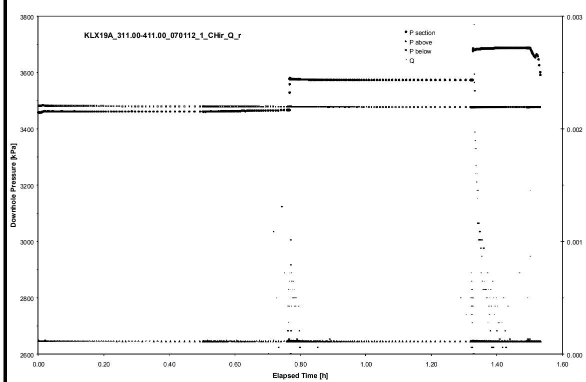
Comments:

The recommended transmissivity of 9.7E-6 m2/s was derived from the analysis of the CHir phase (inner zone), which shows the better data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-6 m2/s to 5.0E-5 m2/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 2,633.0 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070112 16:54
Test section from - to (m):	311.00-411.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3459		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.0		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.00E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

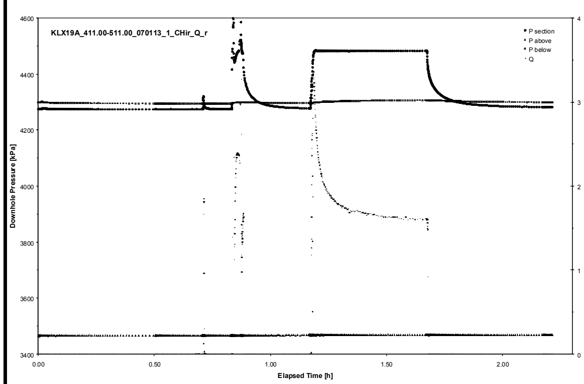
Comments:

Based on the test response the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

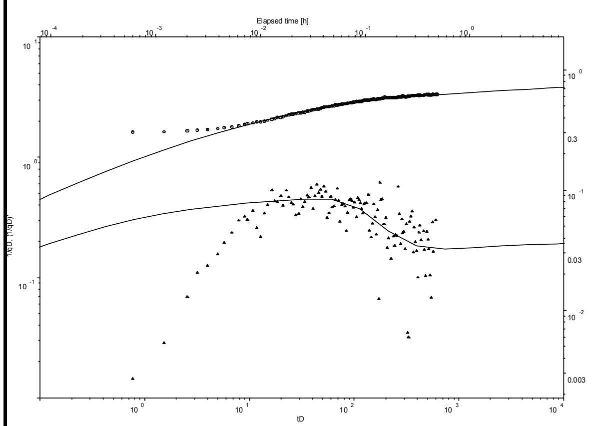
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070113 09:30
Test section from - to (m):	411.00-511.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

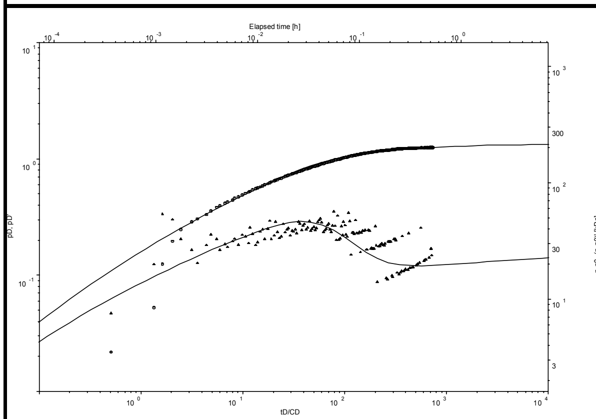


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4275		
p_i (kPa) =	4275		
p_p(kPa) =	4479	p_F (kPa) =	4281
Q_p (m^3/s)=	2.68E-05		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.2		
Derivative fact.=	0.04	Derivative fact.=	0.00
Results		**Results**	
Q/s (m^2/s)=	1.3E-06		
T_M (m^2/s)=	1.7E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.79	dt_1 (min) =	NA
dt_2 (min) =	3.32	dt_2 (min) =	NA
T (m^2/s) =	6.8E-07	T (m^2/s) =	9.5E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.8E-09	K_s (m/s) =	9.5E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.7E-10
C_D (-) =	NA	C_D (-) =	5.2E-02
ξ (-) =	-3.6	ξ (-) =	-4.9
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	4.7E-10
dt_2 (min) =	NA	C_D (-) =	5.2E-02
T_T (m^2/s) =	9.5E-07	ξ (-) =	-4.9
S (-) =	1.0E-06		
K_s (m/s) =	9.5E-09		
S_s (1/m) =	1.0E-08		

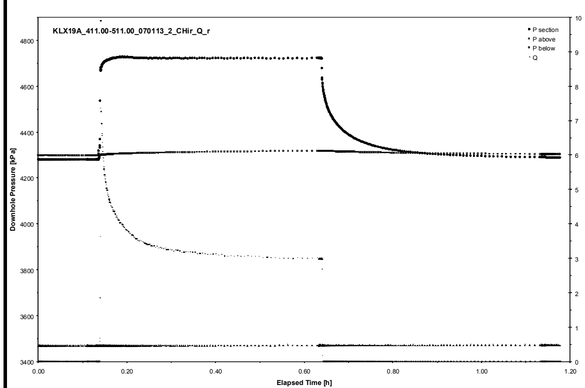
Comments:

The recommended transmissivity of 9.5E-7 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E-7 m2/s to 3.0E-6 m2/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 4,274.7 kPa.

Test Summary Sheet

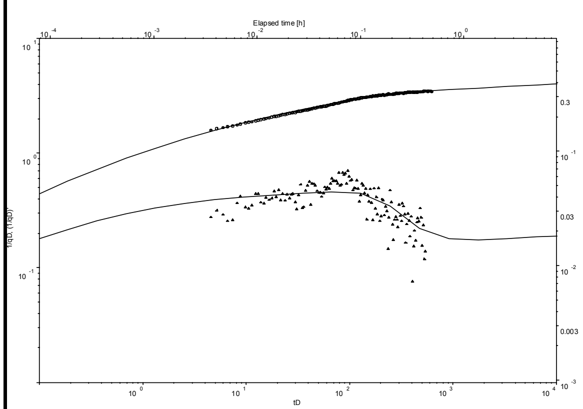
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070113 11:46
Test section from - to (m):	411.00-511.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

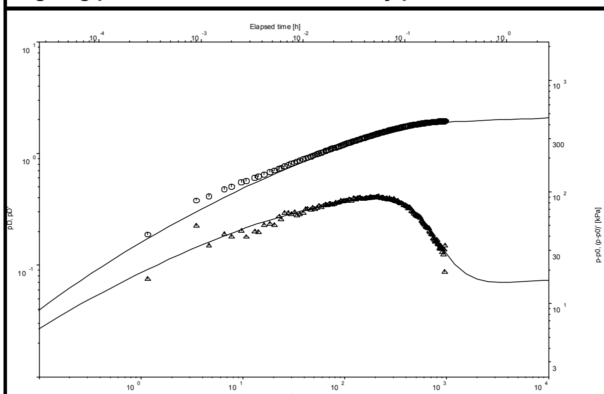


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4280		
p_i (kPa) =	4280		
p_p(kPa) =	4723	p_F (kPa) =	4288
Q_p (m^3/s)=	5.00E-05		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.2		
Derivative fact.=	0.04	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	1.1E-06		
T_M (m^2/s)=	1.4E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.54	dt_1 (min) =	1.99
dt_2 (min) =	5.54	dt_2 (min) =	4.45
T (m^2/s) =	6.1E-07	T (m^2/s) =	3.9E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.1E-09	K_s (m/s) =	3.9E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.3E-10
C_D (-) =	NA	C_D (-) =	2.6E-02
ξ (-) =	-3.5	ξ (-) =	-4.5
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.54	C (m^3/Pa) =	2.3E-10
dt_2 (min) =	5.54	C_D (-) =	2.6E-02
T_T (m^2/s) =	6.1E-07	ξ (-) =	-3.5
S (-) =	1.0E-06		
K_s (m/s) =	6.1E-09		
S_s (1/m) =	1.0E-08		

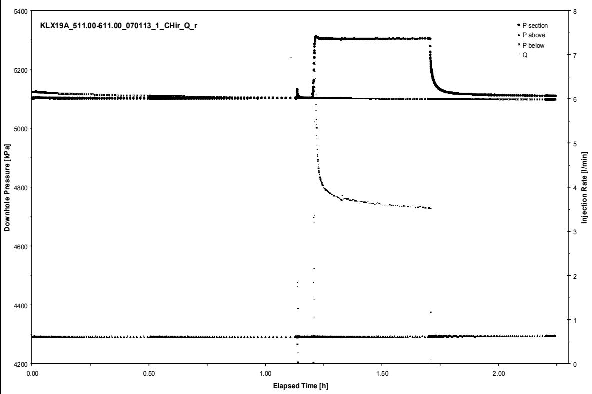
Comments:

The recommended transmissivity of 6.1E-7 m2/s was derived from the analysis of the CHi phase (inner zone), which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 4.0E-7 m2/s to 2.0E-6 m2/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 4,271.5 kPa.

Test Summary Sheet

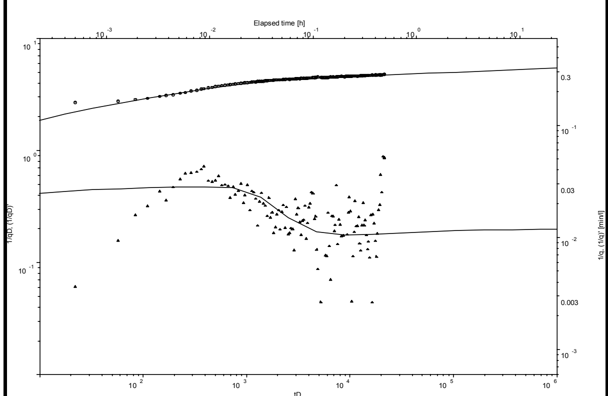
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070113 14:17
Test section from - to (m):	511.00-611.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

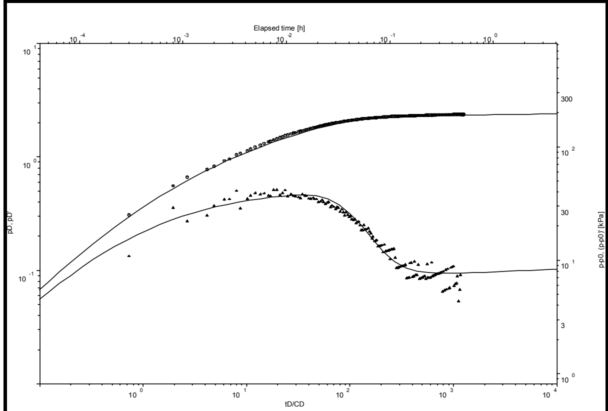


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5102		
p_i (kPa) =	5102		
p_p(kPa) =	5304	p_F (kPa) =	5110
Q_p (m^3/s)=	5.85E-05		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.6		
Derivative fact.=	0.04	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	2.8E-06		
T_M (m^2/s)=	3.7E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.69	dt_1 (min) =	8.87
dt_2 (min) =	24.53	dt_2 (min) =	25.91
T (m^2/s) =	5.4E-06	T (m^2/s) =	5.5E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.4E-08	K_s (m/s) =	5.5E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.1E-09
C_D (-) =	NA	C_D (-) =	1.2E-01
ξ (-) =	-2.4	ξ (-) =	-4.1
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	8.87	C (m^3/Pa) =	1.1E-09
dt_2 (min) =	25.91	C_D (-) =	1.2E-01
T_T (m^2/s) =	5.5E-06	ξ (-) =	-4.1
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-08		
S_s (1/m) =	1.0E-08		

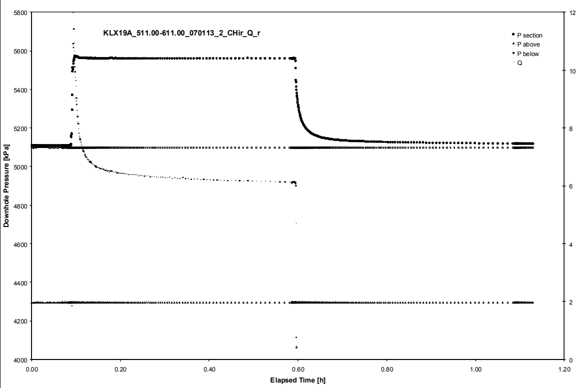
Comments:

The recommended transmissivity of 5.5E-6 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the most reliable data and derivative quality. The confidence range for the interval transmissivity is estimated to be 3.0E-6 m2/s to 8.0E-6 m2/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 5,105.8 kPa.

Test Summary Sheet

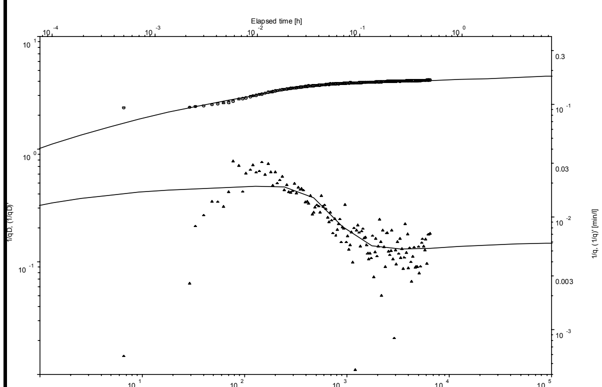
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070113 16:35
Test section from - to (m):	511.00-611.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

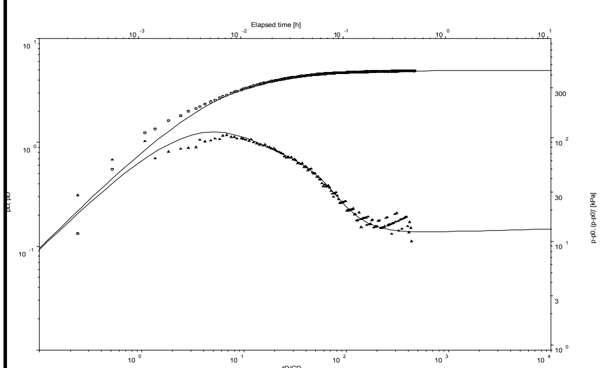


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5110		
p_i (kPa) =	5110		
p_p(kPa) =	5561	p_F (kPa) =	5118
Q_p (m^3/s)=	1.01E-04		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.6		
Derivative fact.=	0.04	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	2.2E-06		
T_M (m^2/s)=	2.9E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.93	dt_1 (min) =	9.91
dt_2 (min) =	25.31	dt_2 (min) =	27.06
T (m^2/s) =	4.8E-06	T (m^2/s) =	6.2E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.8E-08	K_s (m/s) =	6.2E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.6E-09
C_D (-) =	NA	C_D (-) =	5.1E-01
ξ (-) =	-2.8	ξ (-) =	-2.0
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	9.91	C (m^3/Pa) =	4.6E-09
dt_2 (min) =	27.06	C_D (-) =	5.1E-01
T_T (m^2/s) =	6.2E-06	ξ (-) =	-2.0
S (-) =	1.0E-06		
K_s (m/s) =	6.2E-08		
S_s (1/m) =	1.0E-08		

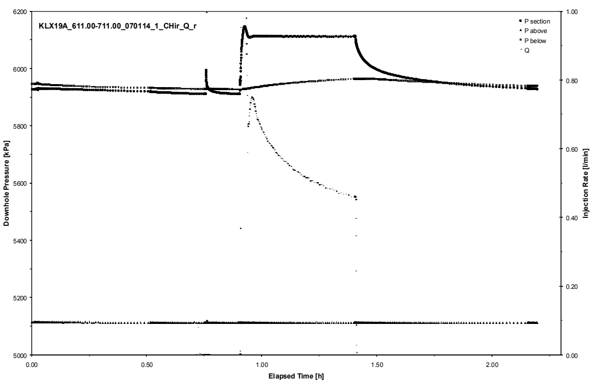
Comments:

The recommended transmissivity of 6.2E-6 m2/s was derived from the analysis of the CHir phase (outer zone), which shows the most reliable and best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 2.0E-6 m2/s to 8.0E-6 m2/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 5,108.4 kPa.

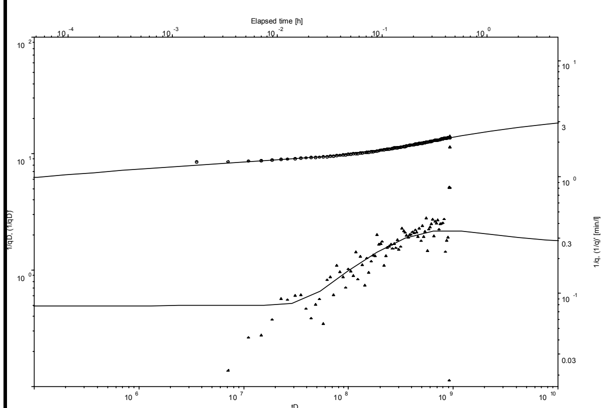
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070114 08:48
Test section from - to (m):	611.00-711.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

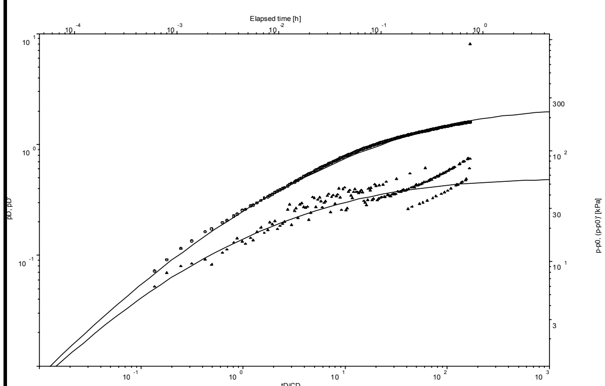
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5926		
p_i (kPa) =	5911		
p_p(kPa) =	6112	p_F (kPa) =	5938
Q_p (m^3/s)=	7.67E-06		
tp (s) =	1800	t_F (s) =	2700
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.0		
Derivative fact.=	0.03	Derivative fact.=	0.00
Results		**Results**	
Q/s (m^2/s)=	3.7E-07		
T_M (m^2/s)=	4.9E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	2.3E-07	T (m^2/s) =	1.2E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.3E-09	K_s (m/s) =	1.2E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.3E-09
C_D (-) =	NA	C_D (-) =	1.4E-01
ξ (-) =	3.5	ξ (-) =	-4.8
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	1.3E-09
dt_2 (min) =	NA	C_D (-) =	1.4E-01
T_T (m^2/s) =	1.2E-07	ξ (-) =	-4.8
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-09		
S_s (1/m) =	1.0E-08		

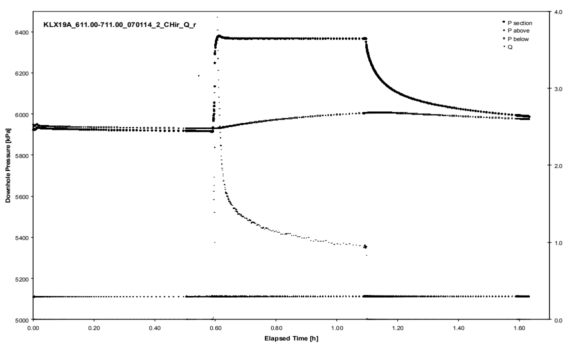
Comments:

The recommended transmissivity of 1.2E-7 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-8 m2/s to 4.0E-7 m2/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 5,902.9 kPa.

Test Summary Sheet

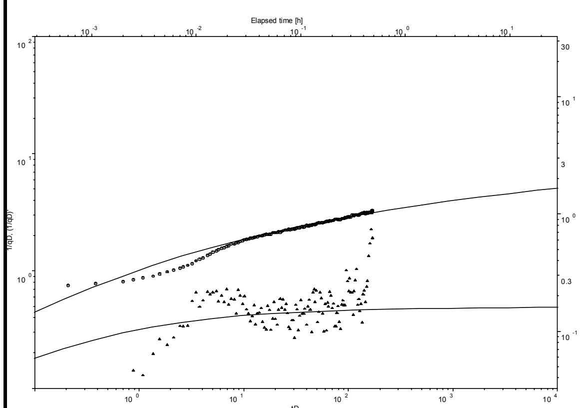
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070114 11:03:00
Test section from - to (m):	611.00-711.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

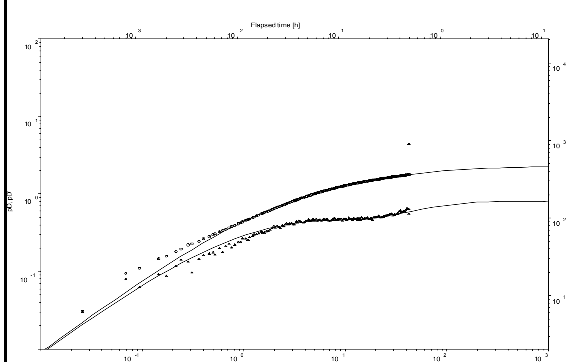


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5926		
p_i (kPa) =	5915		
p_p(kPa) =	6365	p_F (kPa) =	5986
Q_p (m^3/s)=	1.55E-05		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.0		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.4E-07		
T_M (m^2/s)=	4.4E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.55	dt_1 (min) =	2.48
dt_2 (min) =	20.24	dt_2 (min) =	13.52
T (m^2/s) =	1.8E-07	T (m^2/s) =	1.7E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.8E-09	K_s (m/s) =	1.7E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.1E-09
C_D (-) =	NA	C_D (-) =	4.5E-01
ξ (-) =	-3.6	ξ (-) =	-4.2
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.55	C (m^3/Pa) =	4.1E-09
dt_2 (min) =	20.24	C_D (-) =	4.5E-01
T_T (m^2/s) =	1.8E-07	ξ (-) =	-3.6
S (-) =	1.0E-06		
K_s (m/s) =	1.8E-09		
S_s (1/m) =	1.0E-08		

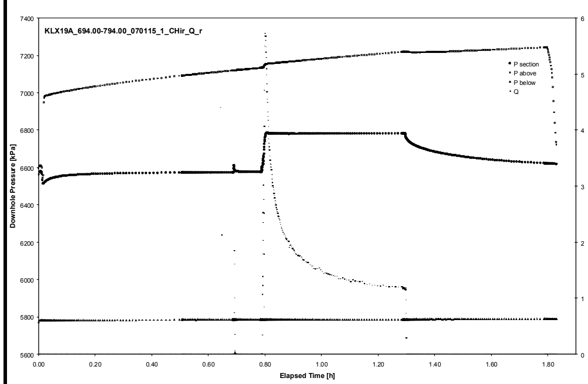
Comments:

The recommended transmissivity of 1.8E-7 m2/s was derived from the analysis of the CHi phase, which shows good data and derivative quality and a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 8.0E-8 m2/s to 4.0E-7 m2/s. The flow dimension displayed during the test is 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 5,889.9 kPa.

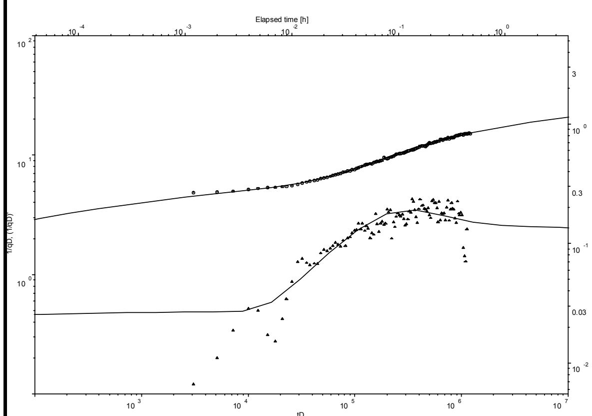
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070115 15:33
Test section from - to (m):	694.00-794.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

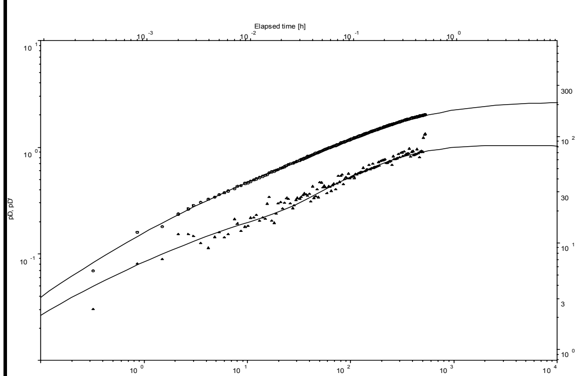
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6596		
p_i (kPa) =	6578		
p_p(kPa) =	6783	p_F (kPa) =	6619
Q_p (m^3/s)=	1.93E-05		
tp (s) =	1800	t_F (s) =	1800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.0		
Derivative fact.=	0.07	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.3E-07		
T_M (m^2/s)=	1.2E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.80	dt_1 (min) =	NA
dt_2 (min) =	23.60	dt_2 (min) =	NA
T (m^2/s) =	4.6E-07	T (m^2/s) =	5.2E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.6E-09	K_s (m/s) =	5.2E-09
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.1E-09
C_D (-) =	NA	C_D (-) =	1.2E-01
ξ (-) =	-4.0	ξ (-) =	-5.3
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	7.80	C (m^3/Pa) =	1.1E-09
dt_2 (min) =	23.60	C_D (-) =	1.2E-01
T_T (m^2/s) =	4.6E-07	ξ (-) =	-4.0
S (-) =	1.0E-06		
K_s (m/s) =	4.6E-09		
S_s (1/m) =	1.0E-08		

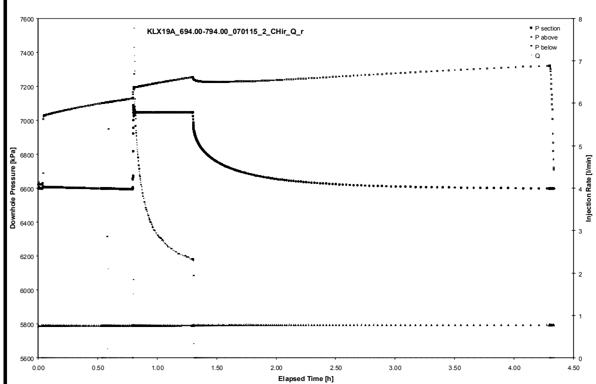
Comments:

The recommended transmissivity of 4.6E-7 m2/s was derived from the analysis of the CHi phase (outer zone), which shows the clearest horizontal stabilisation at late times. Due to the slight communication to the bottom zone, this value should be regarded on the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be 9.0E-8 m2/s to 6.0E-7 m2/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 6,578.9 kPa.

Test Summary Sheet

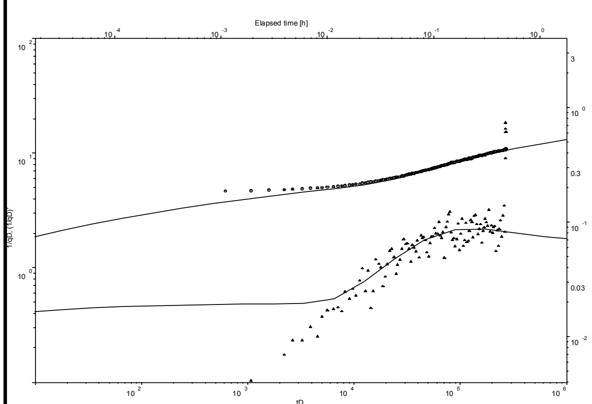
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070115 17:27
Test section from - to (m):	694.00-794.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

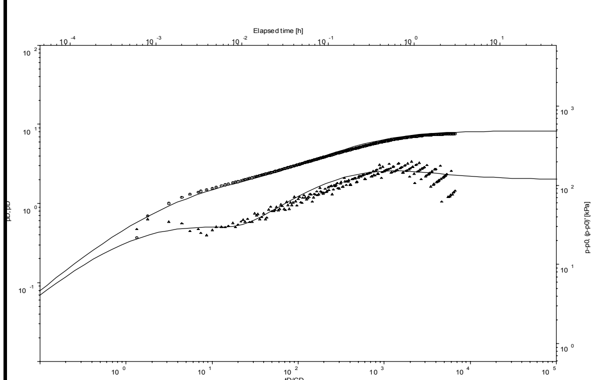


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6598		
p_i (kPa) =	6594		
p_p(kPa) =	7047	p_F (kPa) =	6598
Q_p (m^3/s)=	3.80E-05		
tp (s) =	1800	t_F (s) =	10800
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.0		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	8.2E-07		
T_M (m^2/s)=	1.1E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	8.77	dt_1 (min) =	0.14
dt_2 (min) =	24.90	dt_2 (min) =	0.50
T (m^2/s) =	4.1E-07	T (m^2/s) =	1.3E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.1E-09	K_s (m/s) =	1.3E-08
S_s (1/m) =	1.0E-08	S_s (1/m) =	1.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-09
C_D (-) =	NA	C_D (-) =	1.5E-01
ξ (-) =	-0.9	ξ (-) =	-3.6
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	8.77	C (m^3/Pa) =	1.4E-09
dt_2 (min) =	24.90	C_D (-) =	1.5E-01
T_T (m^2/s) =	4.1E-07	ξ (-) =	-0.9
S (-) =	1.0E-06		
K_s (m/s) =	4.1E-09		
S_s (1/m) =	1.0E-08		

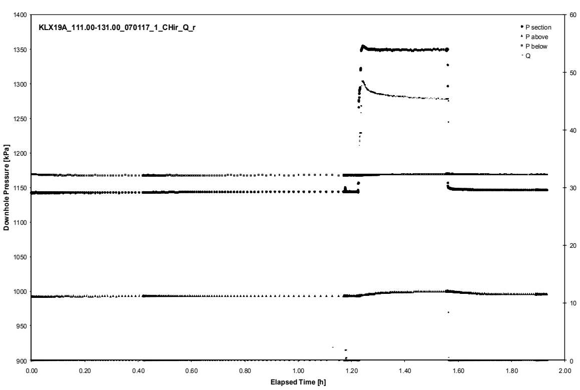
Comments:

The recommended transmissivity of 4.1E-7 m2/s was derived from the analysis of the CHi phase (outer zone), which shows good data and derivative quality and a clear horizontal stabilisation. Due to the hydraulic connection to the bottom zone the derived transmissivity should be regarded at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be 9.0E-8 m2/s to 6.0E-7 m2/s. The flow dimension displayed during the test is 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 6,577.0 kPa.

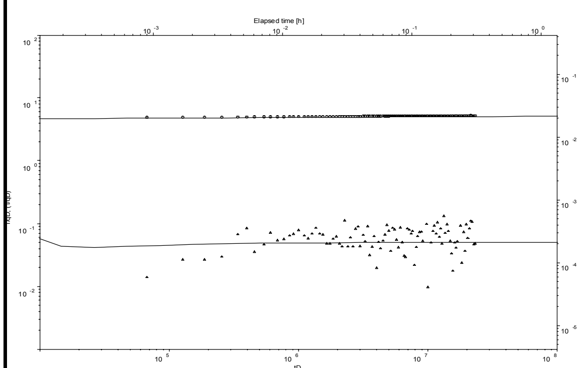
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070117 11:33
Test section from - to (m):	111.00-131.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

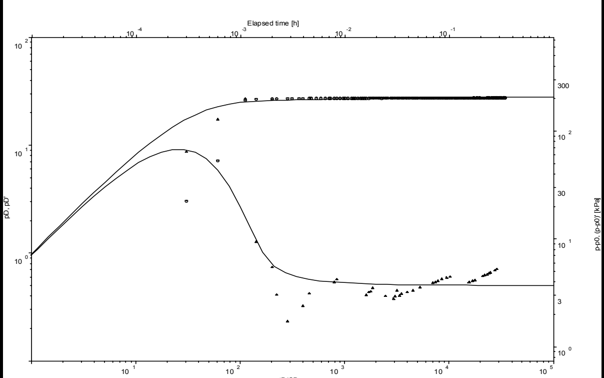
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1142		
p_i (kPa) =	1143		
p_p(kPa) =	1348	p_F (kPa) =	1146
Q_p (m^3/s)=	7.50E-04		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.5		
Derivative fact.=	0.01	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	3.6E-05		
T_M (m^2/s)=	3.8E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.43	dt_1 (min) =	0.49
dt_2 (min) =	18.53	dt_2 (min) =	10.15
T (m^2/s) =	3.0E-04	T (m^2/s) =	1.6E-04
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.5E-05	K_s (m/s) =	8.0E-06
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.7E-09
C_D (-) =	NA	C_D (-) =	4.1E-01
ξ (-) =	0.0	ξ (-) =	18.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	0.43	C (m^3/Pa) =	3.7E-09
dt_2 (min) =	18.53	C_D (-) =	4.1E-01
T_T (m^2/s) =	3.0E-04	ξ (-) =	0.0
S (-) =	1.0E-06		
K_s (m/s) =	1.5E-05		
S_s (1/m) =	5.0E-08		

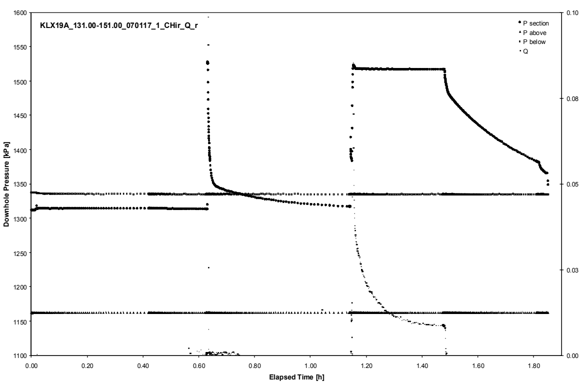
Comments:

The recommended transmissivity of 3.0E-4 m2/s was derived from the analysis of the CHi phase, which shows the best derivative quality. The confidence range for the interval transmissivity is estimated to be 6.0E-5m2/s to 4.0E-4 m2/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 1,145.8 kPa.

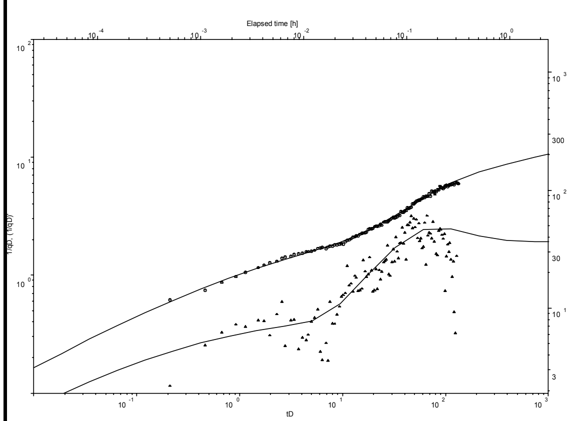
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070117 14:04
Test section from - to (m):	131.00-151.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

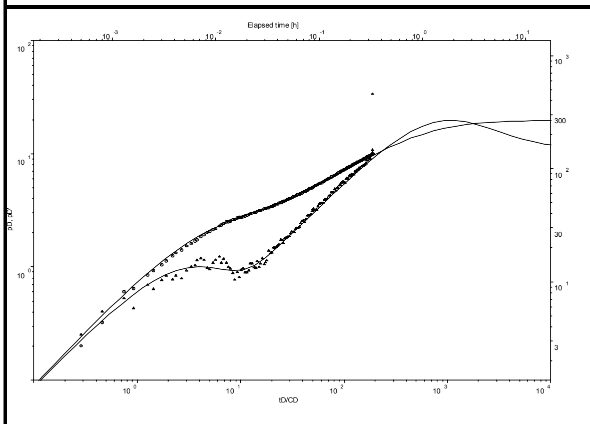
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1312		
p_i (kPa) =	1317		
p_p(kPa) =	1517	p_F (kPa) =	1381
Q_p (m^3/s)=	1.33E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.8		
Derivative fact.=	0.04	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	6.5E-09		
T_M (m^2/s)=	6.8E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	8.26	dt_1 (min) =	NA
dt_2 (min) =	14.20	dt_2 (min) =	NA
T (m^2/s) =	1.7E-09	T (m^2/s) =	1.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	8.5E-11	K_s (m/s) =	6.5E-11
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.1E-10
C_D (-) =	NA	C_D (-) =	1.2E-02
ξ (-) =	-1.9	ξ (-) =	-0.1
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	8.26	C (m^3/Pa) =	1.1E-10
dt_2 (min) =	14.20	C_D (-) =	1.2E-02
T_T (m^2/s) =	1.7E-09	ξ (-) =	-1.9
S (-) =	1.0E-06		
K_s (m/s) =	8.5E-11		
S_s (1/m) =	5.0E-08		

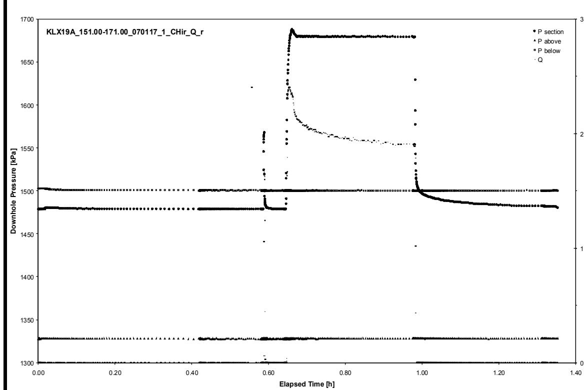
Comments:

The recommended transmissivity of 1.7E-9 m2/s was derived from the analysis of the CHi phase (outer zone). The inner zone was interpreted as the skin zone. The confidence range for the interval transmissivity is estimated to be 9.0E-10 m2/s to 7.0E-9 m2/s. The analysis was conducted using a flow dimension of 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 1,297.7 kPa.

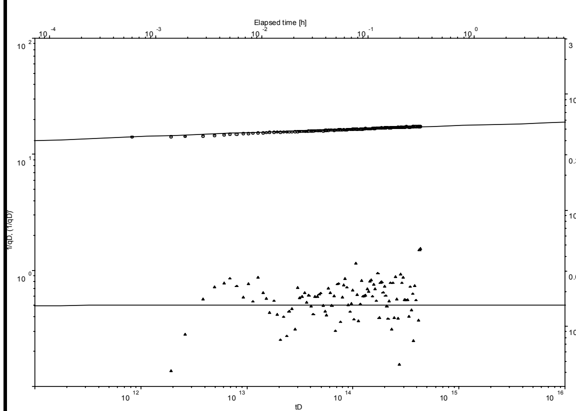
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070117 16:30
Test section from - to (m):	151.00-171.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

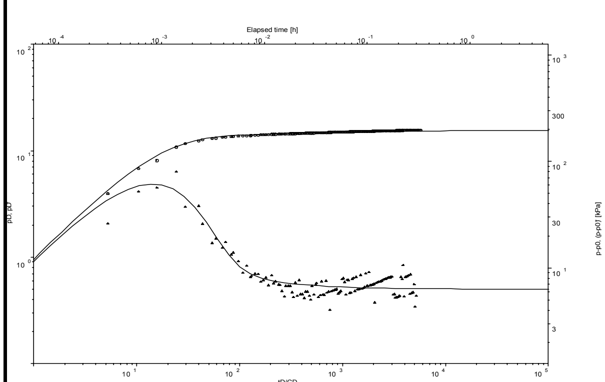
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1479		
p_i (kPa) =	1479		
p_p(kPa) =	1679	p_F (kPa) =	1481
Q_p (m^3/s)=	3.17E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.0		
Derivative fact.=	0.09	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	1.6E-06		
T_M (m^2/s)=	1.6E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.25	dt_1 (min) =	0.97
dt_2 (min) =	16.72	dt_2 (min) =	15.87
T (m^2/s) =	4.3E-06	T (m^2/s) =	4.1E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.2E-07	K_s (m/s) =	2.1E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.4E-10
C_D (-) =	NA	C_D (-) =	6.0E-02
ξ (-) =	9.3	ξ (-) =	8.3
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	0.97	C (m^3/Pa) =	5.4E-10
dt_2 (min) =	15.87	C_D (-) =	6.0E-02
T_T (m^2/s) =	4.1E-06	ξ (-) =	8.3
S (-) =	1.0E-06		
K_s (m/s) =	2.1E-07		
S_s (1/m) =	5.0E-08		

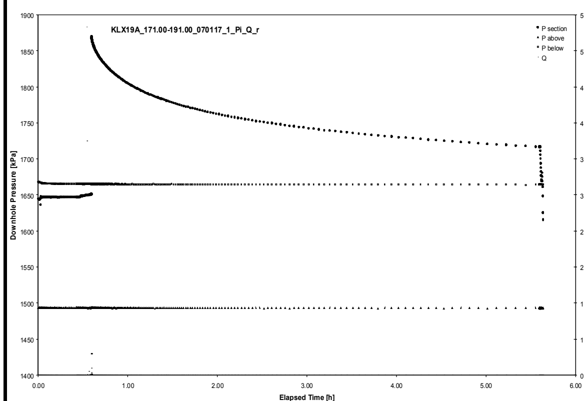
Comments:

The recommended transmissivity of 4.1E-6 m2/s was derived from the analysis of the CHir phase, which shows the best data and derivative quality and a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 1.0E-6 m2/s to 6.0E-6 m2/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 1,477.0 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070117 18:23
Test section from - to (m):	171.00-191.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

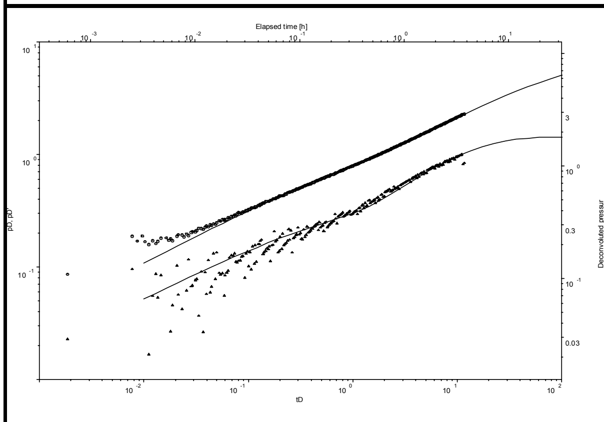


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1646		
p_i (kPa) =	1651		
p_p(kPa) =	1870	p_F (kPa) =	1716
Q_p (m^3/s)=	#NV		
tp (s) =	10.2	t_F (s) =	18000
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.2		
Derivative fact.=	NA	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	4.2E-12
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	2.1E-13
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.2E-11
C_D (-) =	NA	C_D (-) =	3.5E-03
ξ (-) =	NA	ξ (-) =	-1.1
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. derivates- flow period

Not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	3.2E-11
dt_2 (min) =	NA	C_D (-) =	3.5E-03
T_T (m^2/s) =	4.2E-12	ξ (-) =	-1.1
S (-) =	1.0E-06		
K_s (m/s) =	2.1E-13		
S_s (1/m) =	5.0E-08		

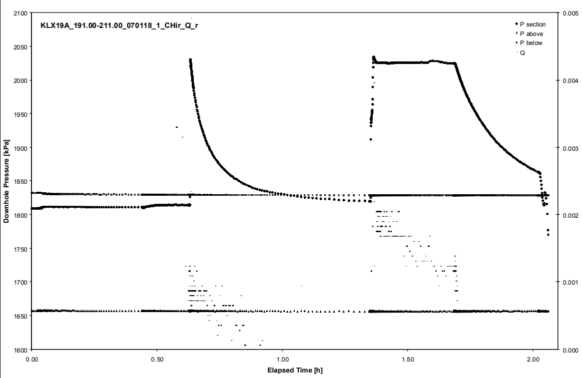
Comments:

The recommended transmissivity of 4.2E-12 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 1.0E-12 to 8.0E-12 m2/s. The analysis was conducted using a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 08:17
Test section from - to (m):	191.00-211.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

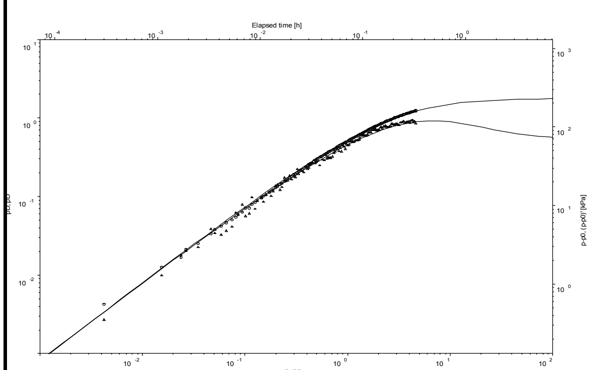


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1808		
p_i (kPa) =	1819		
p_p(kPa) =	2024	p_F (kPa) =	1861
Q_p (m^3/s)=	2.00E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.5		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	9.6E-10		
T_M (m^2/s)=	1.0E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	3.8E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.9E-11
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.2E-11
C_D (-) =	NA	C_D (-) =	6.9E-03
ξ (-) =	NA	ξ (-) =	-0.95
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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	6.2E-11
dt_2 (min) =	NA	C_D (-) =	6.9E-03
T_T (m^2/s) =	3.8E-10	ξ (-) =	-0.95
S (-) =	1.0E-06		
K_s (m/s) =	1.6E-11		
S_s (1/m) =	5.0E-08		

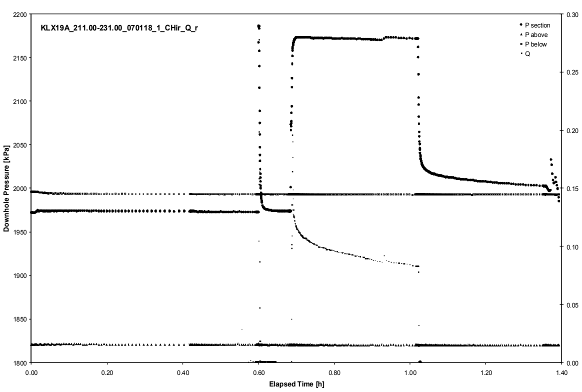
Comments:

The recommended transmissivity of 3.8E-10 m2/s was derived from the analysis of the CHir phase, which is the only analysable phase of this test. Due to the low interval transmissivity the confidence range is estimated to be 1.0E-10 m2/s to 1.0E-9 m2/s. The analysis was conducted assuming a flow dimension of 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 1,791.3 kPa.

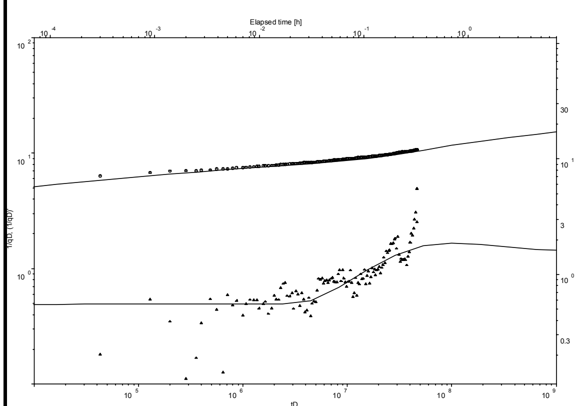
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 10:53
Test section from - to (m):	211.00-231.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

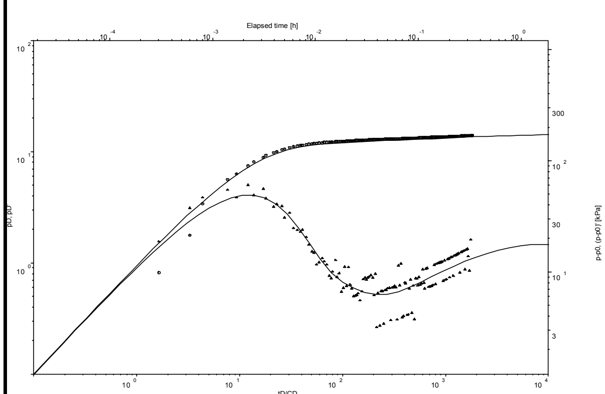
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	1972		
p_i (kPa) =	1973		
p_p(kPa) =	2172	p_F (kPa) =	2002
Q_p (m^3/s)=	1.33E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.7		
Derivative fact.=	0.06	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	6.6E-08		
T_M (m^2/s)=	6.9E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.16	dt_1 (min) =	1.30
dt_2 (min) =	1.73	dt_2 (min) =	4.53
T (m^2/s) =	1.2E-07	T (m^2/s) =	2.0E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.0E-09	K_s (m/s) =	1.0E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	8.6E-11
C_D (-) =	NA	C_D (-) =	9.5E-03
ξ (-) =	3.1	ξ (-) =	7.3
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	1.30	C (m^3/Pa) =	8.6E-11
dt_2 (min) =	4.53	C_D (-) =	9.5E-03
T_T (m^2/s) =	2.0E-07	ξ (-) =	7.3
S (-) =	1.0E-06		
K_s (m/s) =	1.0E-08		
S_s (1/m) =	5.0E-08		

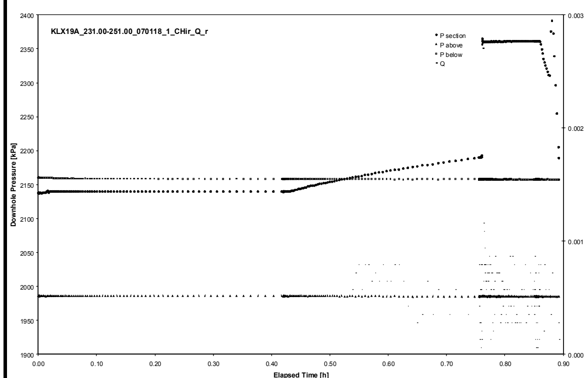
Comments:

The recommended transmissivity of 2.0E-7 m2/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be 6.0E-8 m2/s to 4.0E-7 m2/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 1,995.2 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 13:06
Test section from - to (m):	231.00-251.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2137		
p_i (kPa) =	#NV		
p_p(kPa) =	#NV	p_F (kPa) =	#NV
Q_p (m^3/s)=	#NV		
tp (s) =	0	t_F (s) =	0
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	9.9		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

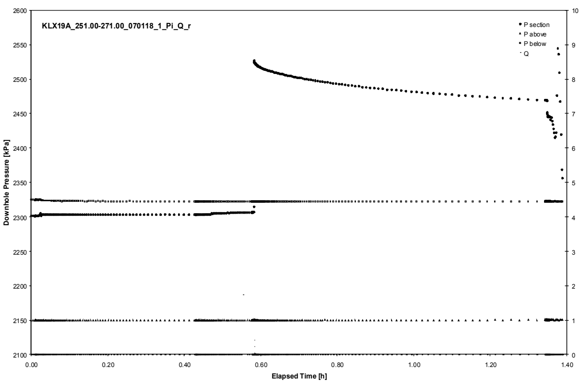
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 14:30
Test section from - to (m):	251.00-271.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

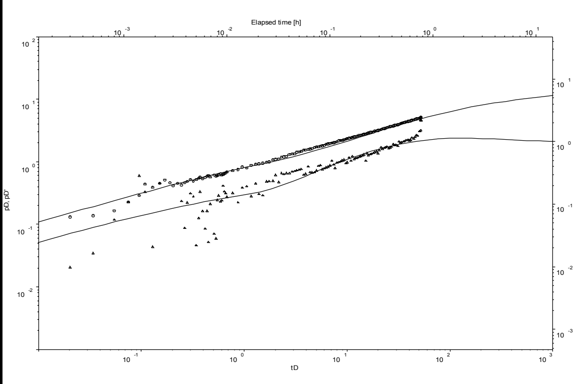


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2301		
p_i (kPa) =	2306		
p_p(kPa) =	2526	p_F (kPa) =	2468
Q_p (m^3/s)=	#NV		
tp (s) =	10	t_F (s) =	2700
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.2		
Derivative fact.=	NA	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	1.2E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	6.0E-13
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.4E-11
C_D (-) =	NA	C_D (-) =	6.0E-03
ξ (-) =	NA	ξ (-) =	-0.3
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. derivates- flow period

Not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	5.4E-11
dt_2 (min) =	NA	C_D (-) =	6.0E-03
T_T (m^2/s) =	1.2E-11	ξ (-) =	-0.3
S (-) =	1.0E-06		
K_s (m/s) =	6.0E-13		
S_s (1/m) =	5.0E-08		

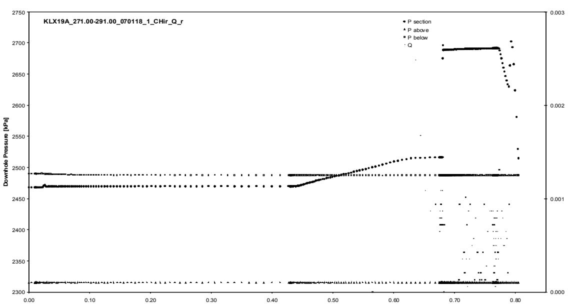
Comments:

The recommended transmissivity of 1.2E-11 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 5.0E-12 to 5.0E-11 m2/s. The analysis was conducted with a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity and the short duration of the test.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 16:24
Test section from - to (m):	271.00-291.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	2468		
p_i (kPa) =	#NV		
p_p(kPa) =	#NV	p_F (kPa) =	#NV
Q_p (m^3/s)=	#NV		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.2		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	#NV		
T_M (m^2/s)=	#NV		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.00E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

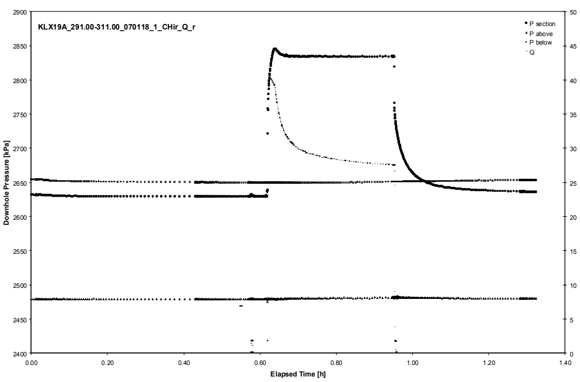
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

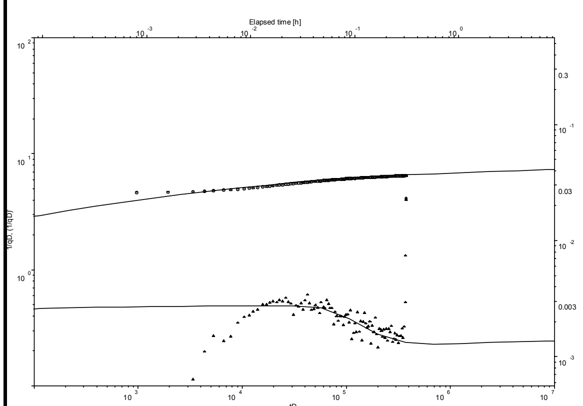
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070118 17:44
Test section from - to (m):	291.00-311.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

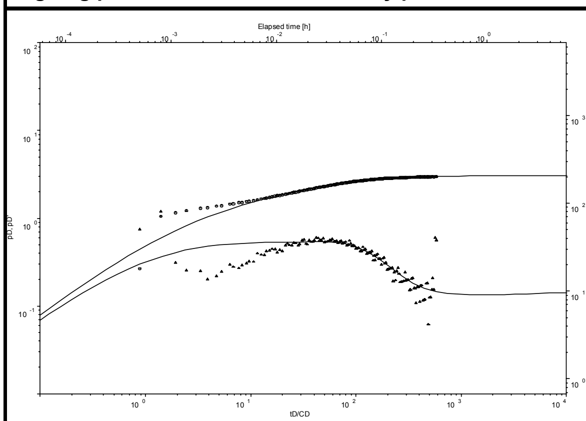


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	2632		
p_i (kPa) =	2629		
p_p(kPa) =	2834	p_F (kPa) =	2636
Q_p (m^3/s)=	4.60E-04		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	10.7		
Derivative fact.=	0.05	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	2.2E-05		
T_M (m^2/s)=	2.3E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.73	dt_1 (min) =	0.77
dt_2 (min) =	2.93	dt_2 (min) =	5.95
T (m^2/s) =	2.3E-05	T (m^2/s) =	1.1E-05
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.2E-06	K_s (m/s) =	5.5E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.5E-08
C_D (-) =	NA	C_D (-) =	1.7E+00
ξ (-) =	-1.9	ξ (-) =	-4.8
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.77	C (m^3/Pa) =	1.5E-08
dt_2 (min) =	5.95	C_D (-) =	1.7E+00
T_T (m^2/s) =	1.1E-05	ξ (-) =	-4.8
S (-) =	1.0E-06		
K_s (m/s) =	5.5E-07		
S_s (1/m) =	5.0E-08		

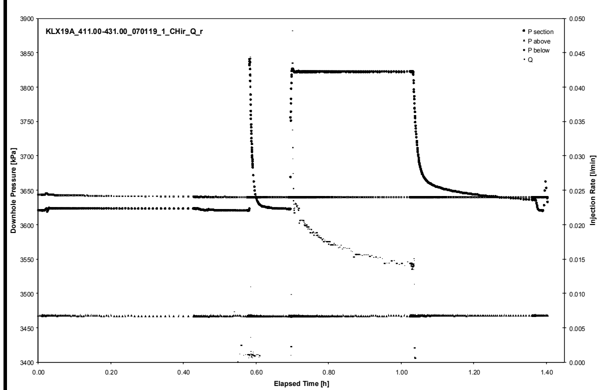
Comments:

The recommended transmissivity of 1.1E-5 m2/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 9.0E-6 m2/s to 5.0E-5 m2/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 2,628.8 kPa.

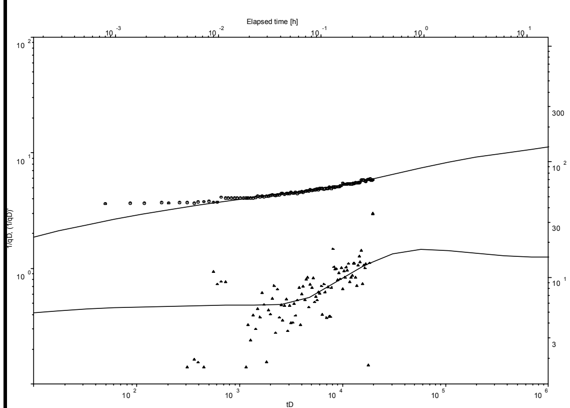
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070119 09:23
Test section from - to (m):	411.00-431.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

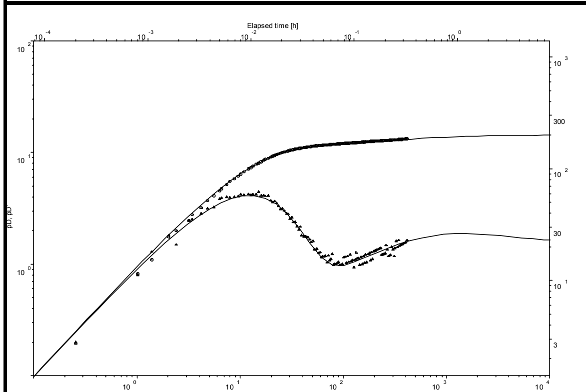
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3621		
p_i (kPa) =	3622		
p_p(kPa) =	3822	p_F (kPa) =	3639
Q_p (m^3/s)=	2.33E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.2		
Derivative fact.=	0.08	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	1.1E-08		
T_M (m^2/s)=	1.2E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.37	dt_1 (min) =	3.19
dt_2 (min) =	3.91	dt_2 (min) =	5.95
T (m^2/s) =	1.1E-08	T (m^2/s) =	3.2E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.5E-10	K_s (m/s) =	1.6E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.7E-11
C_D (-) =	NA	C_D (-) =	6.3E-03
ξ (-) =	0.4	ξ (-) =	7.5
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	3.19	C (m^3/Pa) =	5.7E-11
dt_2 (min) =	5.95	C_D (-) =	6.3E-03
T_T (m^2/s) =	3.2E-08	ξ (-) =	7.5
S (-) =	1.0E-06		
K_s (m/s) =	1.6E-09		
S_s (1/m) =	5.0E-08		

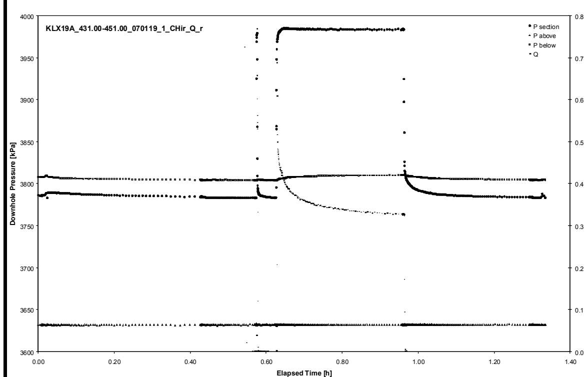
Comments:

The recommended transmissivity of 3.2E-8 m2/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 9.0E-9 m2/s to 5.0E-8 m2/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 3,623.9 kPa.

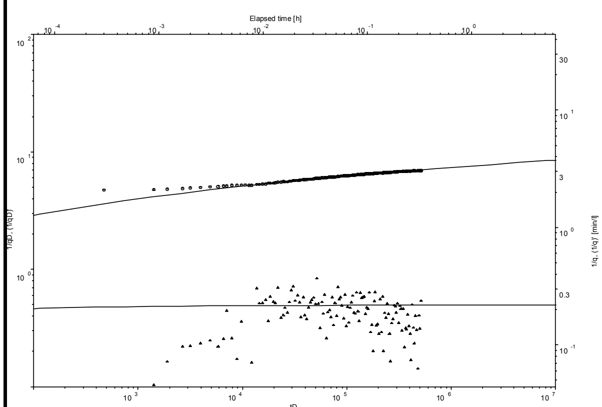
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070119 11:20
Test section from - to (m):	431.00-451.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

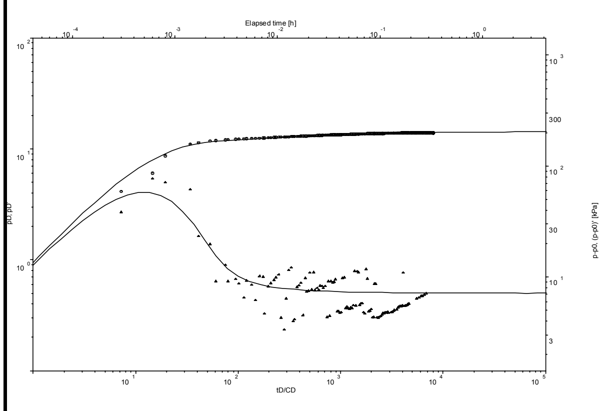
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3785		
p_i (kPa) =	3783		
p_p(kPa) =	3983	p_F (kPa) =	3783
Q_p (m^3/s)=	5.50E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.7E-07		
T_M (m^2/s)=	2.8E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.55	dt_1 (min) =	0.48
dt_2 (min) =	11.45	dt_2 (min) =	12.76
T (m^2/s) =	3.0E-07	T (m^2/s) =	6.4E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.5E-08	K_s (m/s) =	3.2E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.1E-11
C_D (-) =	NA	C_D (-) =	6.7E-03
ξ (-) =	0.4	ξ (-) =	7.5
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	0.55	C (m^3/Pa) =	6.1E-11
dt_2 (min) =	11.45	C_D (-) =	6.7E-03
T_T (m^2/s) =	3.0E-07	ξ (-) =	0.4
S (-) =	1.0E-06		
K_s (m/s) =	1.5E-08		
S_s (1/m) =	5.0E-08		

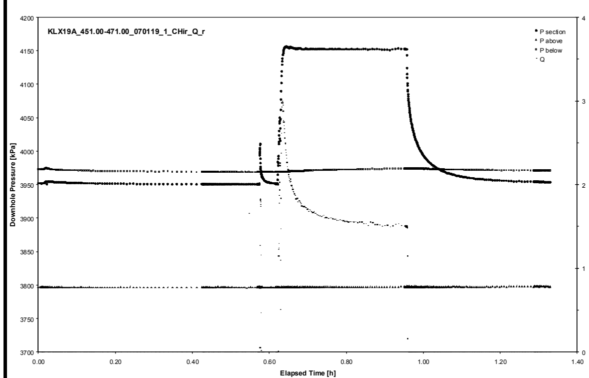
Comments:

The recommended transmissivity of 3.0E-7 m2/s was derived from the analysis of the CHi phase, which has a better derivative quality. The confidence range for the interval transmissivity is estimated to be 2.0E-7 m2/s to 7.0E-7 m2/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 3,782.2 kPa.

Test Summary Sheet

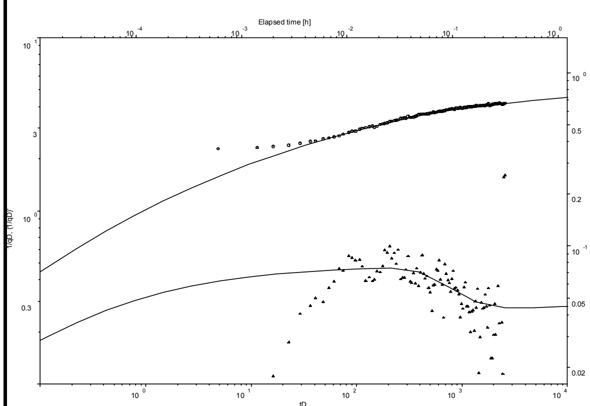
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070119 13:38
Test section from - to (m):	451.00-471.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

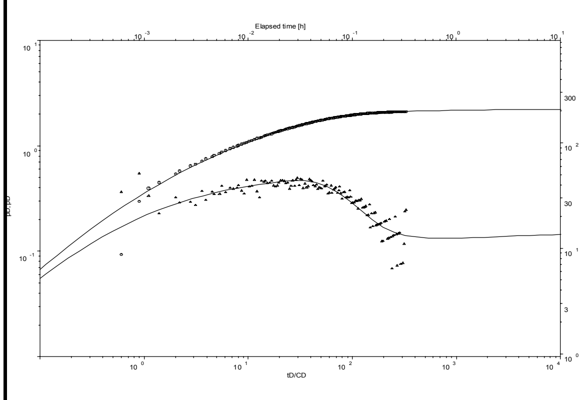


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3951		
p_i (kPa) =	3950		
p_p(kPa) =	4151	p_F (kPa) =	3954
Q_p (m^3/s)=	2.50E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.8		
Derivative fact.=	0.09	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.2E-06		
T_M (m^2/s)=	1.3E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.4E-06	T (m^2/s) =	1.5E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	7.0E-08	K_s (m/s) =	7.5E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.1E-09
C_D (-) =	NA	C_D (-) =	1.2E-01
ξ (-) =	-2.8	ξ (-) =	-4.1
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	1.1E-09
dt_2 (min) =	NA	C_D (-) =	1.2E-01
T_T (m^2/s) =	1.5E-06	ξ (-) =	-4.1
S (-) =	1.0E-06		
K_s (m/s) =	7.5E-08		
S_s (1/m) =	5.0E-08		

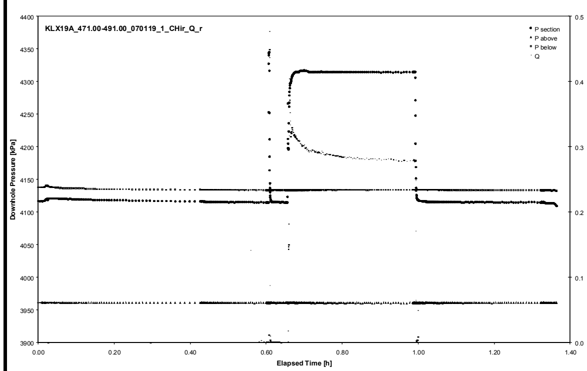
Comments:

The recommended transmissivity of 1.5E-6 m2/s was derived from the analysis of the CHir phase (outer zone); the inner zone was interpreted as the skin. The confidence range for the interval transmissivity is estimated to be 7.0E-7 m2/s to 4.0E-6 m2/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 3,944.1 kPa.

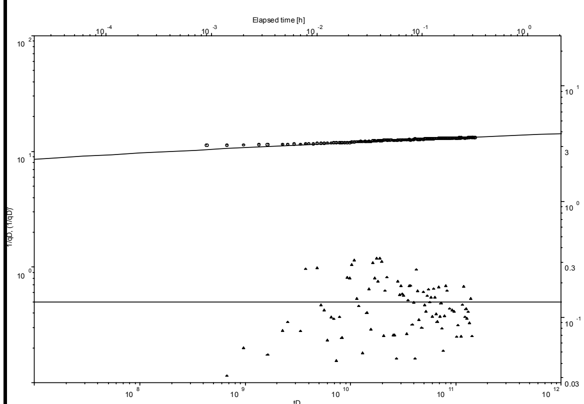
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070119 15:30
Test section from - to (m):	471.00-491.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

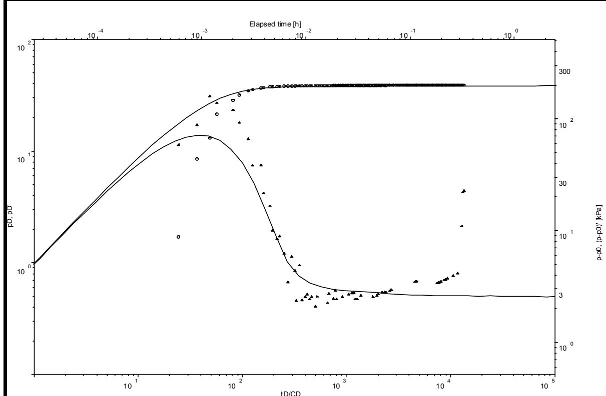
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4117		
p_i (kPa) =	4114		
p_p(kPa) =	4314	p_F (kPa) =	4114
Q_p (m^3/s)=	4.67E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.0		
Derivative fact.=	0.04	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	2.3E-07		
T_M (m^2/s)=	2.4E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.68	dt_1 (min) =	0.64
dt_2 (min) =	16.80	dt_2 (min) =	10.36
T (m^2/s) =	4.8E-07	T (m^2/s) =	1.5E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.4E-08	K_s (m/s) =	7.5E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	8.3E-11
C_D (-) =	NA	C_D (-) =	9.1E-03
ξ (-) =	6.5	ξ (-) =	32.3
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	0.68	C (m^3/Pa) =	8.3E-11
dt_2 (min) =	16.80	C_D (-) =	9.1E-03
T_T (m^2/s) =	4.8E-07	ξ (-) =	6.5
S (-) =	1.0E-06		
K_s (m/s) =	2.4E-08		
S_s (1/m) =	5.0E-08		

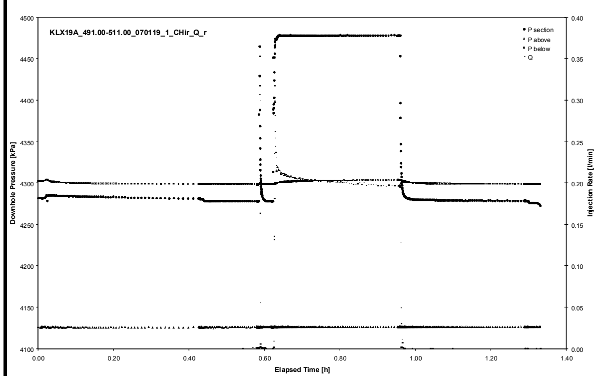
Comments:

The recommended transmissivity of 4.8E-7 m2/s was derived from the analysis of the CHi phase, which shows the best data quality. The confidence range for the interval transmissivity is estimated to be 2.0E-7 m2/s to 8.0E-7 m2/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 4,114.6 kPa.

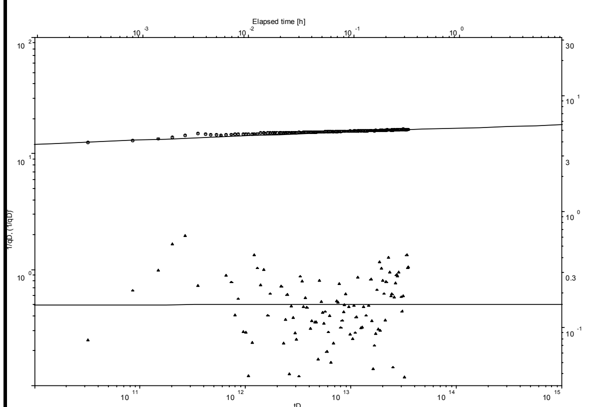
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070119 17:26
Test section from - to (m):	491.00-511.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

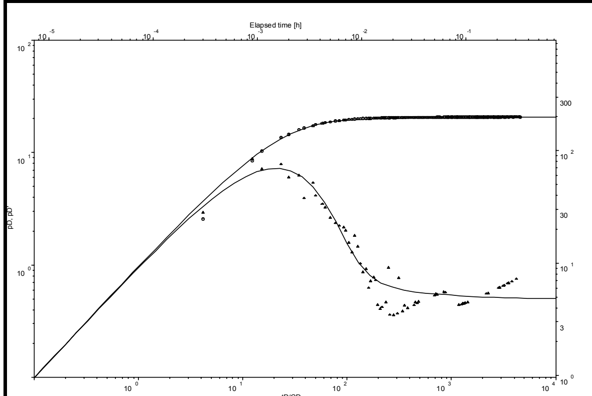
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4281		
p_i (kPa) =	4277		
p_p(kPa) =	4477	p_F (kPa) =	4278
Q_p (m^3/s)=	3.17E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.3		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.6E-07		
T_M (m^2/s)=	1.6E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.47	dt_1 (min) =	0.12
dt_2 (min) =	16.19	dt_2 (min) =	11.42
T (m^2/s) =	4.1E-07	T (m^2/s) =	5.4E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.1E-08	K_s (m/s) =	2.7E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	9.1E-11
C_D (-) =	NA	C_D (-) =	1.0E-02
ξ (-) =	9.2	ξ (-) =	14.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA
Selected representative parameters.			
dt_1 (min) =	0.47	C (m^3/Pa) =	9.1E-11
dt_2 (min) =	16.19	C_D (-) =	1.0E-02
T_T (m^2/s) =	4.1E-07	ξ (-) =	9.2
S (-) =	1.0E-06		
K_s (m/s) =	2.1E-08		
S_s (1/m) =	5.0E-08		

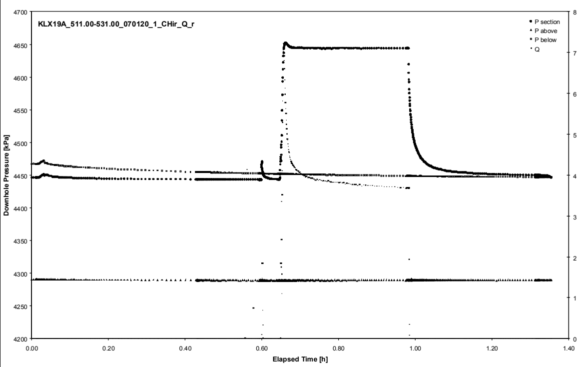
Comments:

The recommended transmissivity of 4.8E-7 m2/s was derived from the analysis of the CHi phase, which shows the most stable derivative. The confidence range for the interval transmissivity is estimated to be 1.0E-7 m2/s to 8.0E-7 m2/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 4,277.7 kPa.

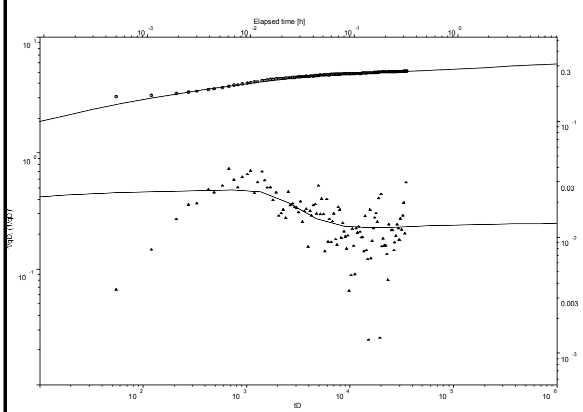
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 08:21
Test section from - to (m):	511.00-531.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

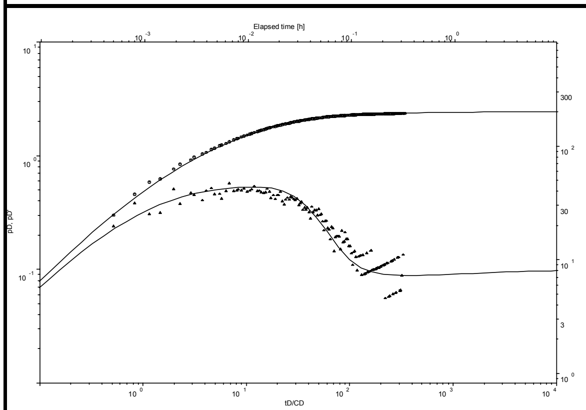
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4446		
p_i (kPa) =	4444		
p_p(kPa) =	4644	p_F (kPa) =	4449
Q_p (m^3/s)=	6.13E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.5		
Derivative fact.=	0.04	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	3.0E-06		
T_M (m^2/s)=	3.1E-06		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	4.40	dt_1 (min) =	8.30
dt_2 (min) =	18.80	dt_2 (min) =	18.53
T (m^2/s) =	4.9E-06	T (m^2/s) =	6.2E-06
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.5E-07	K_s (m/s) =	3.1E-07
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.7E-09
C_D (-) =	NA	C_D (-) =	3.0E-01
ξ (-) =	-2.0	ξ (-) =	-4.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	4.40	C (m^3/Pa) =	2.7E-09
dt_2 (min) =	18.80	C_D (-) =	3.0E-01
T_T (m^2/s) =	4.9E-06	ξ (-) =	-2.0
S (-) =	1.0E-06		
K_s (m/s) =	2.5E-07		
S_s (1/m) =	5.0E-08		

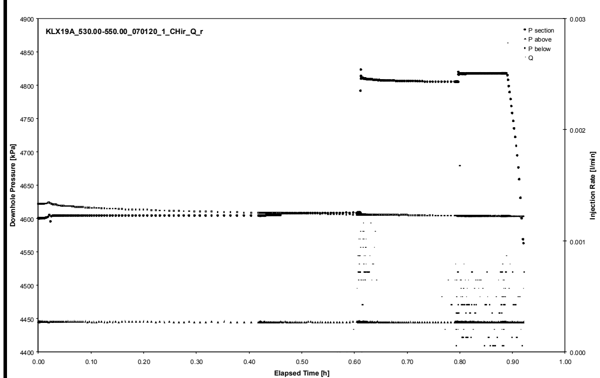
Comments:

The recommended transmissivity of 4.9E-6 m2/s was derived from the analysis of the CHi phase (outer zone), which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 1.0E-6 m2/s to 8.0E-6 m2/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 4,444.2 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 10:18
Test section from - to (m):	530.00-550.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4600		
p_i (kPa) =	#NV		
p_p(kPa) =	#NV	p_F (kPa) =	#NV
Q_p (m^3/s)=	#NV		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.8		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	#NV		
T_M (m^2/s)=	#NV		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-10	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.00E-10	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

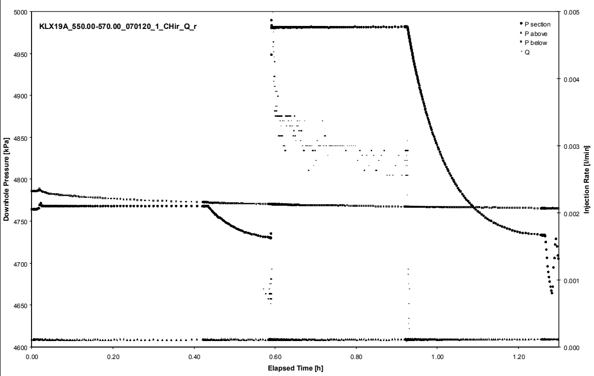
Comments:

Based on the test response (very slow pulse recovery) the interval transmissivity is lower than 1.0E-10 m2/s. No static pressure could be derived.

Test Summary Sheet

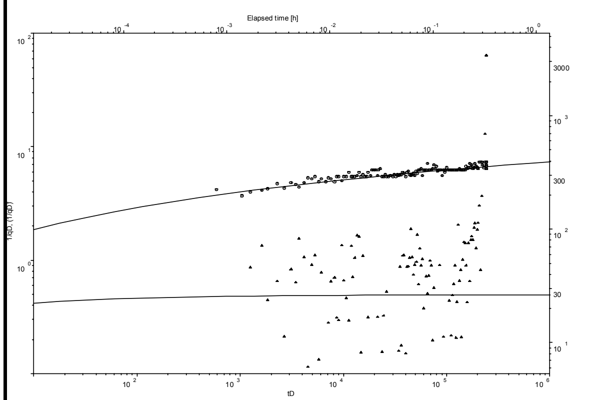
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 11:45
Test section from - to (m):	550.00-570.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

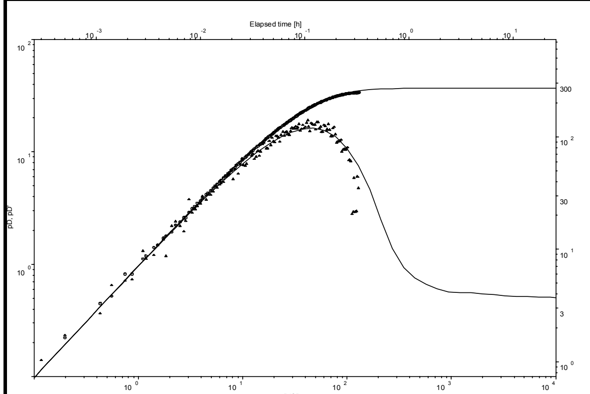


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4764		
p_i (kPa) =	4730		
p_p(kPa) =	4981	p_F (kPa) =	4733
Q_p (m^3/s)=	5.00E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.0		
Derivative fact.=	0.15	Derivative fact.=	0.00
Results		**Results**	
Q/s (m^2/s)=	2.0E-09		
T_M (m^2/s)=	2.0E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.27	dt_1 (min) =	NA
dt_2 (min) =	13.93	dt_2 (min) =	NA
T (m^2/s) =	2.0E-09	T (m^2/s) =	1.1E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.0E-10	K_s (m/s) =	5.5E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.3E-11
C_D (-) =	NA	C_D (-) =	6.9E-03
ξ (-) =	2.5	ξ (-) =	32.4
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.27	C (m^3/Pa) =	6.3E-11
dt_2 (min) =	13.93	C_D (-) =	6.9E-03
T_T (m^2/s) =	2.0E-09	ξ (-) =	2.5
S (-) =	1.0E-06		
K_s (m/s) =	1.0E-10		
S_s (1/m) =	5.0E-08		

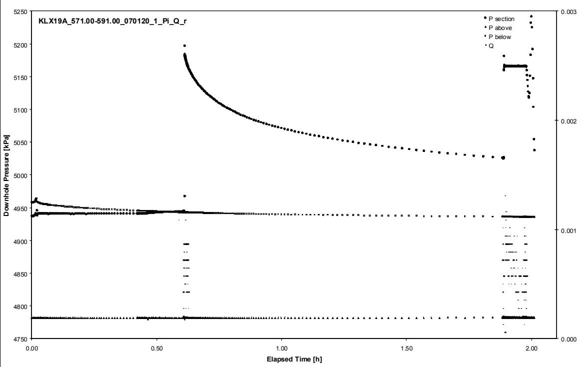
Comments:

The recommended transmissivity of 2.0E-9 m2/s was derived from the analysis of the CHir phase, which is very noisy but shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 9.0E-10 m2/s to 5.0E-9 m2/s. The analysis was conducted using a flow dimension of 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 4,715.0 kPa. Due to the short test duration and the uncertainness concerning the flow model, this value is uncertain.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 13:39
Test section from - to (m):	571.00-591.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

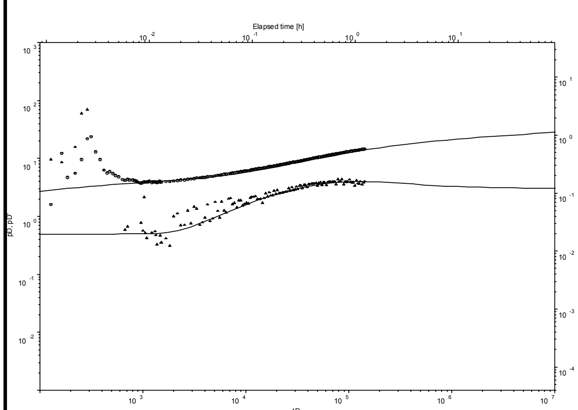


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4938		
p_i (kPa) =	4942		
p_p(kPa) =	5180	p_F (kPa) =	5026
Q_p (m^3/s)=	NA		
tp (s) =	10	t_F (s) =	4560
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.3		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	21.38
dt_2 (min) =	NA	dt_2 (min) =	69.76
T (m^2/s) =	NA	T (m^2/s) =	1.1E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	5.5E-12
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.9E-11
C_D (-) =	NA	C_D (-) =	6.5E-03
ξ (-) =	NA	ξ (-) =	2.1
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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	21.38	C (m^3/Pa) =	5.9E-11
dt_2 (min) =	69.76	C_D (-) =	6.5E-03
T_T (m^2/s) =	1.10E-10	ξ (-) =	2.1
S (-) =	1.00E-06		
K_s (m/s) =	5.50E-12		
S_s (1/m) =	NA		

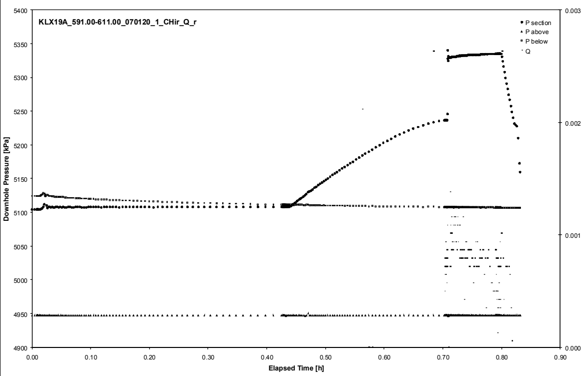
Comments:

The recommended transmissivity of 1.1E-10 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 5.0E-11 to 5.0E-10 m2/s. The analysis was conducted using a flow dimension of 2. The static pressure could not be extrapolated due to the very low transmissivity.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 16:19
Test section from - to (m):	591.00-611.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5103		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	#NV
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.6		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.00E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

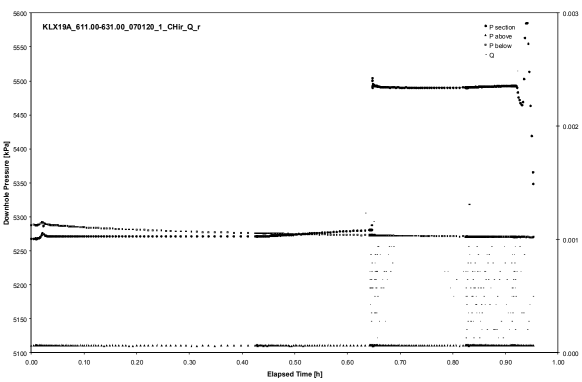
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070120 17:41
Test section from - to (m):	611.00-631.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5268		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	#NV
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.9		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-10	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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
Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-10	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

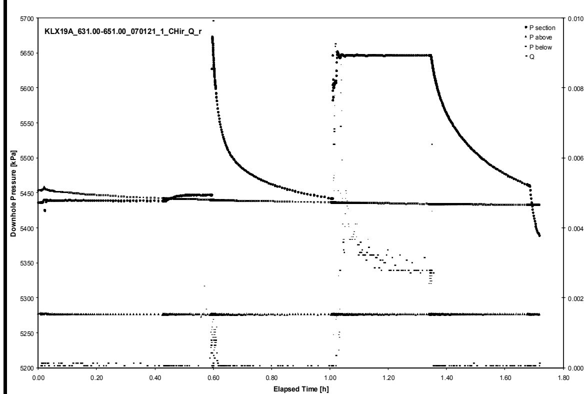
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-10 m2/s.

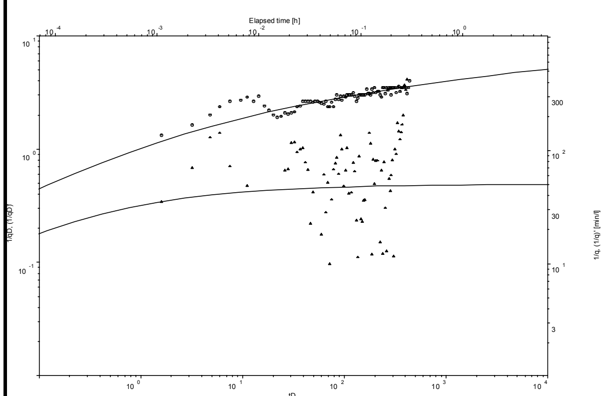
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070121 08:29
Test section from - to (m):	631.00-651.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

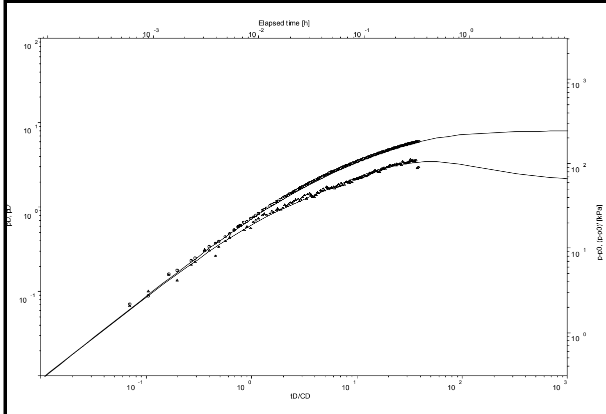
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5435		
p_i (kPa) =	5441		
p_p(kPa) =	5646	p_F (kPa) =	5459
Q_p (m^3/s)=	4.67E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.2		
Derivative fact.=	0.12	Derivative fact.=	0.14
Results		**Results**	
Q/s (m^2/s)=	2.2E-09		
T_M (m^2/s)=	2.3E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.91	dt_1 (min) =	NA
dt_2 (min) =	12.71	dt_2 (min) =	NA
T (m^2/s) =	1.2E-09	T (m^2/s) =	2.7E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.0E-11	K_s (m/s) =	1.4E-10
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.4E-11
C_D (-) =	NA	C_D (-) =	5.9E-03
ξ (-) =	-0.4	ξ (-) =	3.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	1.91	C (m^3/Pa) =	5.4E-11
dt_2 (min) =	12.71	C_D (-) =	5.9E-03
T_T (m^2/s) =	1.2E-09	ξ (-) =	-0.4
S (-) =	1.0E-06		
K_s (m/s) =	6.0E-11		
S_s (1/m) =	5.0E-08		

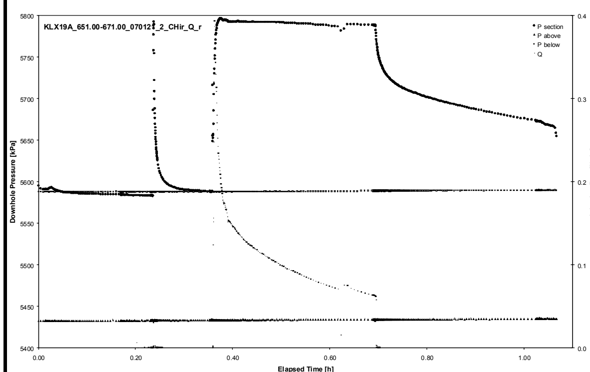
Comments:

The recommended transmissivity of 1.2E-09 m2/s was derived from the analysis of the CHi phase, which is noisy but still of amenable quality. The confidence range for the interval transmissivity is estimated to be 8.0E-10 m2/s to 3.0E-9 m2/s. The analysis was conducted using a flow dimension of 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 5,397.2 kPa.

Test Summary Sheet

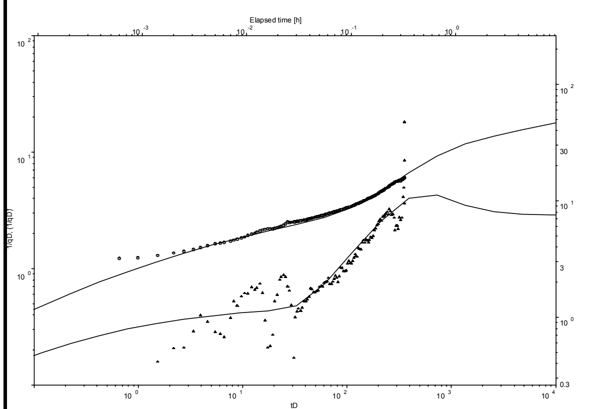
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	2
Borehole ID:	KLX19A	Test start:	070121 13:18
Test section from - to (m):	651.00-671.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

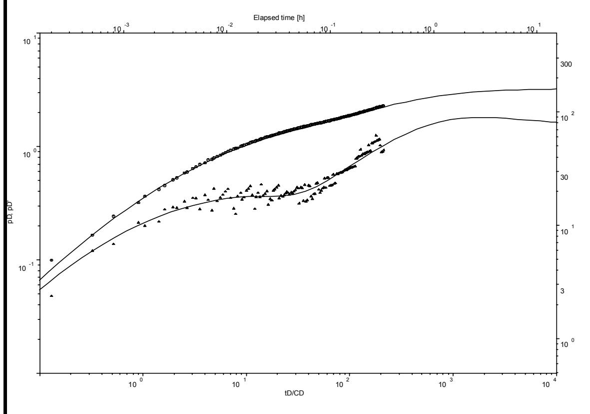


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5592		
p_i (kPa) =	5588		
p_p(kPa) =	5788	p_F (kPa) =	5673
Q_p (m^3/s)=	1.00E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.4		
Derivative fact.=	0.04	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	4.9E-08		
T_M (m^2/s)=	5.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.48
dt_2 (min) =	NA	dt_2 (min) =	2.39
T (m^2/s) =	5.0E-08	T (m^2/s) =	5.4E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.5E-09	K_s (m/s) =	2.7E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.9E-10
C_D (-) =	NA	C_D (-) =	2.1E-02
ξ (-) =	-2.4	ξ (-) =	-3.3
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.48	C (m^3/Pa) =	1.9E-10
dt_2 (min) =	2.39	C_D (-) =	2.1E-02
T_T (m^2/s) =	5.4E-08	ξ (-) =	-3.3
S (-) =	1.0E-06		
K_s (m/s) =	2.7E-09		
S_s (1/m) =	5.0E-08		

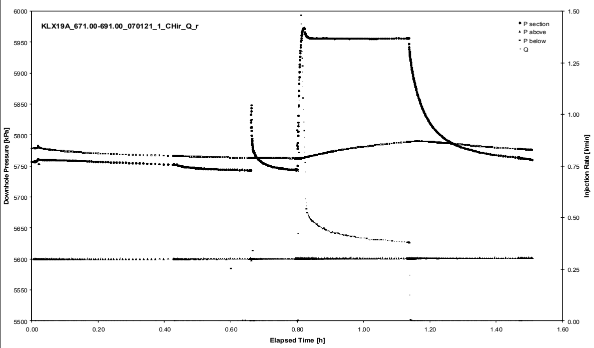
Comments:

The recommended transmissivity of 5.4E-8 m2/s was derived from the analysis of the CHir phase (inner zone), which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 1.0E-08 m2/s to 7.0E-8 m2/s. The flow dimension displayed during the test is 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 5,612.5 kPa.

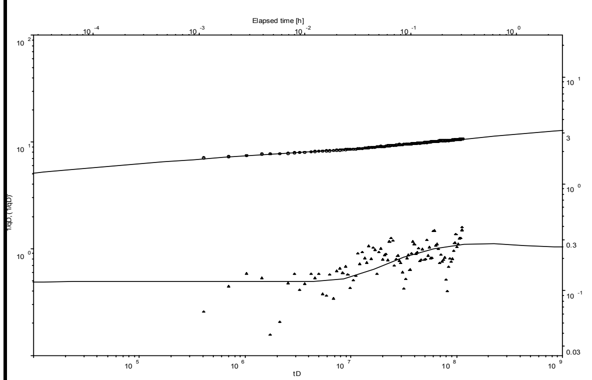
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070121 14:52
Test section from - to (m):	671.00-691.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

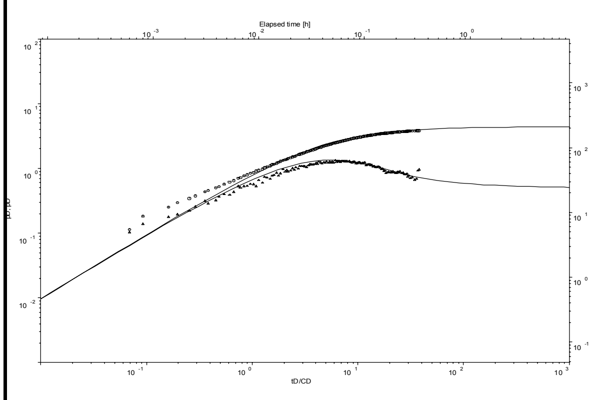
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5756		
p_i (kPa) =	5743		
p_p(kPa) =	5955	p_F (kPa) =	5761
Q_p (m^3/s)=	6.30E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.7		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.9E-07		
T_M (m^2/s)=	3.0E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.67	dt_1 (min) =	NA
dt_2 (min) =	17.14	dt_2 (min) =	NA
T (m^2/s) =	2.5E-07	T (m^2/s) =	2.3E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.3E-08	K_s (m/s) =	1.2E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.5E-09
C_D (-) =	NA	C_D (-) =	5.0E-01
ξ (-) =	2.8	ξ (-) =	1.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	4.5E-09
dt_2 (min) =	NA	C_D (-) =	5.0E-01
T_T (m^2/s) =	2.3E-07	ξ (-) =	1.9
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-08		
S_s (1/m) =	5.0E-08		

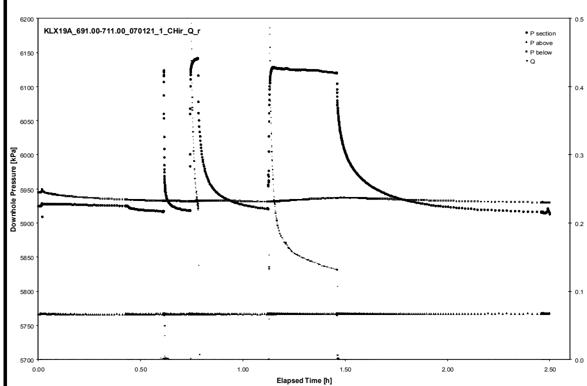
Comments:

The recommended transmissivity of 2.3E-7 m2/s was derived from the analysis of the CHi phase, which shows the best data and derivative quality. The confidence range for the interval transmissivity is estimated to be 9.0E-8 m2/s to 6.0E-7 m2/s. The flow dimension displayed during the test is 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 5,743.3 kPa.

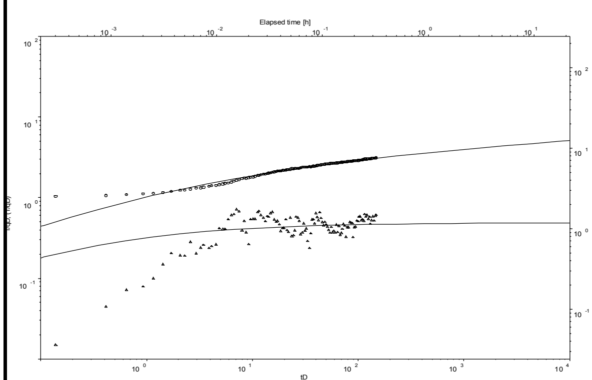
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070121 16:56
Test section from - to (m):	691.00-711.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

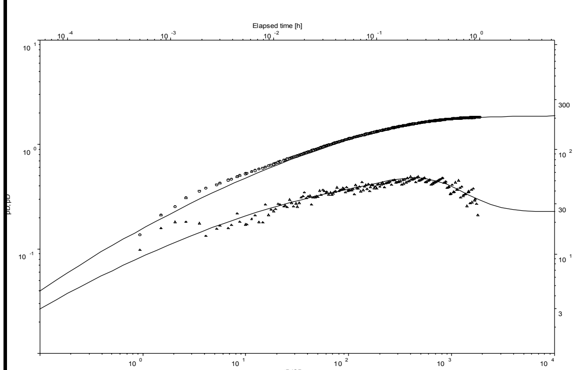
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5924		
p_i (kPa) =	5920		
p_p(kPa) =	6121	p_F (kPa) =	5915
Q_p (m^3/s)=	2.17E-06		
tp (s) =	1200	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.0		
Derivative fact.=	0.04	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	1.1E-07		
T_M (m^2/s)=	1.1E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.68	dt_1 (min) =	2.21
dt_2 (min) =	17.05	dt_2 (min) =	14.10
T (m^2/s) =	5.4E-08	T (m^2/s) =	3.7E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.7E-09	K_s (m/s) =	1.9E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.6E-11
C_D (-) =	NA	C_D (-) =	5.1E-03
ξ (-) =	-2.8	ξ (-) =	-3.7
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	0.68	C (m^3/Pa) =	4.6E-11
dt_2 (min) =	17.05	C_D (-) =	5.1E-03
T_T (m^2/s) =	5.4E-08	ξ (-) =	-2.8
S (-) =	1.0E-06		
K_s (m/s) =	2.7E-09		
S_s (1/m) =	5.0E-08		

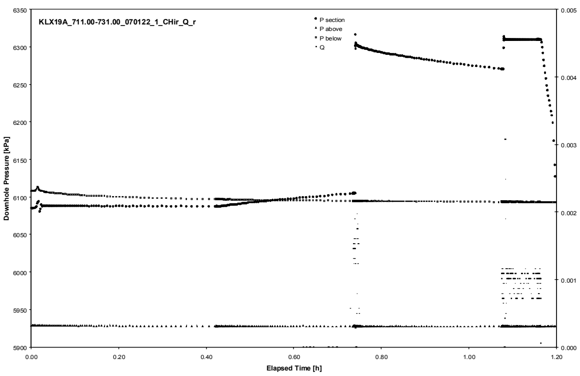
Comments:

The recommended transmissivity of 3.7E-8 m2/s was derived from the analysis of the CHi phase, which shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 1.0E-8 m2/s to 8.0E-8 m2/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 5,906.2 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070122 08:46
Test section from - to (m):	711.00-731.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6085		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.2		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

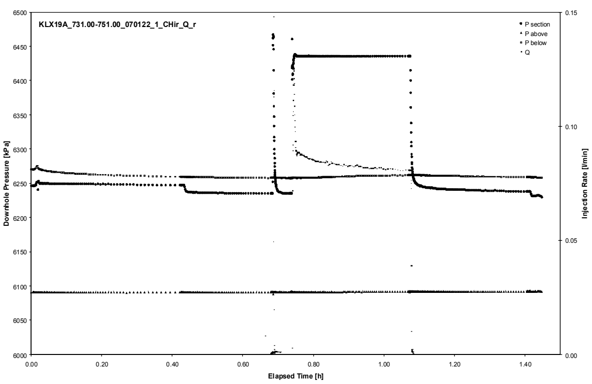
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

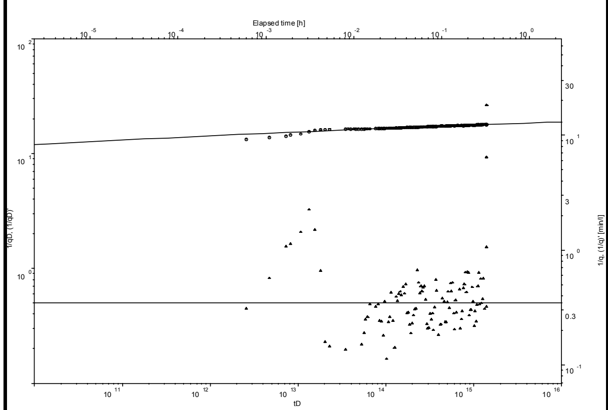
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070122 10:50
Test section from - to (m):	731.00-751.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

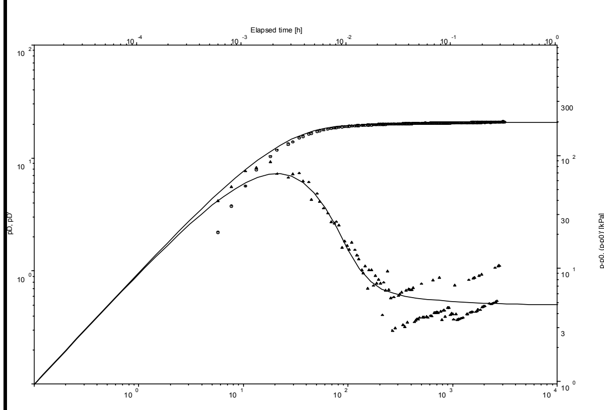


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6245		
p_i (kPa) =	6235		
p_p(kPa) =	6435	p_F (kPa) =	6238
Q_p (m^3/s)=	1.33E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.5		
Derivative fact.=	0.05	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	6.5E-08		
T_M (m^2/s)=	6.8E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.10	dt_1 (min) =	1.69
dt_2 (min) =	17.80	dt_2 (min) =	15.80
T (m^2/s) =	1.9E-07	T (m^2/s) =	2.3E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	9.4E-09	K_s (m/s) =	1.1E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.5E-11
C_D (-) =	NA	C_D (-) =	6.1E-03
ξ (-) =	11.5	ξ (-) =	3.7
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.69	C (m^3/Pa) =	5.5E-11
dt_2 (min) =	15.80	C_D (-) =	6.1E-03
T_T (m^2/s) =	2.3E-07	ξ (-) =	3.7
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-08		
S_s (1/m) =	5.0E-08		

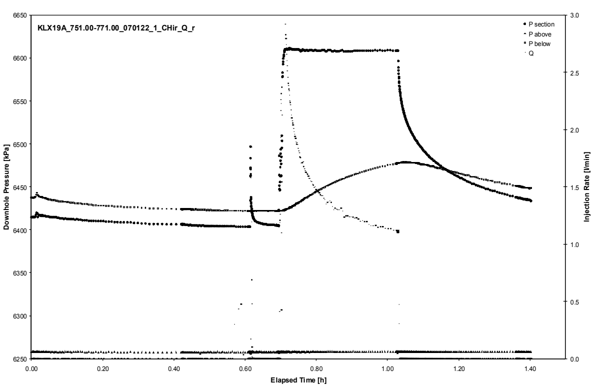
Comments:

The recommended transmissivity of 2.3E-7 m2/s was derived from the analysis of the CHir phase, which shows a clear horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 8.0E-8 m2/s to 5.0E-7 m2/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 6,235.2 kPa.

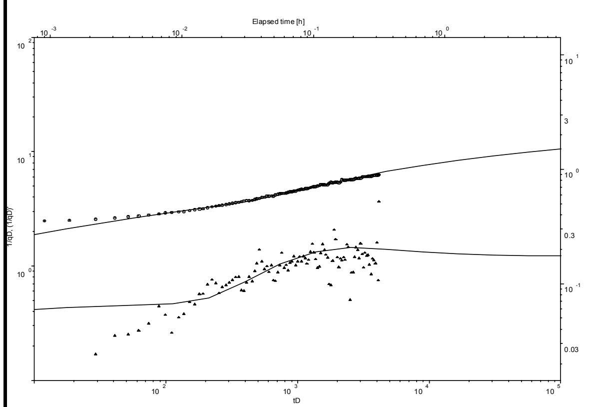
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070122 13:36
Test section from - to (m):	751.00-771.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

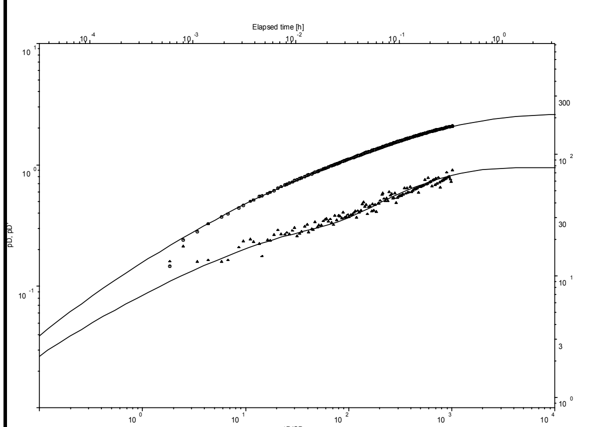
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6414		
p_i (kPa) =	6405		
p_p(kPa) =	6608	p_F (kPa) =	6434
Q_p (m^3/s)=	1.83E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.7		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	8.9E-07		
T_M (m^2/s)=	9.3E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	7.25	dt_1 (min) =	NA
dt_2 (min) =	16.93	dt_2 (min) =	NA
T (m^2/s) =	3.6E-07	T (m^2/s) =	4.5E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.8E-08	K_s (m/s) =	2.3E-08
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.4E-10
C_D (-) =	NA	C_D (-) =	3.7E-02
ξ (-) =	-2.6	ξ (-) =	-4.7
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	7.25	C (m^3/Pa) =	3.4E-10
dt_2 (min) =	16.93	C_D (-) =	3.7E-02
T_T (m^2/s) =	3.6E-07	ξ (-) =	-2.6
S (-) =	1.0E-06		
K_s (m/s) =	1.8E-08		
S_s (1/m) =	5.0E-08		

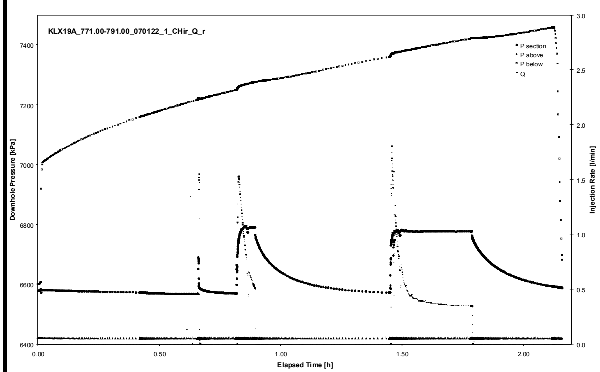
Comments:

The recommended transmissivity of 3.6E-7 m2/s was derived from the analysis of the CHi phase (outer zone), which shows a horizontal stabilisation. This value should be regarded as the upper limit for the interval transmissivity, due to hydraulic communication to the bottom zone. The confidence range for the interval transmissivity is estimated to be 7.0E-8 m2/s to 4.0E-7 m2/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 6,397.8 kPa.

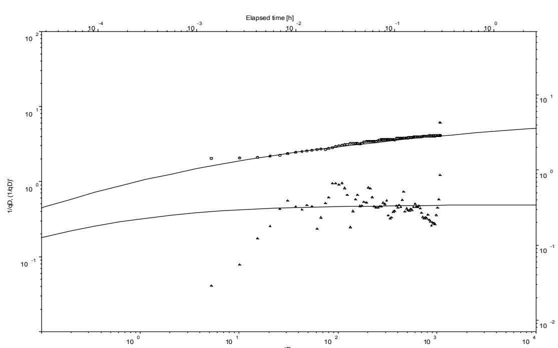
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070122 15:43
Test section from - to (m):	771.00-791.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

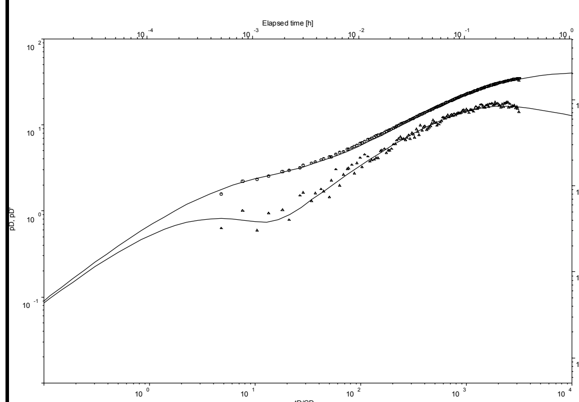
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6578		
p_i (kPa) =	6571		
p_p(kPa) =	6776	p_F (kPa) =	6588
Q_p (m^3/s)=	5.83E-06		
tp (s) =	1200	t_F (s) =	1200
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	17.0		
Derivative fact.=	0.09	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.8E-07		
T_M (m^2/s)=	2.9E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.16	dt_1 (min) =	NA
dt_2 (min) =	10.83	dt_2 (min) =	NA
T (m^2/s) =	1.8E-07	T (m^2/s) =	1.1E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	9.0E-09	K_s (m/s) =	5.6E-09
S_s (1/m) =	5.0E-08	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.9E-10
C_D (-) =	NA	C_D (-) =	5.4E-02
ξ (-) =	-2.4	ξ (-) =	-2.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	1.16	C (m^3/Pa) =	4.9E-10
dt_2 (min) =	10.83	C_D (-) =	5.4E-02
T_T (m^2/s) =	1.8E-07	ξ (-) =	-2.4
S (-) =	1.0E-06		
K_s (m/s) =	9.0E-09		
S_s (1/m) =	5.0E-08		

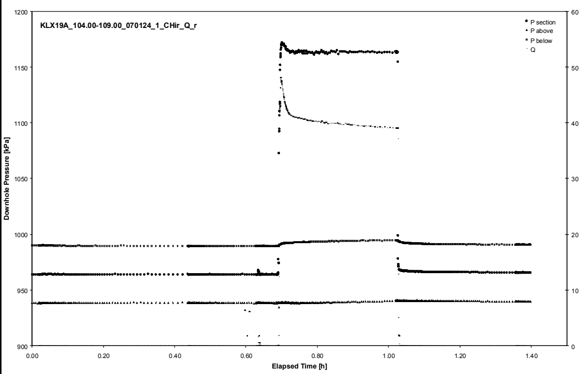
Comments:

The recommended transmissivity of 1.8E-7 m2/s was derived from the analysis of the CHi phase, which shows a horizontal stabilisation. The confidence range for the interval transmissivity is estimated to be 7.0E-08 m2/s to 4.0E-7 m2/s. The flow dimension displayed during the test is 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 6,546.2 kPa.

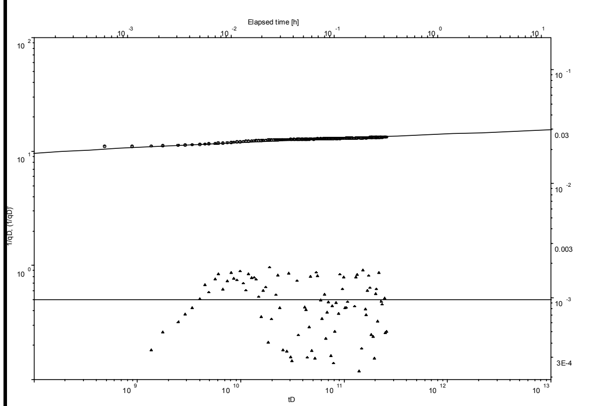
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070124 09:08
Test section from - to (m):	104.00-109.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

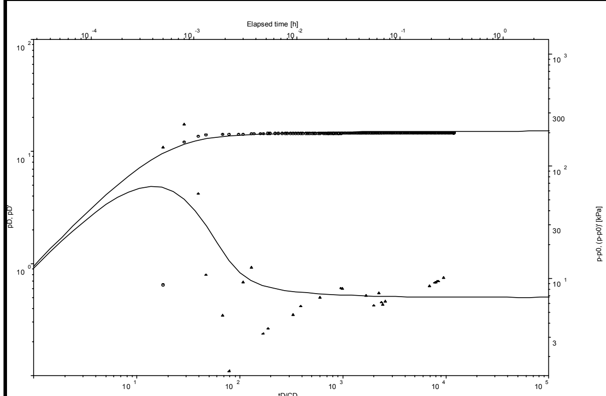
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	964		
p_i (kPa) =	964		
p_p(kPa) =	1164	p_F (kPa) =	965
Q_p (m^3/s)=	6.52E-04		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.8		
Derivative fact.=	0.01	Derivative fact.=	0.01
Results		**Results**	
Q/s (m^2/s)=	3.2E-05		
T_M (m^2/s)=	2.6E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.06	dt_1 (min) =	0.28
dt_2 (min) =	16.81	dt_2 (min) =	12.29
T (m^2/s) =	6.8E-05	T (m^2/s) =	7.7E-05
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.4E-05	K_s (m/s) =	1.5E-05
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	5.0E-09
C_D (-) =	NA	C_D (-) =	5.5E-01
ξ (-) =	4.2	ξ (-) =	7.2
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA
Selected representative parameters.			
dt_1 (min) =	1.06	C (m^3/Pa) =	5.0E-09
dt_2 (min) =	16.81	C_D (-) =	5.5E-01
T_T (m^2/s) =	6.8E-05	ξ (-) =	4.2
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-05		
S_s (1/m) =	2.0E-07		

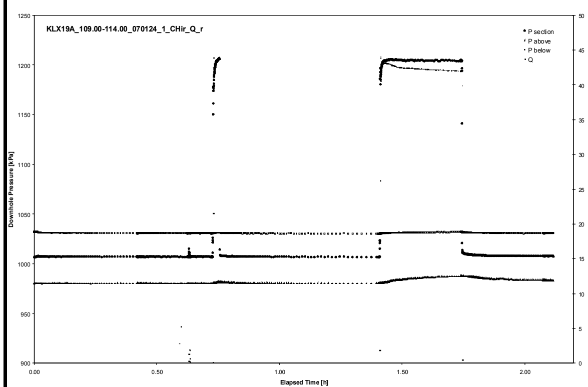
Comments:

The recommended transmissivity of 6.8E-05 m2/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 3.0E-05 m2/s to 8.0E-5 m2/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 965.3 kPa.

Test Summary Sheet

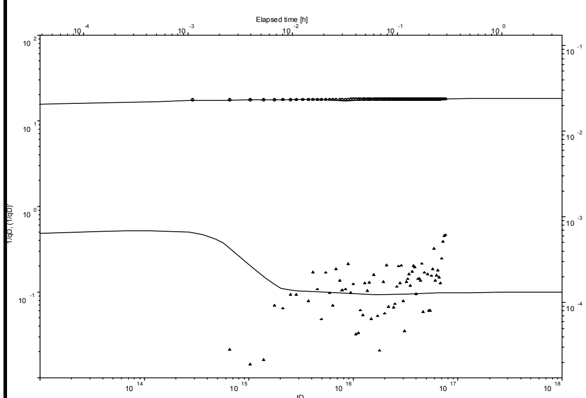
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070124 10:57
Test section from - to (m):	109.00-114.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

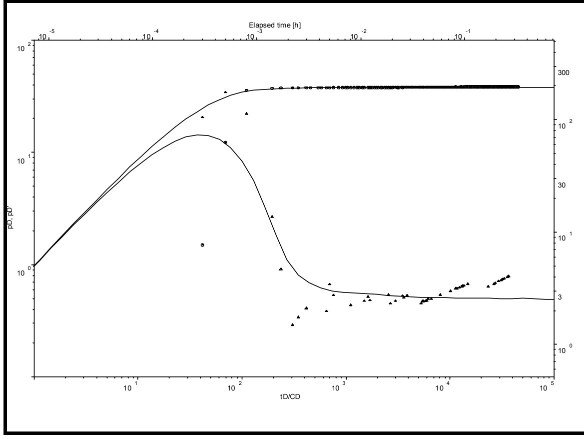


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	1007		
p_i (kPa) =	1006		
p_p(kPa) =	1204	p_F (kPa) =	1007
Q_p (m^3/s)=	6.98E-04		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	8.8		
Derivative fact.=	0.03	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	3.5E-05		
T_M (m^2/s)=	2.9E-05		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.55	dt_1 (min) =	0.23
dt_2 (min) =	14.80	dt_2 (min) =	7.10
T (m^2/s) =	4.9E-04	T (m^2/s) =	2.2E-04
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	9.8E-05	K_s (m/s) =	4.4E-05
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.6E-09
C_D (-) =	NA	C_D (-) =	4.0E-01
ξ (-) =	10.4	ξ (-) =	30.4
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.55	C (m^3/Pa) =	3.6E-09
dt_2 (min) =	14.80	C_D (-) =	4.0E-01
T_T (m^2/s) =	4.9E-04	ξ (-) =	10.4
S (-) =	1.0E-06		
K_s (m/s) =	9.8E-05		
S_s (1/m) =	2.0E-07		

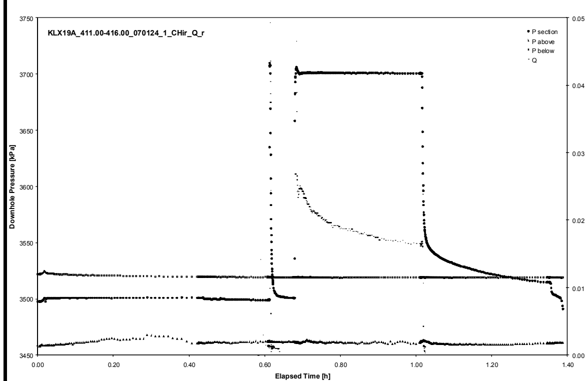
Comments:

The recommended transmissivity of 4.9E-04 m2/s was derived from the analysis of the CHi phase (outer zone), which shows a clear horizontal stabilization and the better derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-05 m2/s to 5.0E-4 m2/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 1,007.1 kPa.

Test Summary Sheet

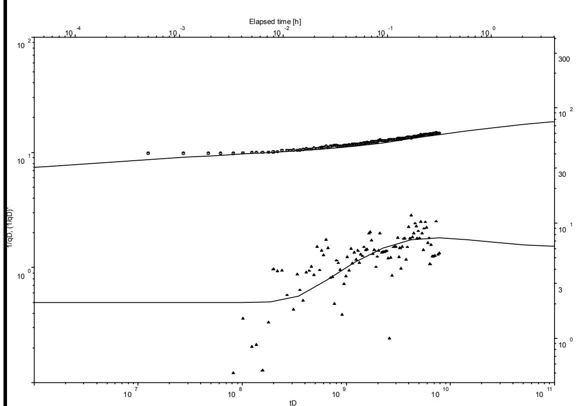
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070124 17:05
Test section from - to (m):	411.00-416.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

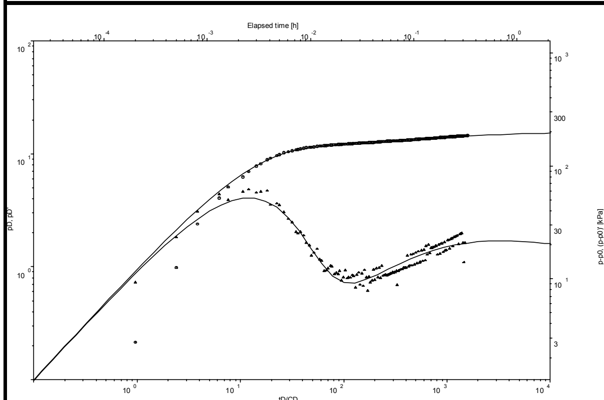


Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3497		
p_i (kPa) =	3500		
p_p(kPa) =	3700	p_F (kPa) =	3513
Q_p (m^3/s)=	2.83E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12		
Derivative fact.=	0.08	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	1.4E-08		
T_M (m^2/s)=	1.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	1.01
dt_2 (min) =	NA	dt_2 (min) =	2.26
T (m^2/s) =	3.2E-08	T (m^2/s) =	3.9E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.3E-09	K_s (m/s) =	7.8E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.9E-11
C_D (-) =	NA	C_D (-) =	2.1E-03
ξ (-) =	6.3	ξ (-) =	8.1
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	1.01	C (m^3/Pa) =	1.9E-11
dt_2 (min) =	2.26	C_D (-) =	2.1E-03
T_T (m^2/s) =	3.9E-08	ξ (-) =	8.1
S (-) =	1.0E-06		
K_s (m/s) =	7.8E-09		
S_s (1/m) =	2.0E-07		

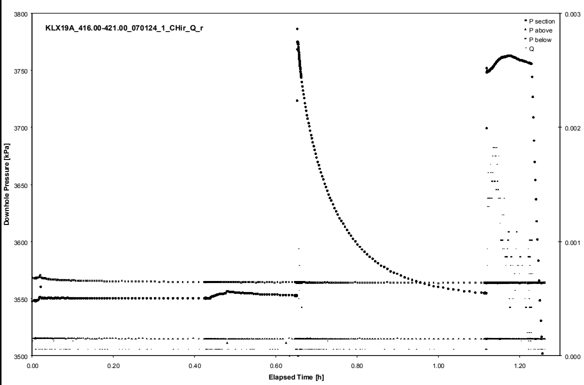
Comments:

The recommended transmissivity of 3.9E-08 m2/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization and the better derivative quality. The confidence range for the interval transmissivity is estimated to be 8.0E-09 m2/s to 5.0E-08 m2/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 3,500.9 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 08:23
Test section from - to (m):	416.00-421.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

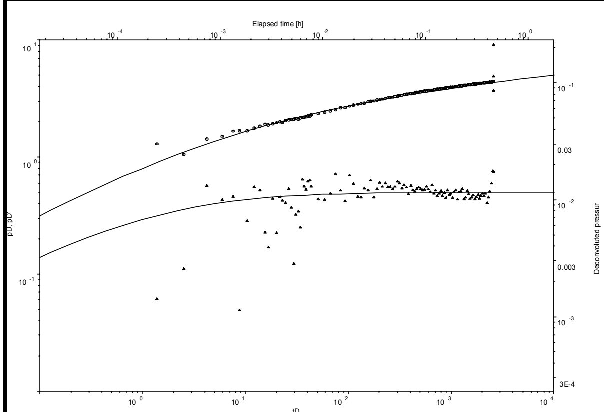
Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3548		
p_i (kPa) =	3553		
p_p(kPa) =	3774	p_F (kPa) =	3554
Q_p (m^3/s)=	#NV		
tp (s) =	10.2	t_F (s) =	1680
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.1		
Derivative fact.=	NA	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.22
dt_2 (min) =	NA	dt_2 (min) =	20.84
T (m^2/s) =	NA	T (m^2/s) =	3.2E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	6.5E-11
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.7E-11
C_D (-) =	NA	C_D (-) =	1.9E-03
ξ (-) =	NA	ξ (-) =	1.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	0.22	C (m^3/Pa) =	1.7E-11
dt_2 (min) =	20.84	C_D (-) =	1.9E-03
T_T (m^2/s) =	3.2E-10	ξ (-) =	1.0
S (-) =	1.0E-06		
K_s (m/s) =	6.5E-11		
S_s (1/m) =	2.0E-07		

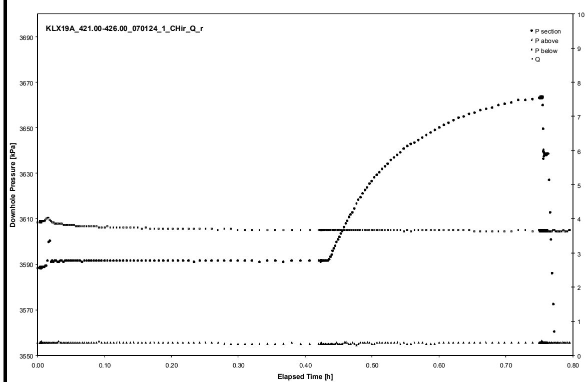
Comments:

The recommended transmissivity of 3.2E-10 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 1.0E-10 to 6.0E-10 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 10:04
Test section from - to (m):	421.00-426.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	3588		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.2		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

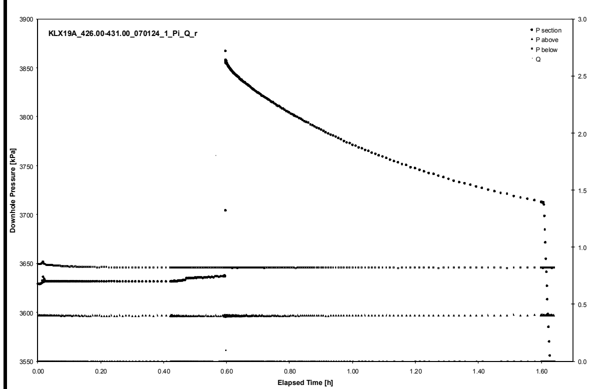
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 11:16
Test section from - to (m):	426.00-431.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

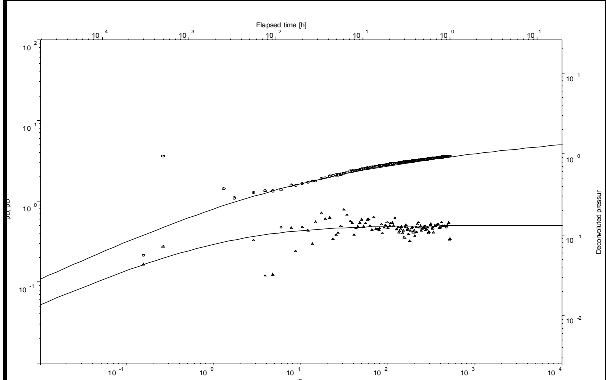
Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3629		
p_i (kPa) =	3636		
p_p(kPa) =	3867	p_F (kPa) =	3712
Q_p (m^3/s)=	NA		
tp (s) =	10.2	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.3		
Derivative fact.=	NA	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	3.29
dt_2 (min) =	NA	dt_2 (min) =	57.78
T (m^2/s) =	NA	T (m^2/s) =	2.3E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	4.6E-12
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-11
C_D (-) =	NA	C_D (-) =	1.5E-03
ξ (-) =	NA	ξ (-) =	1.1
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. derivates- flow period

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	3.29	C (m^3/Pa) =	1.4E-11
dt_2 (min) =	57.78	C_D (-) =	1.5E-03
T_T (m^2/s) =	2.3E-11	ξ (-) =	1.1
S (-) =	1.0E-06		
K_s (m/s) =	4.6E-12		
S_s (1/m) =	2.0E-07		

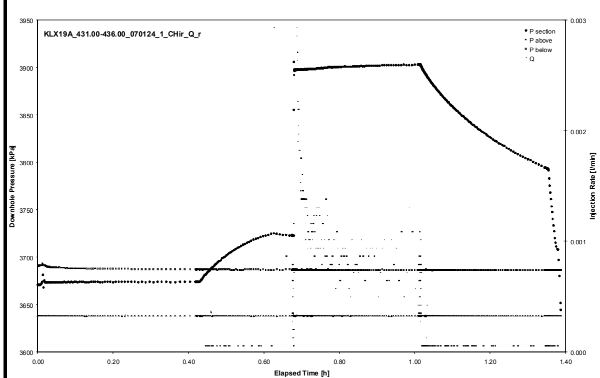
Comments:

The recommended transmissivity of 2.3E-11 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 9.0E-12 to 6.0E-11 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

Test Summary Sheet

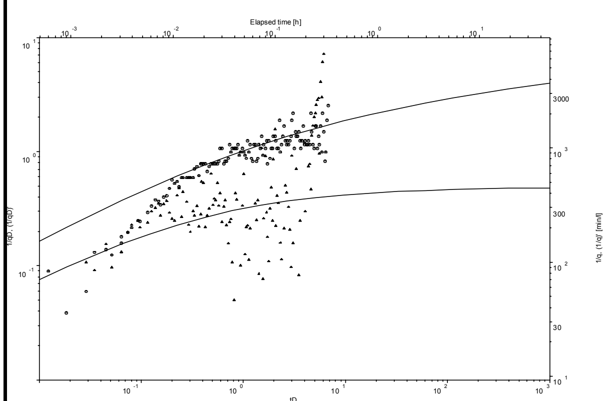
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 13:20
Test section from - to (m):	431.00-436.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

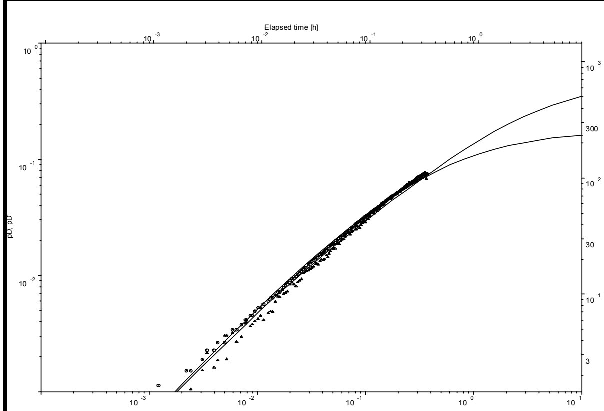


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3671		
p_i (kPa) =	3722		
p_p(kPa) =	3902	p_F (kPa) =	3793
Q_p (m^3/s)=	1.67E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.3		
Derivative fact.=	0.18	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	9.1E-10		
T_M (m^2/s)=	7.5E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.6E-10	T (m^2/s) =	2.0E-11
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.2E-11	K_s (m/s) =	4.0E-12
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.1E-11
C_D (-) =	NA	C_D (-) =	4.5E-03
ξ (-) =	-1.5	ξ (-) =	-2.5
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	4.1E-11
dt_2 (min) =	NA	C_D (-) =	4.5E-03
T_T (m^2/s) =	1.6E-10	ξ (-) =	-1.5
S (-) =	1.0E-06		
K_s (m/s) =	3.2E-11		
S_s (1/m) =	2.0E-07		

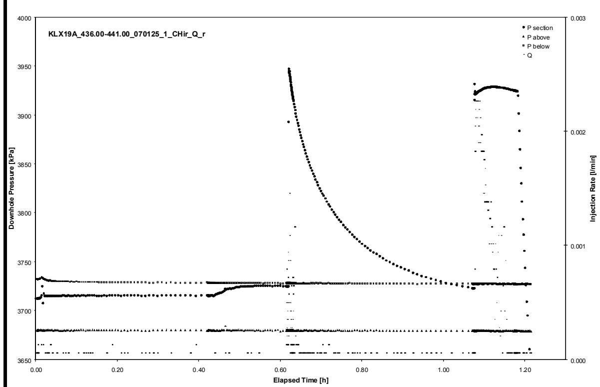
Comments:

The recommended transmissivity of 1.6E-10 m2/s was derived from the analysis of the CHi phase, which is close to show a horizontal stabilization. The confidence range for the interval transmissivity is estimated to be 8.0E-11 m2/s to 8.0E-10 m2/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 3,640.3 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 15:07
Test section from - to (m):	436.00-441.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

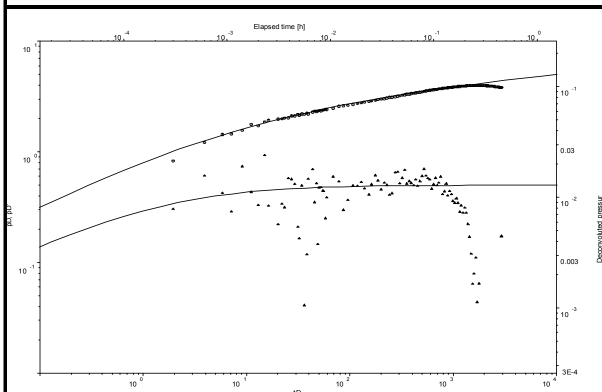
Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3712		
p_i (kPa) =	3725		
p_p(kPa) =	3944	p_F (kPa) =	3722
Q_p (m^3/s)=	NA		
tp (s) =	10	t_F (s) =	1620
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.4		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.20
dt_2 (min) =	NA	dt_2 (min) =	7.27
T (m^2/s) =	NA	T (m^2/s) =	1.8E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	3.6E-11
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.1E-11
C_D (-) =	NA	C_D (-) =	1.2E-03
ξ (-) =	NA	ξ (-) =	1.3
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. derivates- flow period

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.20	C (m^3/Pa) =	1.1E-11
dt_2 (min) =	7.27	C_D (-) =	1.2E-03
T_T (m^2/s) =	1.8E-10	ξ (-) =	1.3
S (-) =	1.0E-06		
K_s (m/s) =	3.6E-11		
S_s (1/m) =	2.0E-07		

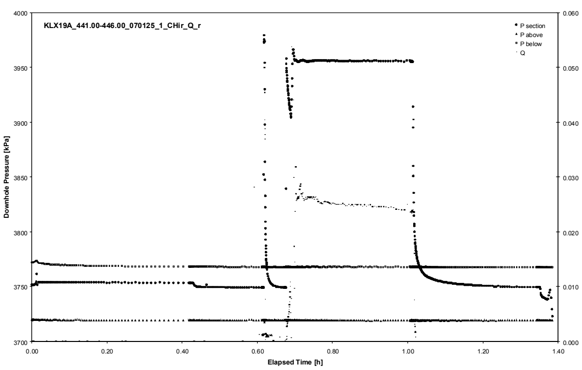
Comments:

The recommended transmissivity of 1.8E-10 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 8.0E-11 to 6.0E-10 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

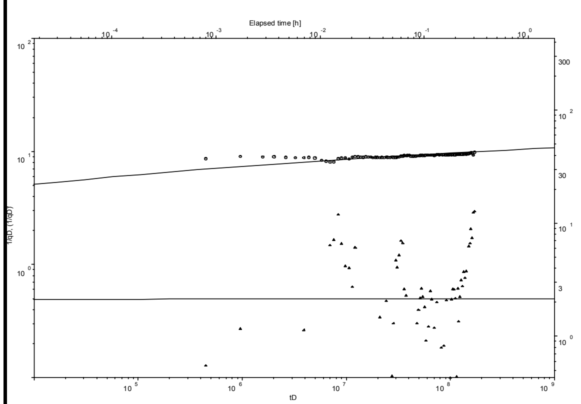
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 16:48
Test section from - to (m):	441.00-446.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

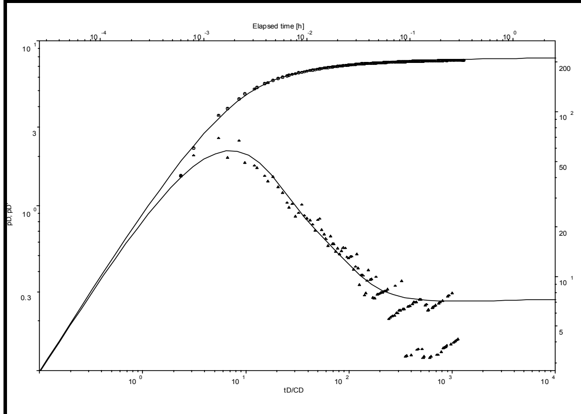
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3752		
p_i (kPa) =	3749		
p_p(kPa) =	3955	p_F (kPa) =	3749
Q_p (m^3/s)=	4.00E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	0.05	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	1.9E-08		
T_M (m^2/s)=	1.6E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.97	dt_1 (min) =	NA
dt_2 (min) =	13.45	dt_2 (min) =	NA
T (m^2/s) =	2.9E-08	T (m^2/s) =	2.4E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.8E-09	K_s (m/s) =	4.8E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-11
C_D (-) =	NA	C_D (-) =	1.5E-03
ξ (-) =	4.5	ξ (-) =	3.2
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	1.97	C (m^3/Pa) =	1.4E-11
dt_2 (min) =	13.45	C_D (-) =	1.5E-03
T_T (m^2/s) =	2.9E-08	ξ (-) =	4.5
S (-) =	1.0E-06		
K_s (m/s) =	5.8E-09		
S_s (1/m) =	2.0E-07		

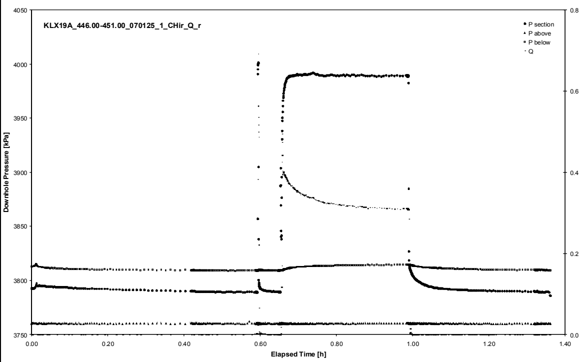
Comments:

The recommended transmissivity of 2.9E-08 m2/s was derived from the analysis of the CHi phase, which horizontal part is less sensitive to the derivative smoothing factor. The confidence range for the interval transmissivity is estimated to be 1.0E-08 m2/s to 8.0E-08 m2/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 3,745.9 kPa.

Test Summary Sheet

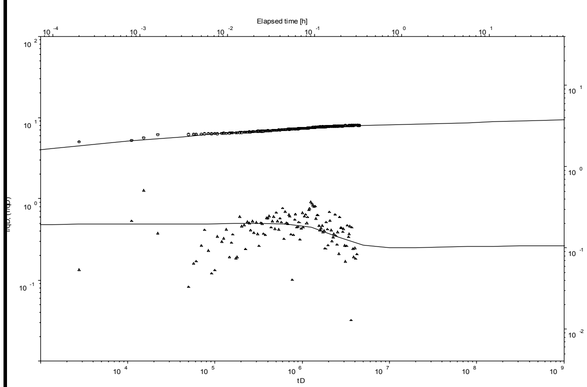
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070125 18:36
Test section from - to (m):	446.00-451.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

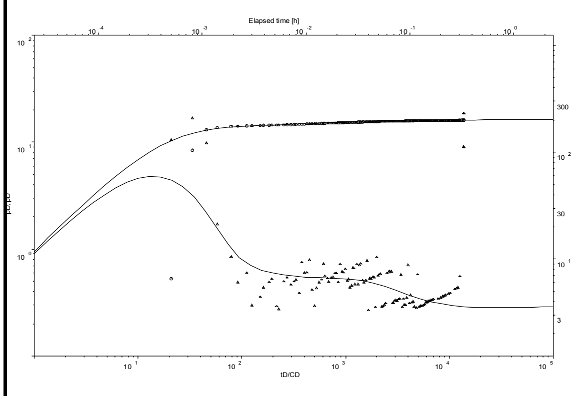


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	3792		
p_i (kPa) =	3789		
p_p(kPa) =	3989	p_F (kPa) =	3789
Q_p (m^3/s)=	5.17E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	12.5		
Derivative fact.=	0.05	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	2.5E-07		
T_M (m^2/s)=	2.1E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.57	dt_1 (min) =	0.45
dt_2 (min) =	4.69	dt_2 (min) =	1.53
T (m^2/s) =	3.2E-07	T (m^2/s) =	9.3E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	6.5E-08	K_s (m/s) =	1.9E-07
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.9E-11
C_D (-) =	NA	C_D (-) =	4.2E-03
ξ (-) =	1.4	ξ (-) =	9.6
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.57	C (m^3/Pa) =	3.9E-11
dt_2 (min) =	4.69	C_D (-) =	4.2E-03
T_T (m^2/s) =	3.2E-07	ξ (-) =	1.4
S (-) =	1.0E-06		
K_s (m/s) =	6.5E-08		
S_s (1/m) =	2.0E-07		

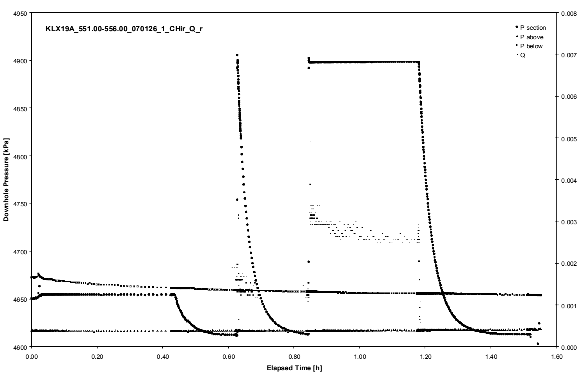
Comments:

The recommended transmissivity of 3.2E-07 m2/s was derived from the analysis of the CHi phase (inner zone), which shows horizontal stabilization and a better derivative quality than the CHir phase. The confidence range for the interval transmissivity is estimated to be 8.0E-08 m2/s to 8.0E-07 m2/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 3,786.3 kPa.

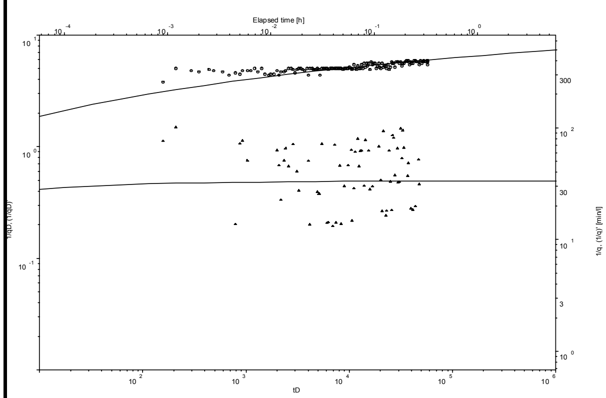
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070126 09:34
Test section from - to (m):	551.00-556.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

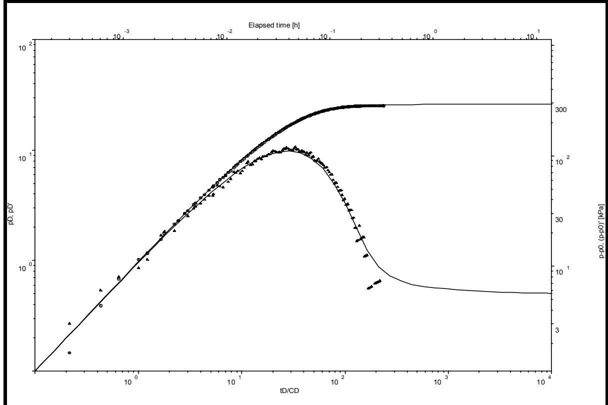
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4650		
p_i (kPa) =	4613		
p_p(kPa) =	4898	p_F (kPa) =	4612
Q_p (m^3/s)=	4.17E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.9		
Derivative fact.=	0.12	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.4E-09		
T_M (m^2/s)=	1.2E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.74	dt_1 (min) =	NA
dt_2 (min) =	16.55	dt_2 (min) =	NA
T (m^2/s) =	1.4E-09	T (m^2/s) =	6.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.8E-10	K_s (m/s) =	1.3E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.0E-11
C_D (-) =	NA	C_D (-) =	2.2E-03
ξ (-) =	2.0	ξ (-) =	21.5
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	0.74	C (m^3/Pa) =	2.0E-11
dt_2 (min) =	16.55	C_D (-) =	2.2E-03
T_T (m^2/s) =	1.4E-09	ξ (-) =	2.0
S (-) =	1.0E-06		
K_s (m/s) =	2.8E-10		
S_s (1/m) =	2.0E-07		

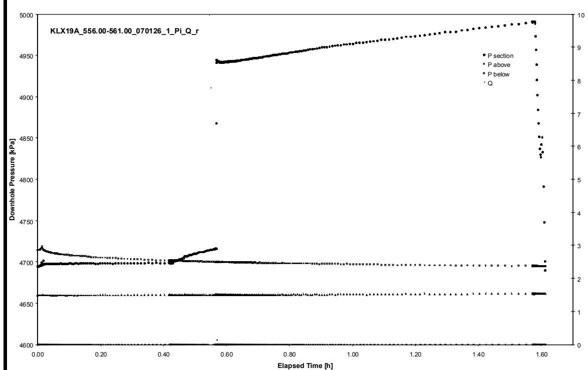
Comments:

The recommended transmissivity of 1.4E-09 m2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although the derivative data is a bit noisy. The confidence range for the interval transmissivity is estimated to be 8.0E-10 m2/s to 6.0E-09 m2/s. The analyses were conducted using a flow dimension of 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 4,609.5 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070126 11:34
Test section from - to (m):	556.00-561.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	4694		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	#NV
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.0		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.0E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

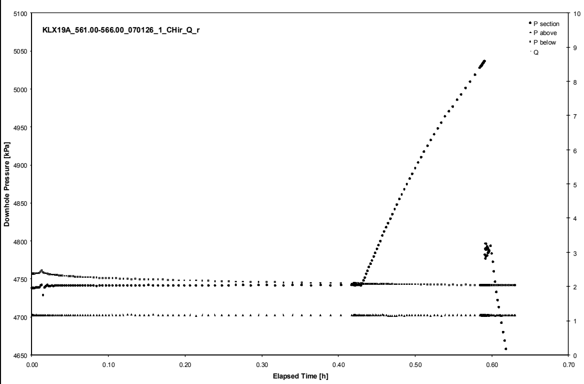
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070126 13:58
Test section from - to (m):	561.00-566.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4738		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

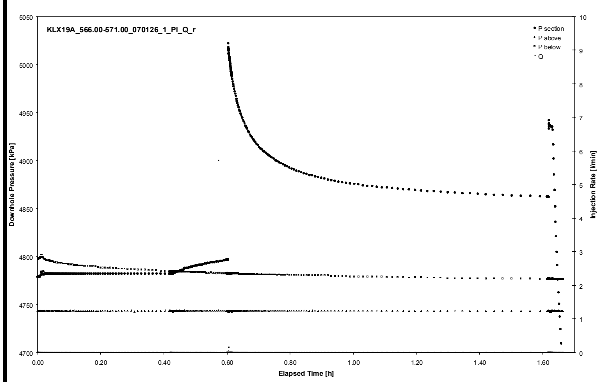
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070126 14:59
Test section from - to (m):	566.00-571.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

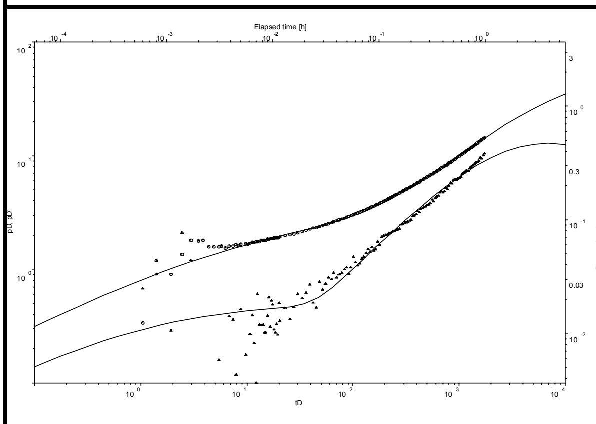


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4779		
p_i (kPa) =	4797		
p_p(kPa) =	5022	p_F (kPa) =	4862
Q_p (m^3/s)=	NA		
tp (s) =	7.2	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	14.1		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.29
dt_2 (min) =	NA	dt_2 (min) =	14.10
T (m^2/s) =	NA	T (m^2/s) =	2.0E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	4.0E-11
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.6E-11
C_D (-) =	NA	C_D (-) =	1.8E-03
ξ (-) =	NA	ξ (-) =	0.6
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. derivates- flow period

Not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.29	C (m^3/Pa) =	1.6E-11
dt_2 (min) =	14.10	C_D (-) =	1.8E-03
T_T (m^2/s) =	2.0E-10	ξ (-) =	0.6
S (-) =	1.0E-06		
K_s (m/s) =	4.0E-11		
S_s (1/m) =	2.0E-07		

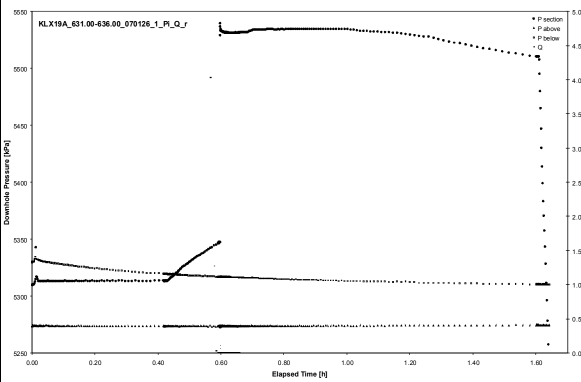
Comments:

The recommended transmissivity of 2.0E-10 m2/s was derived from the analysis of the Pi phase (inner zone). The confidence range for the interval transmissivity is estimated to be 5.0E-11 to 5.0E-10 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the very low transmissivity.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070126 17:42
Test section from - to (m):	631.00-636.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5309		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	#NV
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.0		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

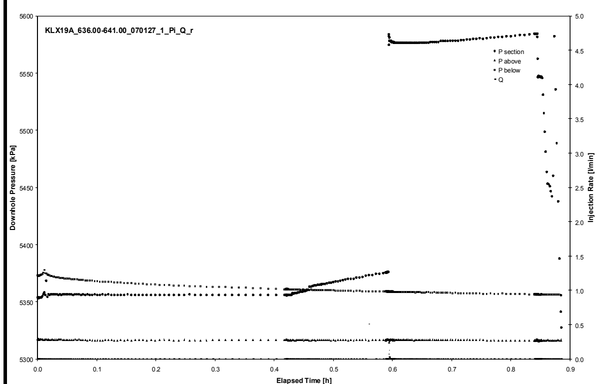
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	PI
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 08:26
Test section from - to (m):	636.00-641.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5353		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.0		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.0E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

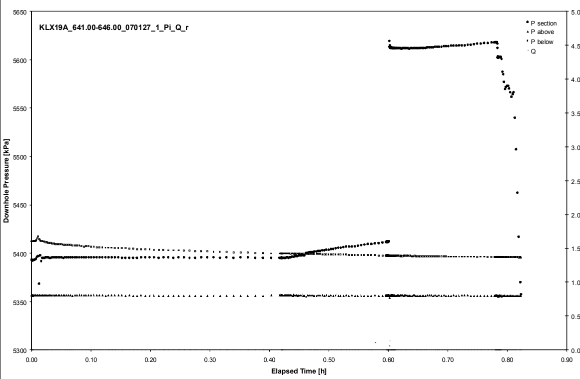
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 09:47
Test section from - to (m):	641.00-646.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5393		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.1		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.0E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

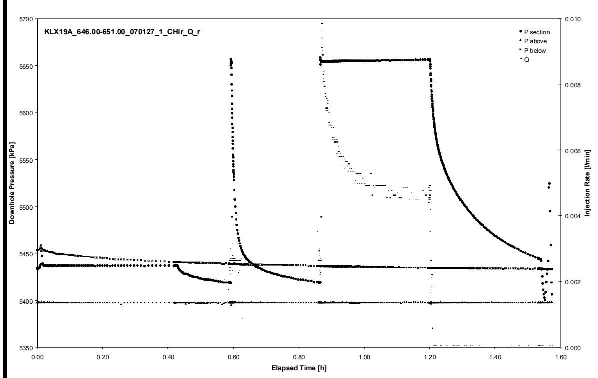
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

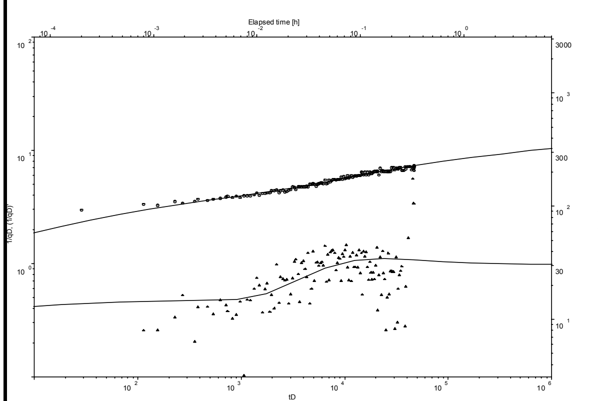
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 11:03
Test section from - to (m):	646.00-651.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

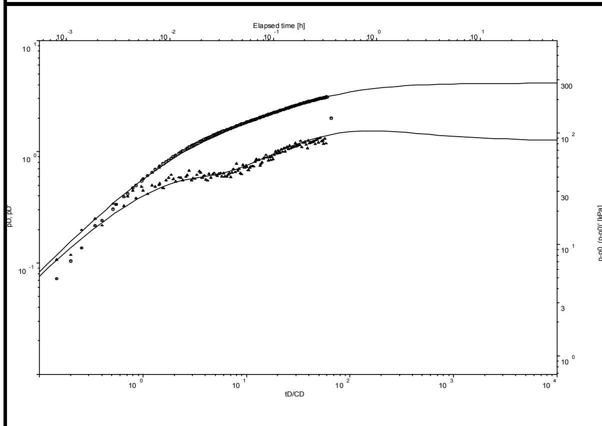
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5434		
p_i (kPa) =	5418		
p_p(kPa) =	5656	p_F (kPa) =	5443
Q_p (m^3/s)=	7.67E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.2		
Derivative fact.=	0.15	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.2E-09		
T_M (m^2/s)=	2.6E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.15	dt_1 (min) =	1.04
dt_2 (min) =	0.73	dt_2 (min) =	2.55
T (m^2/s) =	3.5E-09	T (m^2/s) =	2.0E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	7.0E-10	K_s (m/s) =	4.0E-10
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.6E-11
C_D (-) =	NA	C_D (-) =	2.9E-03
ξ (-) =	1.4	ξ (-) =	-1.1
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	1.04	C (m^3/Pa) =	2.6E-11
dt_2 (min) =	2.55	C_D (-) =	2.9E-03
T_T (m^2/s) =	2.0E-09	ξ (-) =	-1.1
S (-) =	1.0E-06		
K_s (m/s) =	4.0E-10		
S_s (1/m) =	2.0E-07		

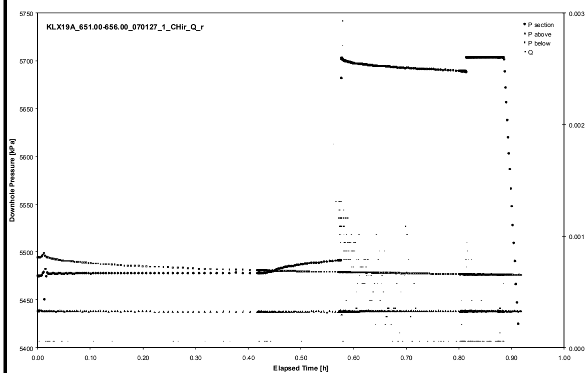
Comments:

The recommended transmissivity of 2.0E-09 m2/s was derived from the analysis of the CHir phase (inner zone), which shows a horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be 9.0E-09 m2/s to 5.0E-09 m2/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 5,388.8 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 13:03
Test section from - to (m):	651.00-656.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5475		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.2		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.00E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

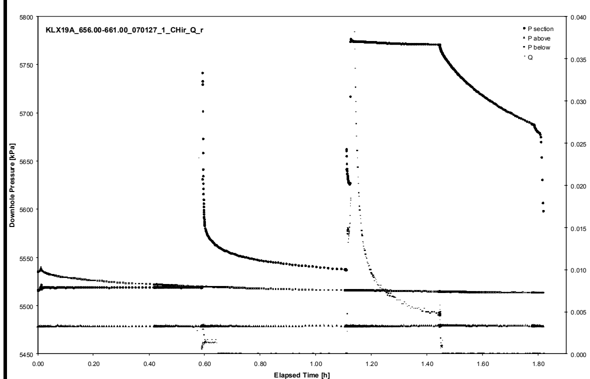
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

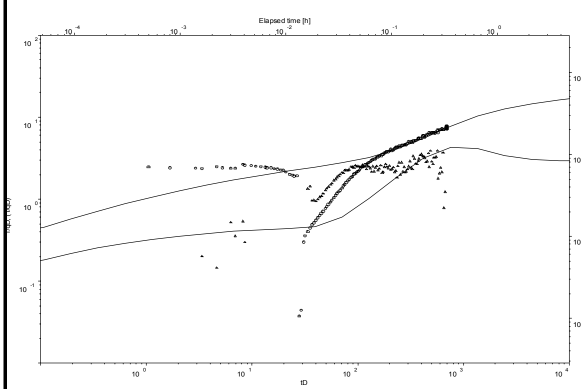
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 14:22
Test section from - to (m):	656.00-661.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

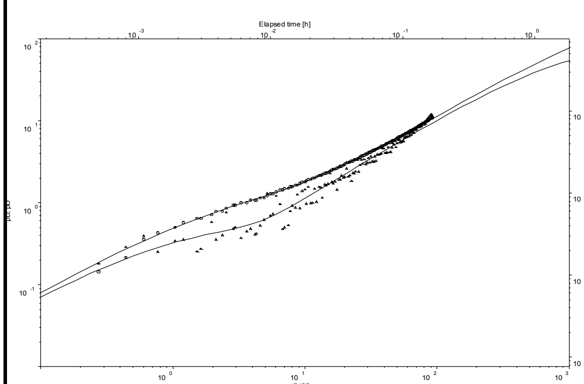
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5516		
p_i (kPa) =	5536		
p_p(kPa) =	5770	p_F (kPa) =	5686
Q_p (m^3/s)=	8.33E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.3		
Derivative fact.=	0.05	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	3.5E-09		
T_M (m^2/s)=	2.9E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	#NV	dt_1 (min) =	#NV
dt_2 (min) =	#NV	dt_2 (min) =	#NV
T (m^2/s) =	6.5E-10	T (m^2/s) =	5.3E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.3E-10	K_s (m/s) =	1.1E-10
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-10
C_D (-) =	NA	C_D (-) =	1.6E-02
ξ (-) =	-0.8	ξ (-) =	-2.5
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	#NV	C (m^3/Pa) =	1.4E-10
dt_2 (min) =	#NV	C_D (-) =	1.6E-02
T_T (m^2/s) =	6.5E-10	ξ (-) =	-2.5
S (-) =	1.0E-06		
K_s (m/s) =	1.3E-10		
S_s (1/m) =	2.0E-07		

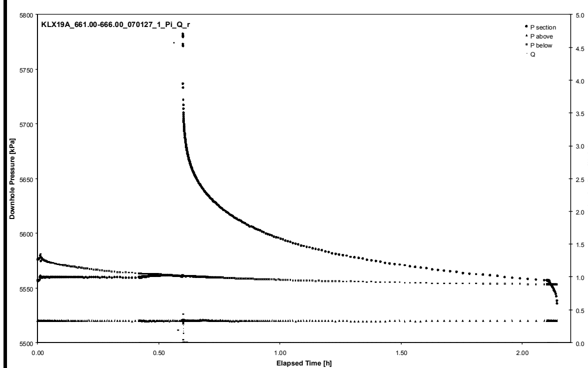
Comments:

The recommended transmissivity of 6.5E-10 m2/s was derived from the analysis of the CHi phase (outer zone). The inner zones of both phases are interpreted as skin zones. The confidence range for the interval transmissivity is estimated to be 3.0E-10 m2/s to 3.0E-09 m2/s. A flow dimension of 2 was assumed. 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 5,623.5 kPa. Due to the low transmissivity and the short test time, the derived head is not representative for the formation.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070127 17:13
Test section from - to (m):	661.00-666.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

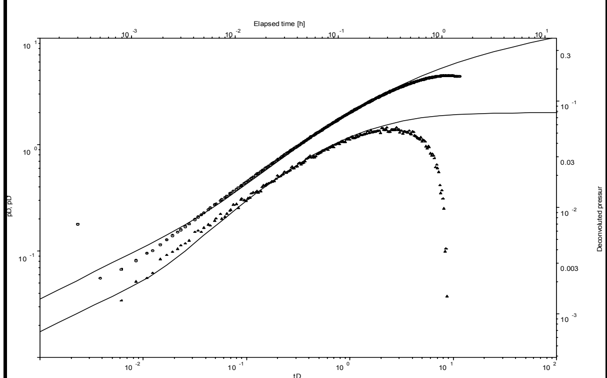


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5557		
p_i (kPa) =	5560		
p_p(kPa) =	5782	p_F (kPa) =	5557
Q_p (m^3/s)=	NA		
tp (s) =	10.2	t_F (s) =	5400
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.4		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	4.0E-10
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	8.0E-11
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.4E-10
C_D (-) =	NA	C_D (-) =	1.5E-02
ξ (-) =	NA	ξ (-) =	-3.1
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. derivates- flow period

Not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	1.4E-10
dt_2 (min) =	NA	C_D (-) =	1.5E-02
T_T (m^2/s) =	4.0E-10	ξ (-) =	-3.1
S (-) =	1.0E-06		
K_s (m/s) =	8.0E-11		
S_s (1/m) =	2.0E-07		

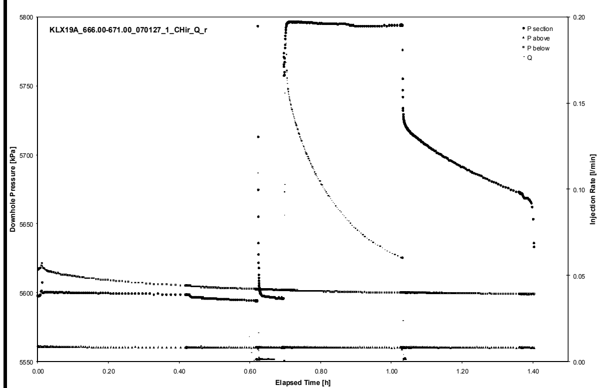
Comments:

The recommended transmissivity of 4.0E-10 m2/s was derived from the analysis of the Pi phase (outer zone). The inner zone is interpreted as skin. The confidence range for the interval transmissivity is estimated to be 1.0E-10 to 8.0E-10 m2/s. The flow dimension was assumed to be 2. The static pressure could not be extrapolated due to the low transmissivity.

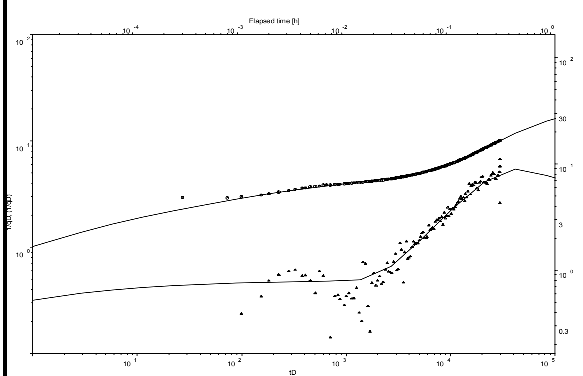
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 18:17
Test section from - to (m):	666.00-671.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

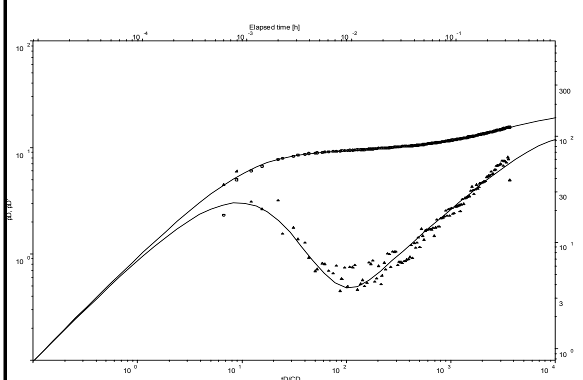
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5598		
p_i (kPa) =	5595		
p_p(kPa) =	5793	p_F (kPa) =	5671
Q_p (m^3/s)=	1.00E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.4		
Derivative fact.=	0.01	Derivative fact.=	0.05
Results		**Results**	
Q/s (m^2/s)=	5.0E-08		
T_M (m^2/s)=	4.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.12	dt_1 (min) =	0.43
dt_2 (min) =	0.89	dt_2 (min) =	0.96
T (m^2/s) =	8.0E-08	T (m^2/s) =	3.1E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.6E-08	K_s (m/s) =	6.2E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.4E-11
C_D (-) =	NA	C_D (-) =	7.1E-03
ξ (-) =	-0.4	ξ (-) =	4.8
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	0.43	C (m^3/Pa) =	6.4E-11
dt_2 (min) =	0.96	C_D (-) =	7.1E-03
T_T (m^2/s) =	3.1E-07	ξ (-) =	4.8
S (-) =	1.0E-06		
K_s (m/s) =	6.2E-08		
S_s (1/m) =	2.0E-07		

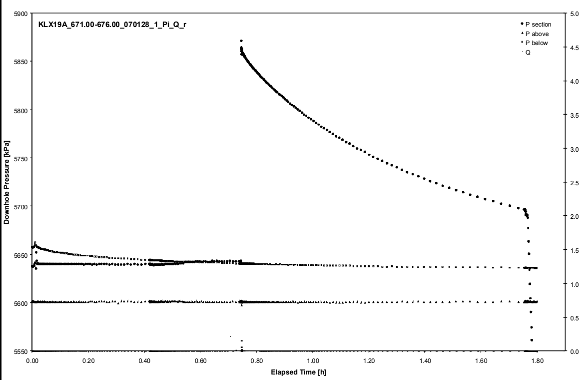
Comments:

The recommended transmissivity of 3.1E-07 m2/s was derived from the analysis of the CHir phase (inner zone), which shows horizontal stabilization in a segment of the derivative. The confidence range for the interval transmissivity is estimated to be 8.0E-08 m2/s to 4.0E-07 m2/s. The flow dimension displayed during the test is 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 5,617.0 kPa. Due to the short test duration and the low transmissivity, the derived head is not representative for the formation.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 10:07
Test section from - to (m):	671.00-676.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

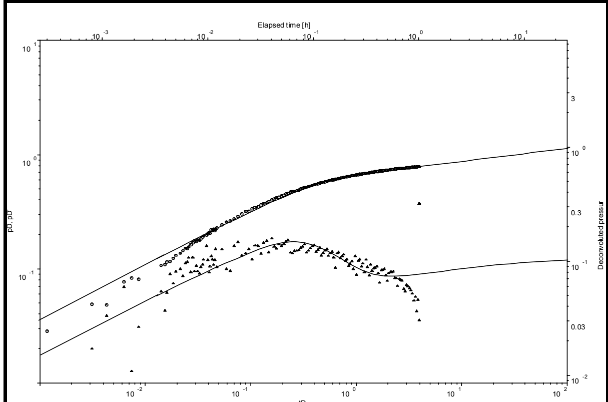
Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5638		
p_i (kPa) =	5642		
p_p(kPa) =	5871	p_F (kPa) =	5695
Q_p (m^3/s)=	NA		
tp (s) =	10	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.5		
Derivative fact.=	NA	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	NA	T (m^2/s) =	3.7E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	7.4E-12
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.8E-11
C_D (-) =	NA	C_D (-) =	2.0E-03
ξ (-) =	NA	ξ (-) =	-0.9
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. derivates- flow period

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	1.8E-11
dt_2 (min) =	NA	C_D (-) =	2.0E-03
T_T (m^2/s) =	3.7E-11	ξ (-) =	-0.9
S (-) =	1.0E-06		
K_s (m/s) =	7.4E-12		
S_s (1/m) =	2.0E-07		

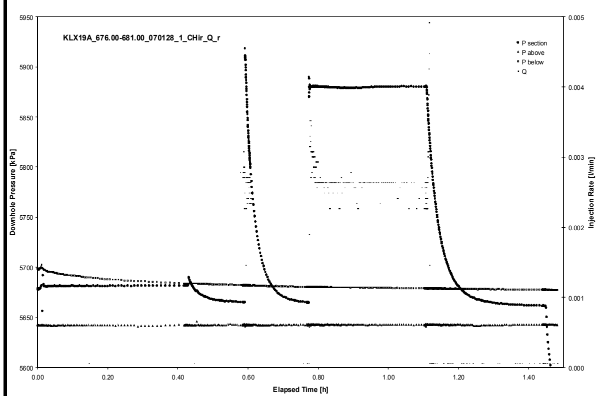
Comments:

The recommended transmissivity of 3.7E-11 m2/s was derived from the analysis of the Pi phase (outer zone). The confidence range for the interval transmissivity is estimated to be 8.0E-12 to 5.0E-11 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

Test Summary Sheet

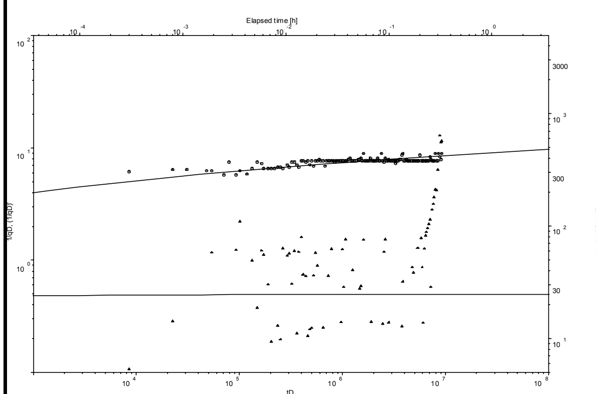
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 12:22
Test section from - to (m):	676.00-681.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

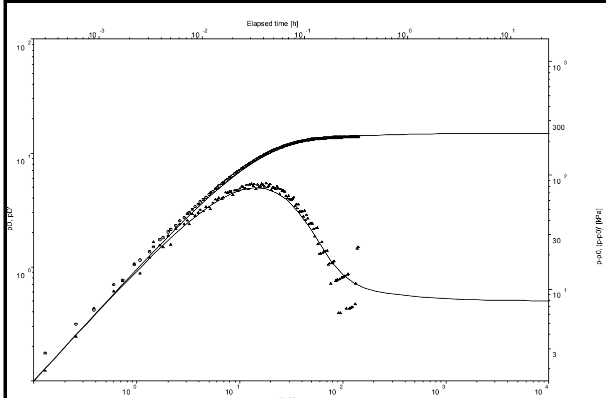


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5679		
p_i (kPa) =	5664		
p_p(kPa) =	5879	p_F (kPa) =	5661
Q_p (m^3/s)=	4.33E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.6		
Derivative fact.=	0.17	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.0E-09		
T_M (m^2/s)=	1.6E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.55	dt_1 (min) =	NA
dt_2 (min) =	11.72	dt_2 (min) =	NA
T (m^2/s) =	2.4E-09	T (m^2/s) =	4.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.8E-10	K_s (m/s) =	8.6E-10
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.3E-11
C_D (-) =	NA	C_D (-) =	2.5E-03
ξ (-) =	4.2	ξ (-) =	9.9
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.55	C (m^3/Pa) =	2.3E-11
dt_2 (min) =	11.72	C_D (-) =	2.5E-03
T_T (m^2/s) =	2.4E-09	ξ (-) =	4.2
S (-) =	1.0E-06		
K_s (m/s) =	4.8E-10		
S_s (1/m) =	2.0E-07		

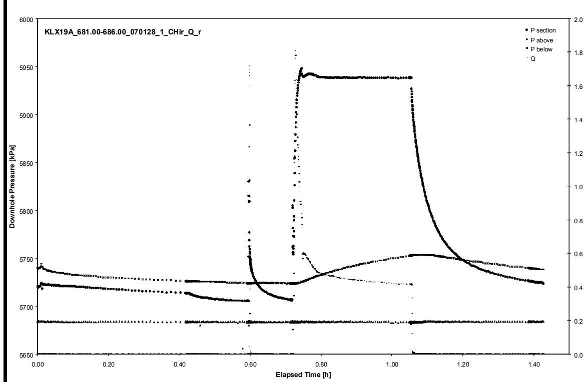
Comments:

The recommended transmissivity of 2.4E-09 m2/s was derived from the analysis of the CHi phase, which shows a continuous horizontal stabilization although the derivative is noisy. The confidence range for the interval transmissivity is estimated to be 8.0E-10 m2/s to 6.0E-09 m2/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 5,652.7 kPa.

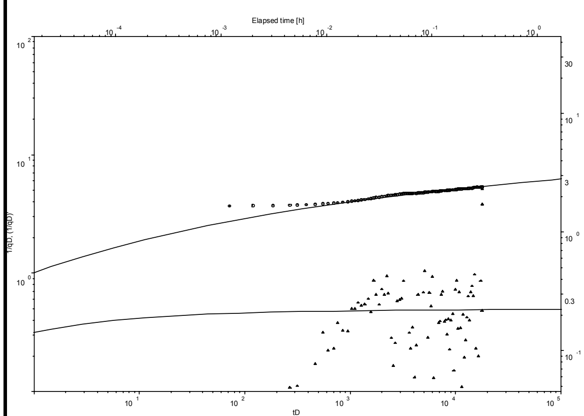
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 14:19
Test section from - to (m):	681.00-686.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, 2·r_w (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

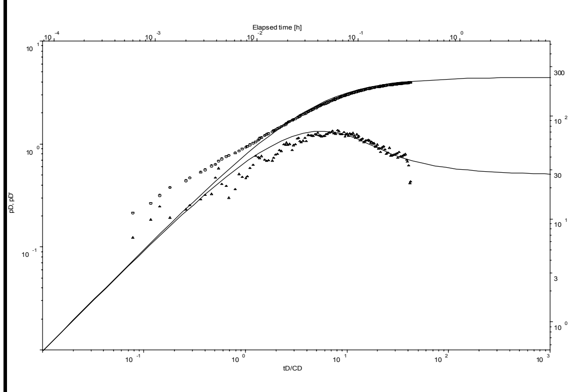
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5720		
p_i (kPa) =	5706		
p_p(kPa) =	5938	p_F (kPa) =	5724
Q_p (m^3/s)=	6.95E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.6		
Derivative fact.=	0.01	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	2.9E-07		
T_M (m^2/s)=	2.4E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.10	dt_1 (min) =	NA
dt_2 (min) =	16.88	dt_2 (min) =	NA
T (m^2/s) =	2.5E-07	T (m^2/s) =	2.2E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	5.0E-08	K_s (m/s) =	4.4E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.9E-09
C_D (-) =	NA	C_D (-) =	4.3E-01
ξ (-) =	-1.2	ξ (-) =	-1.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.

dt_1 (min) =	1.10	C (m^3/Pa) =	3.9E-09
dt_2 (min) =	16.88	C_D (-) =	4.3E-01
T_T (m^2/s) =	2.5E-07	ξ (-) =	-1.2
S (-) =	1.0E-06		
K_s (m/s) =	5.0E-08		
S_s (1/m) =	2.0E-07		

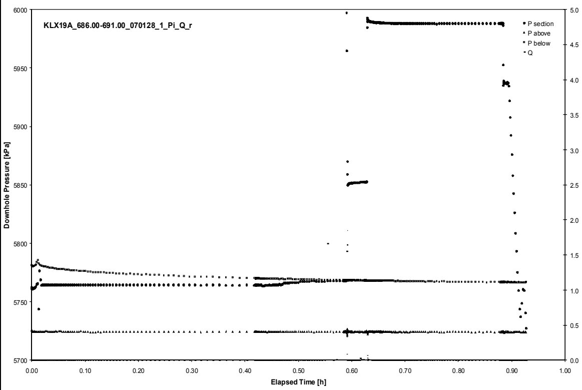
Comments:

The recommended transmissivity of 2.5E-07 m2/s was derived from the analysis of the CHi phase, which shows a continuous horizontal stabilization. The confidence range for the interval transmissivity is estimated to be 9.0E-08 m2/s to 4.0E-07 m2/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 5,697.2 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 16:10
Test section from - to (m):	686.00-691.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5761		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.7		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

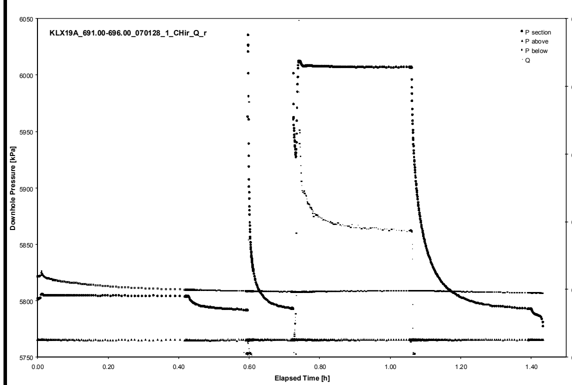
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

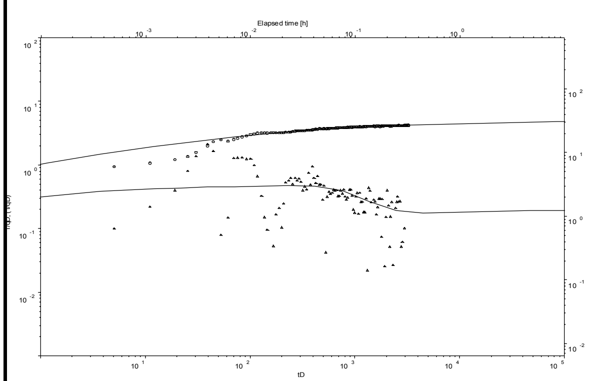
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070128 17:33
Test section from - to (m):	691.00-696.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

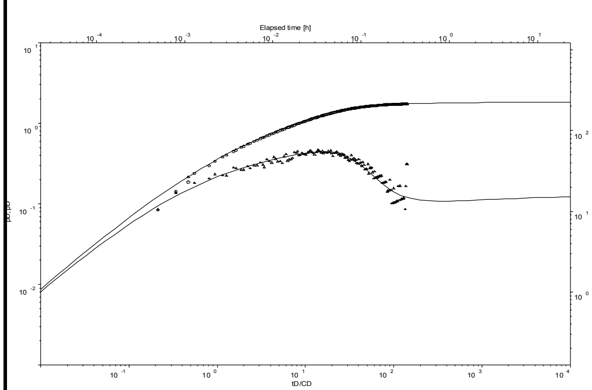


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5802		
p_i (kPa) =	5792		
p_p(kPa) =	6006	p_F (kPa) =	5792
Q_p (m^3/s)=	6.17E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.8		
Derivative fact.=	0.06	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	2.8E-08		
T_M (m^2/s)=	2.3E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.96	dt_1 (min) =	NA
dt_2 (min) =	2.70	dt_2 (min) =	NA
T (m^2/s) =	1.9E-08	T (m^2/s) =	8.6E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.8E-09	K_s (m/s) =	1.7E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	4.7E-11
C_D (-) =	NA	C_D (-) =	5.1E-03
ξ (-) =	0.8	ξ (-) =	-2.6
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	4.7E-11
dt_2 (min) =	NA	C_D (-) =	5.1E-03
T_T (m^2/s) =	8.6E-09	ξ (-) =	-2.6
S (-) =	1.0E-06		
K_s (m/s) =	1.7E-09		
S_s (1/m) =	2.0E-07		

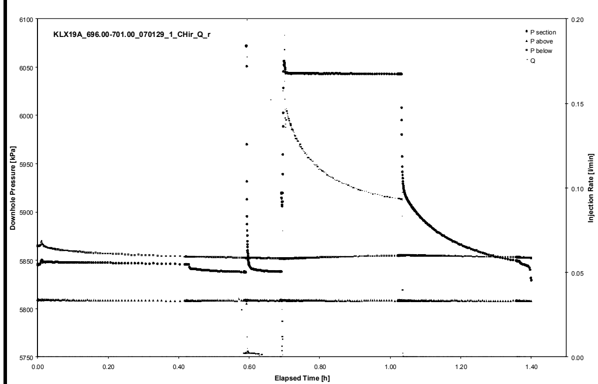
Comments:

The recommended transmissivity of 8.6E-09 m2/s was derived from the analysis of the CHir phase (inner zone), which shows horizontal stabilization. The confidence range for the interval transmissivity is estimated to be 7.0E-09 m2/s to 5.0E-8 m2/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 5,781.8 kPa.

Test Summary Sheet

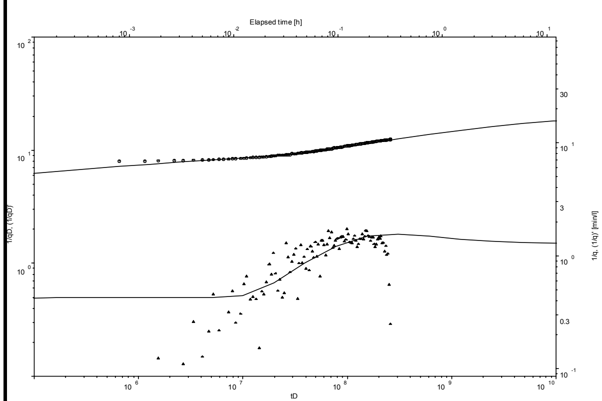
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 08:23
Test section from - to (m):	696.00-701.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

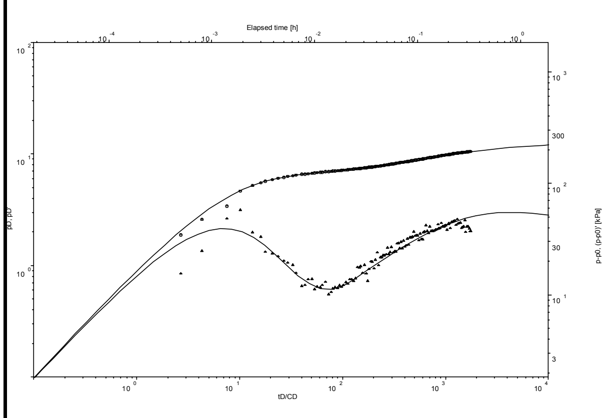


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5846		
p_i (kPa) =	5838		
p_p(kPa) =	6043	p_F (kPa) =	5852
Q_p (m^3/s)=	1.55E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.8		
Derivative fact.=	0.04	Derivative fact.=	0.03
Results		**Results**	
Q/s (m^2/s)=	7.4E-08		
T_M (m^2/s)=	6.1E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.52
dt_2 (min) =	NA	dt_2 (min) =	1.18
T (m^2/s) =	1.5E-07	T (m^2/s) =	1.5E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.0E-08	K_s (m/s) =	3.0E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.5E-11
C_D (-) =	NA	C_D (-) =	7.2E-03
ξ (-) =	3.9	ξ (-) =	2.5
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.52	C (m^3/Pa) =	6.5E-11
dt_2 (min) =	1.18	C_D (-) =	7.2E-03
T_T (m^2/s) =	1.5E-07	ξ (-) =	2.5
S (-) =	1.0E-06		
K_s (m/s) =	3.0E-08		
S_s (1/m) =	2.0E-07		

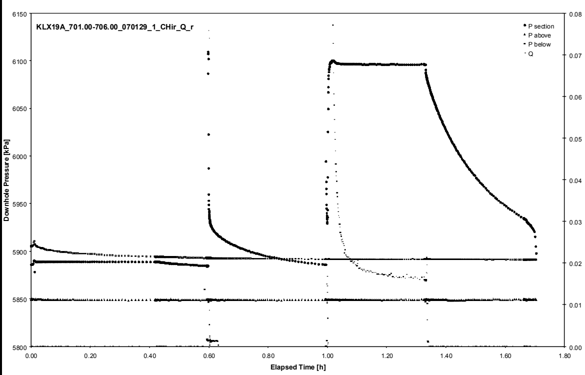
Comments:

The recommended transmissivity of 1.5E-07 m2/s was derived from the analysis of the CHir phase (inner zone), which shows a short sequence of horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be 8.0E-08 m2/s to 3.0E-07 m2/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 5,819.5 kPa.

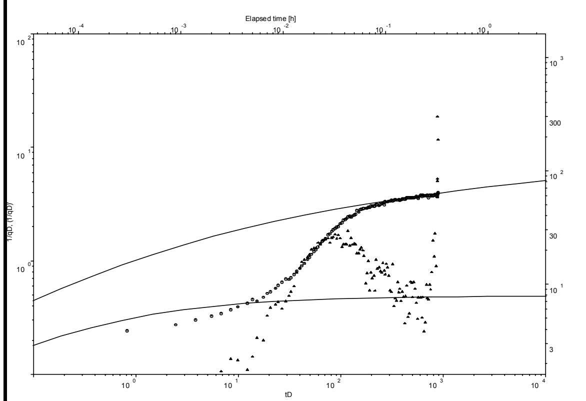
Test Summary Sheet

d	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 10:16
Test section from - to (m):	701.00-706.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

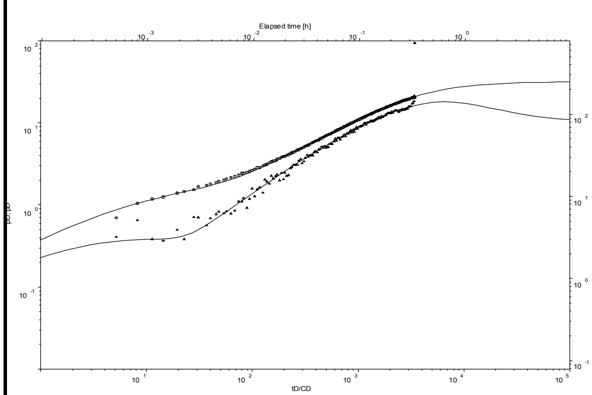
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	5885		
p_i (kPa) =	5886		
p_p(kPa) =	6095	p_F (kPa) =	5993
Q_p (m^3/s)=	2.67E-07		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	15.9		
Derivative fact.=	0.08	Derivative fact.=	0.01
Results		**Results**	
Q/s (m^2/s)=	1.3E-08		
T_M (m^2/s)=	1.0E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	6.47	dt_1 (min) =	NA
dt_2 (min) =	16.54	dt_2 (min) =	NA
T (m^2/s) =	7.8E-09	T (m^2/s) =	4.3E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.6E-09	K_s (m/s) =	8.6E-10
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.9E-11
C_D (-) =	NA	C_D (-) =	2.1E-03
ξ (-) =	-1.0	ξ (-) =	-2.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	6.474	C (m^3/Pa) =	1.9E-11
dt_2 (min) =	16.536	C_D (-) =	2.1E-03
T_T (m^2/s) =	7.8E-09	ξ (-) =	-1.0
S (-) =	1.0E-06		
K_s (m/s) =	1.6E-09		
S_s (1/m) =	2.0E-07		

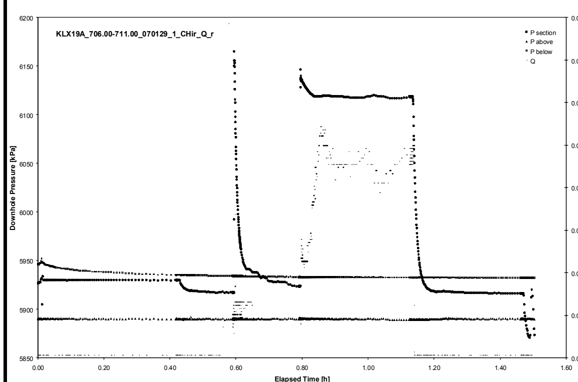
Comments:

The recommended transmissivity of 7.8E-09 m2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be 3.0E-09 m2/s to 3.0E-8 m2/s. The flow dimension displayed during the test is 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 5,845.9 kPa.

Test Summary Sheet

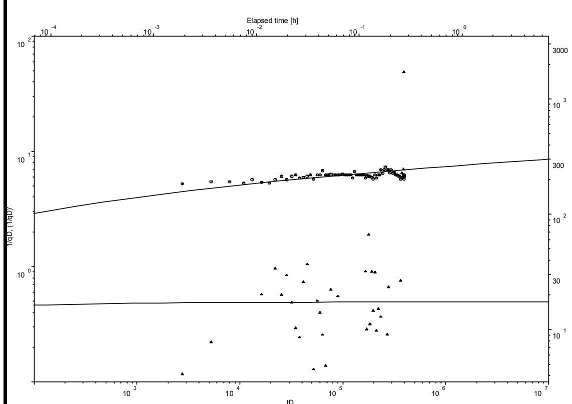
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 12:42
Test section from - to (m):	706.00-711.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

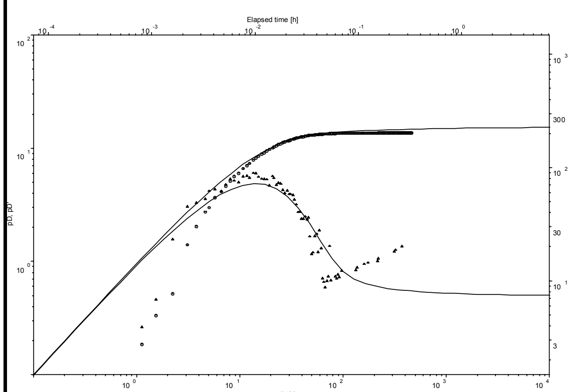


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	5927		
p_i (kPa) =	5923		
p_p(kPa) =	6118	p_F (kPa) =	5916
Q_p (m^3/s)=	8.33E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.0		
Derivative fact.=	0.15	Derivative fact.=	0.00
Results		**Results**	
Q/s (m^2/s)=	4.2E-09		
T_M (m^2/s)=	3.5E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.93	dt_1 (min) =	NA
dt_2 (min) =	12.45	dt_2 (min) =	NA
T (m^2/s) =	3.8E-09	T (m^2/s) =	7.2E-09
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	7.6E-10	K_s (m/s) =	1.4E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.2E-11
C_D (-) =	NA	C_D (-) =	1.3E-03
ξ (-) =	2.5	ξ (-) =	10.2
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.93	C (m^3/Pa) =	1.2E-11
dt_2 (min) =	12.45	C_D (-) =	1.3E-03
T_T (m^2/s) =	3.8E-09	ξ (-) =	2.5
S (-) =	1.0E-06		
K_s (m/s) =	7.6E-10		
S_s (1/m) =	2.0E-07		

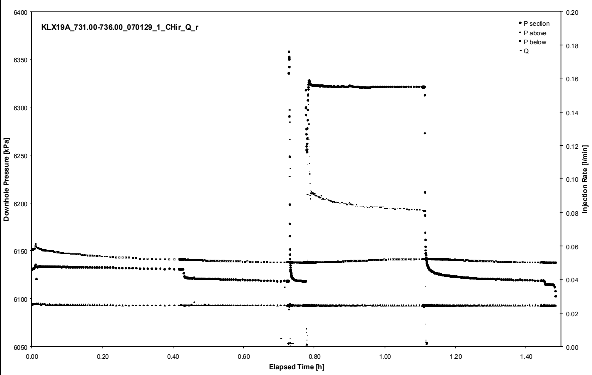
Comments:

The recommended transmissivity of 3.8E-09 m2/s was derived from the analysis of the CHi phase. The confidence range for the interval transmissivity is estimated to be 1.0E-09 m2/s to 8.0E-09 m2/s. A flow dimension of 2 was assumed. 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 5,914.6 kPa.

Test Summary Sheet

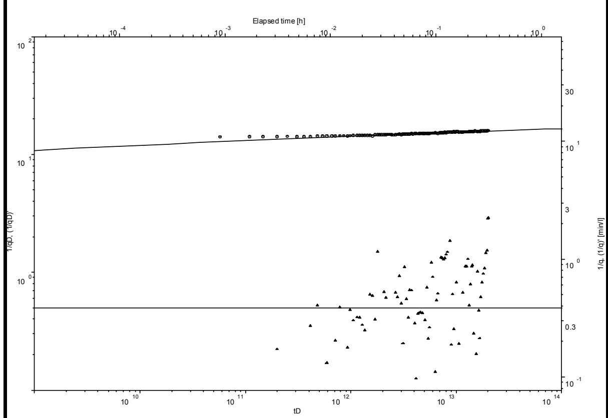
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 14:49
Test section from - to (m):	731.00-736.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6131		
p_i (kPa) =	6118		
p_p(kPa) =	6321	p_F (kPa) =	6118
Q_p (m^3/s)=	1.33E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.3		
Derivative fact.=	0.03	Derivative fact.=	0.01
Results		**Results**	
Q/s (m^2/s)=	6.4E-08		
T_M (m^2/s)=	5.3E-08		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	1.29	dt_1 (min) =	0.58
dt_2 (min) =	15.36	dt_2 (min) =	3.79
T (m^2/s) =	1.7E-07	T (m^2/s) =	1.4E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	3.4E-08	K_s (m/s) =	2.8E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.6E-11
C_D (-) =	NA	C_D (-) =	2.9E-03
ξ (-) =	9.4	ξ (-) =	7.9
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

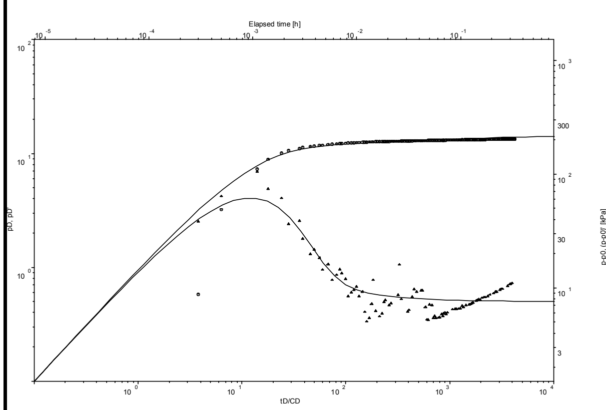
Log-Log plot incl. derivates- flow period



Selected representative parameters.

dt_1 (min) =	0.58	C (m^3/Pa) =	2.6E-11
dt_2 (min) =	3.79	C_D (-) =	2.9E-03
T_T (m^2/s) =	1.4E-07	ξ (-) =	7.9
S (-) =	1.0E-06		
K_s (m/s) =	2.8E-08		
S_s (1/m) =	2.0E-07		

Log-Log plot incl. derivatives- recovery period



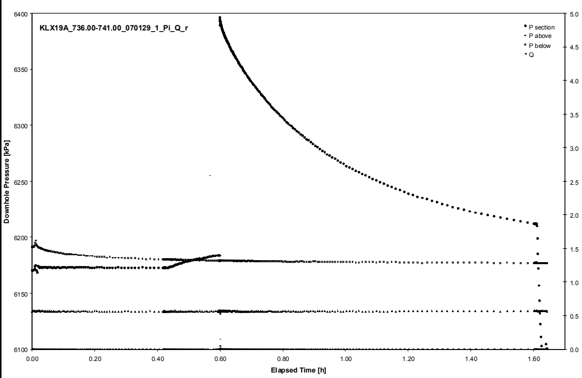
Comments:

The recommended transmissivity of 1.4E-07 m2/s was derived from the analysis of the CHir phase, which shows a clear horizontal stabilization. The confidence range for the interval transmissivity is estimated to be 7.0E-08 m2/s to 3.0E-07 m2/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 6,115.3 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 16:43
Test section from - to (m):	736.00-741.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

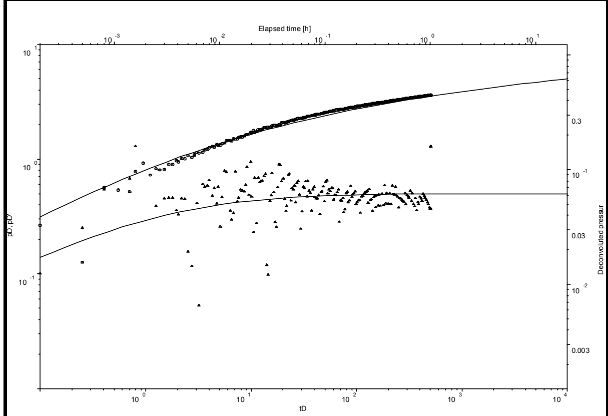
Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6171		
p_i (kPa) =	6183		
p_p(kPa) =	6396	p_F (kPa) =	6211
Q_p (m^3/s)=	NA		
tp (s) =	10.2	t_F (s) =	3600
S el S* (-)=	1.00E-06	S el S* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.3		
Derivative fact.=	NA	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	1.33
dt_2 (min) =	NA	dt_2 (min) =	37.77
T (m^2/s) =	NA	T (m^2/s) =	6.2E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	1.2E-11
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.8E-11
C_D (-) =	NA	C_D (-) =	2.0E-03
ξ (-) =	NA	ξ (-) =	0.6
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. derivates- flow period

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	1.33	C (m^3/Pa) =	1.8E-11
dt_2 (min) =	37.77	C_D (-) =	2.0E-03
T_T (m^2/s) =	6.2E-11	ξ (-) =	0.6
S (-) =	1.0E-06		
K_s (m/s) =	1.2E-11		
S_s (1/m) =	2.0E-07		

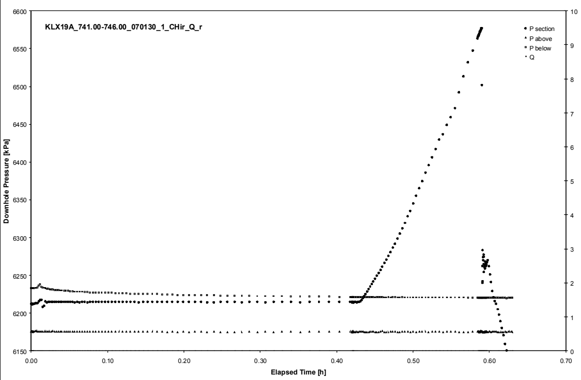
Comments:

The recommended transmissivity of 6.2E-11 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 3.0E-11 to 8.0E-11 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070129 18:54
Test section from - to (m):	741.00-746.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Log-Log plot incl. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Flow period		**Recovery period**	
Indata		**Indata**	
p_0 (kPa) =	6212		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.4		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.00E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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

Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

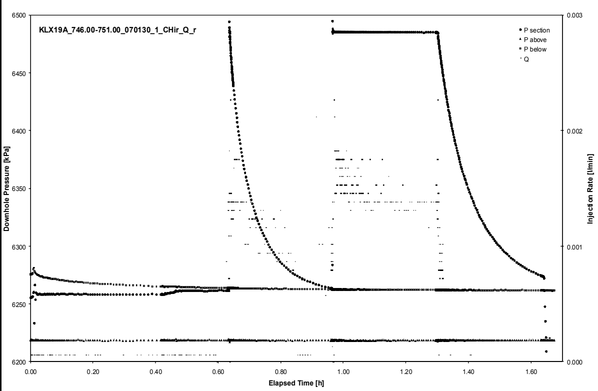
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

Test Summary Sheet

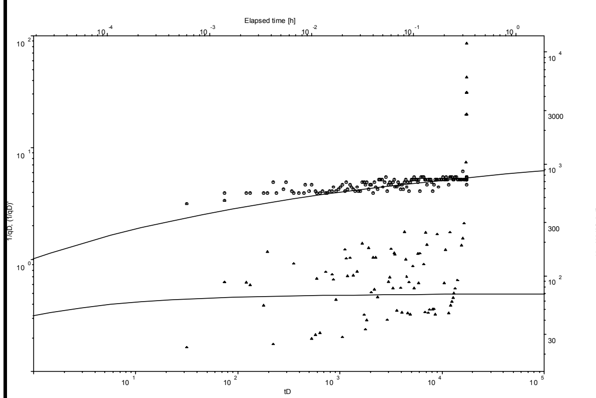
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070130 08:14
Test section from - to (m):	746.00-751.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

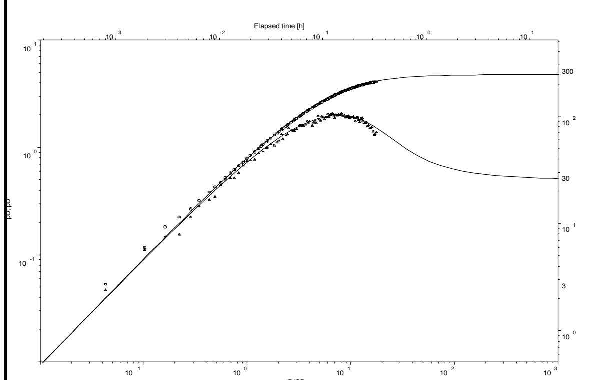


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6256		
p_i (kPa) =	6262		
p_p(kPa) =	6483	p_F (kPa) =	6273
Q_p (m^3/s)=	1.67E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.5		
Derivative fact.=	0.17	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	7.4E-10		
T_M (m^2/s)=	6.1E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	0.97	dt_1 (min) =	NA
dt_2 (min) =	14.54	dt_2 (min) =	NA
T (m^2/s) =	8.4E-10	T (m^2/s) =	7.1E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.7E-10	K_s (m/s) =	1.4E-10
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.1E-11
C_D (-) =	NA	C_D (-) =	3.4E-03
ξ (-) =	1.6	ξ (-) =	1.7
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	0.97	C (m^3/Pa) =	3.1E-11
dt_2 (min) =	14.54	C_D (-) =	3.4E-03
T_T (m^2/s) =	8.4E-10	ξ (-) =	1.6
S (-) =	1.0E-06		
K_s (m/s) =	1.7E-10		
S_s (1/m) =	2.0E-07		

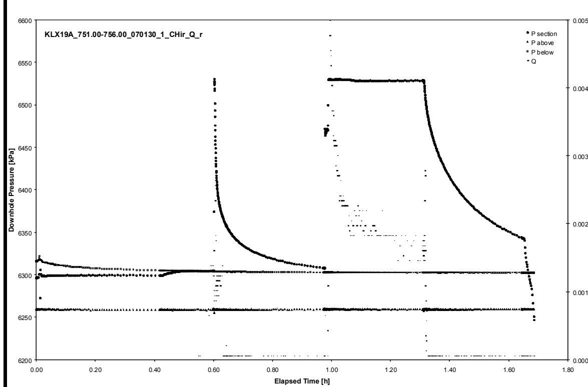
Comments:

The recommended transmissivity of 8.4E-10 m2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be 6.0E-10 m2/s to 3.0E-9 m2/s. The flow dimension displayed during the test is 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 6,239.3 kPa.

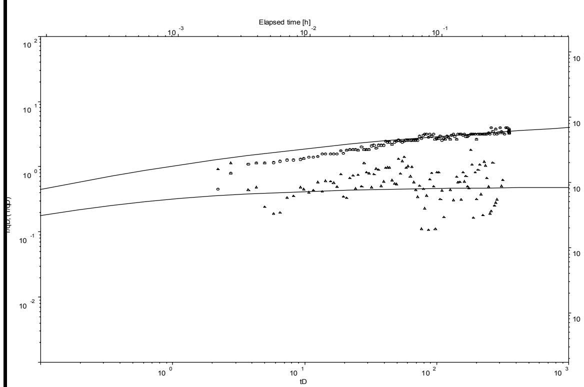
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070130 10:20
Test section from - to (m):	751.00-756.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

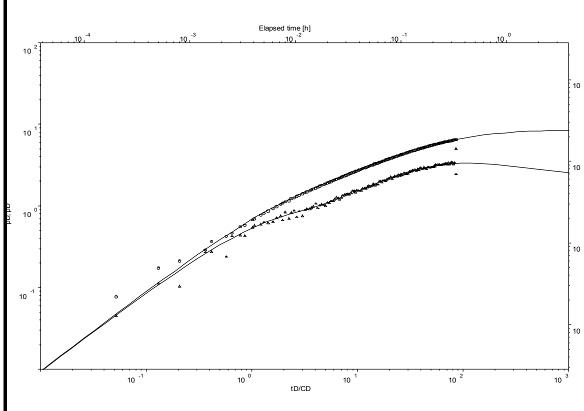
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6296		
p_i (kPa) =	6307		
p_p(kPa) =	6527	p_F (kPa) =	6340
Q_p (m^3/s)=	2.67E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.6		
Derivative fact.=	0.09	Derivative fact.=	0
Results		**Results**	
Q/s (m^2/s)=	1.2E-09		
T_M (m^2/s)=	9.8E-10		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	3.68	dt_1 (min) =	NA
dt_2 (min) =	17.07	dt_2 (min) =	NA
T (m^2/s) =	6.8E-10	T (m^2/s) =	4.5E-10
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	1.4E-10	K_s (m/s) =	9.0E-11
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	1.8E-11
C_D (-) =	NA	C_D (-) =	2.0E-03
ξ (-) =	0.2	ξ (-) =	4.8E-02
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	3.68	C (m^3/Pa) =	1.8E-11
dt_2 (min) =	17.07	C_D (-) =	2.0E-03
T_T (m^2/s) =	6.8E-10	ξ (-) =	0.2
S (-) =	1.0E-06		
K_s (m/s) =	1.4E-10		
S_s (1/m) =	2.0E-07		

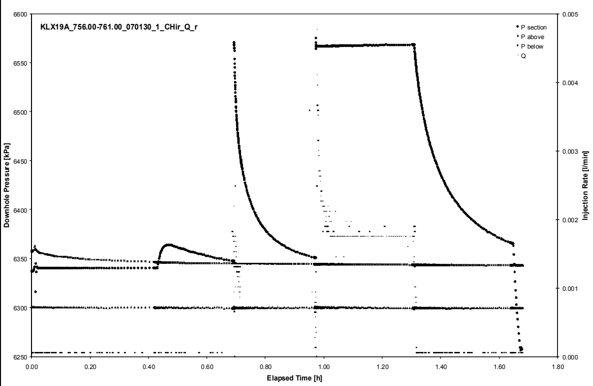
Comments:

The recommended transmissivity of 6.8E-10 m2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be 4.0E-11 m2/s to 2.0E-09 m2/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 6,278.0 kPa.

Test Summary Sheet

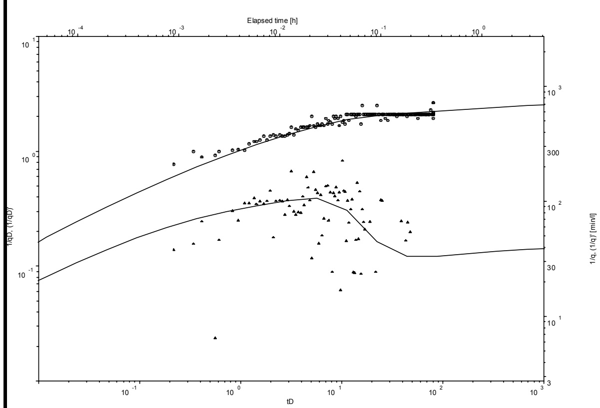
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070130 12:47
Test section from - to (m):	756.00-761.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

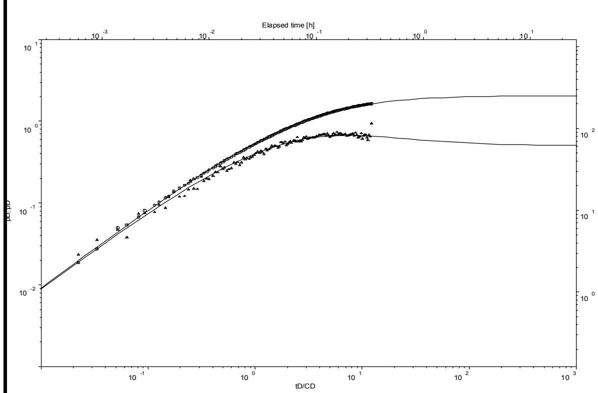


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6338		
p_i (kPa) =	6347		
p_p(kPa) =	6568	p_F (kPa) =	6365
Q_p (m^3/s)=	2.83E-08		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.6		
Derivative fact.=	0.2	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	1.3E-09		
T_M (m^2/s)=	1.0E-09		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	10.02
dt_2 (min) =	NA	dt_2 (min) =	14.04
T (m^2/s) =	1.4E-09	T (m^2/s) =	3.8E-08
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	2.9E-10	K_s (m/s) =	1.9E-09
S_s (1/m) =	2.0E-07	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.4E-11
C_D (-) =	NA	C_D (-) =	2.6E-03
ξ (-) =	-0.7	ξ (-) =	-1.1
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	10.02	C (m^3/Pa) =	2.4E-11
dt_2 (min) =	14.04	C_D (-) =	2.6E-03
T_T (m^2/s) =	3.8E-08	ξ (-) =	-1.1
S (-) =	1.0E-06		
K_s (m/s) =	1.9E-09		
S_s (1/m) =	5.0E-08		

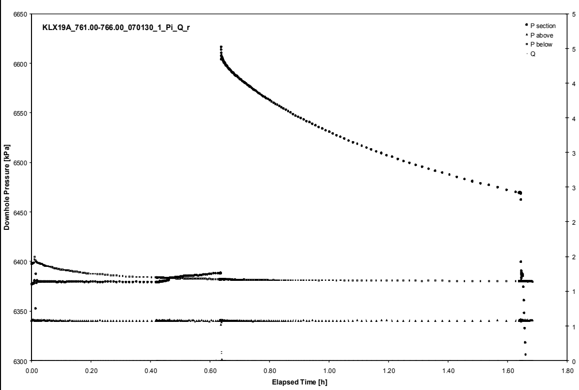
Comments:

The recommended transmissivity of 3.8E-10 m2/s was derived from the analysis of the CHir phase, which shows a horizontal stabilization and a good data quality. The confidence range for the interval transmissivity is estimated to be 1.0E-10 m2/s to 8.0E-10 m2/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 6,310.8 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Pi
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070130 14:54
Test section from - to (m):	761.00-766.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

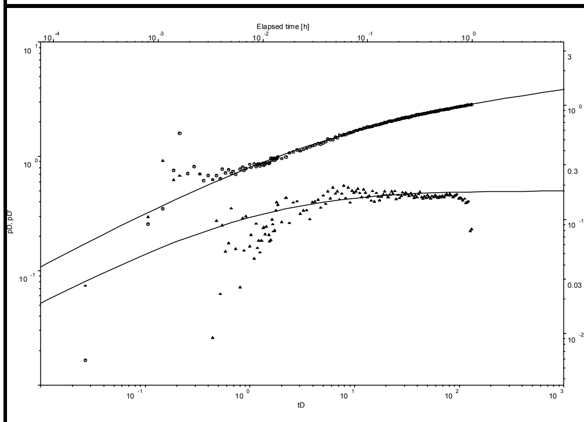
Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6377		
p_i (kPa) =	6388		
p_p(kPa) =	6616	p_F (kPa) =	6468
Q_p (m^3/s)=	NA		
tp (s) =	10.2	t_F (s) =	3600
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.7		
Derivative fact.=	NA	Derivative fact.=	0.10
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	2.50
dt_2 (min) =	NA	dt_2 (min) =	36.29
T (m^2/s) =	NA	T (m^2/s) =	2.5E-11
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	5.0E-12
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	2.1E-11
C_D (-) =	NA	C_D (-) =	2.3E-03
ξ (-) =	NA	ξ (-) =	0.4
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. derivates- flow period

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	2.50	C (m^3/Pa) =	2.1E-11
dt_2 (min) =	36.29	C_D (-) =	2.3E-03
T_T (m^2/s) =	2.5E-11	ξ (-) =	0.4
S (-) =	1.0E-06		
K_s (m/s) =	5.0E-12		
S_s (1/m) =	2.0E-07		

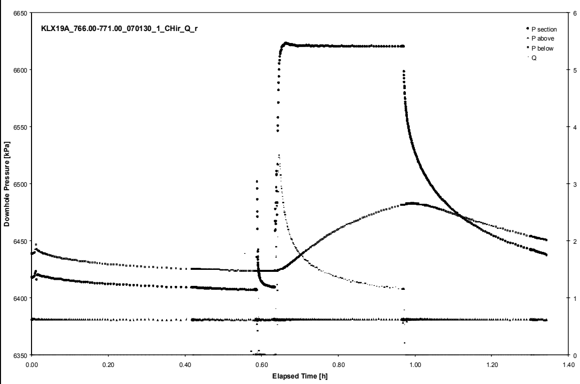
Comments:

The recommended transmissivity of 2.5E-11 m2/s was derived from the analysis of the Pi phase. The confidence range for the interval transmissivity is estimated to be 8.0E-12 to 6.0E-11 m2/s. The flow dimension displayed during the test is 2. The static pressure could not be extrapolated due to the low transmissivity.

Test Summary Sheet

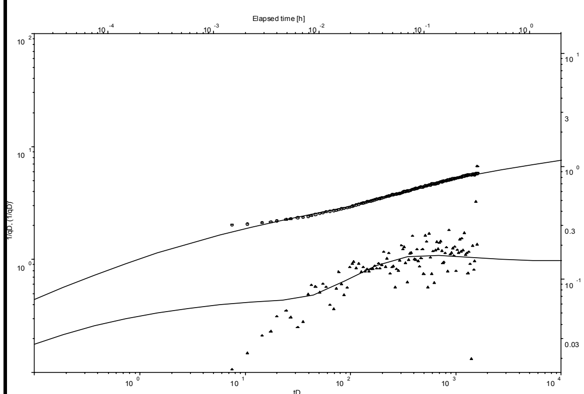
Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070130 17:00
Test section from - to (m):	766.00-771.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

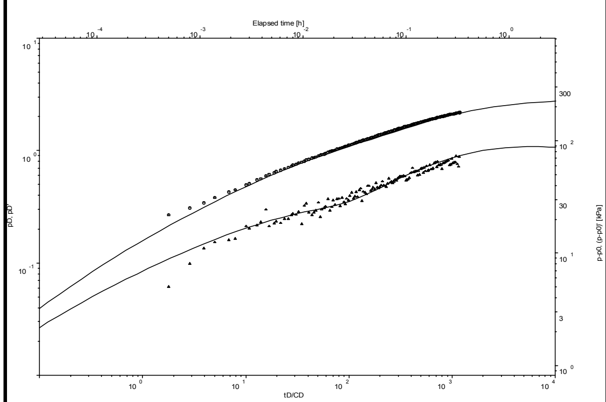


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6417		
p_i (kPa) =	6409		
p_p(kPa) =	6620	p_F (kPa) =	6441
Q_p (m^3/s)=	1.91E-05		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.8		
Derivative fact.=	0.02	Derivative fact.=	0.02
Results		**Results**	
Q/s (m^2/s)=	8.9E-07		
T_M (m^2/s)=	7.3E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.44
dt_2 (min) =	NA	dt_2 (min) =	1.84
T (m^2/s) =	4.1E-07	T (m^2/s) =	4.7E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	8.3E-08	K_s (m/s) =	9.5E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	3.1E-10
C_D (-) =	NA	C_D (-) =	3.4E-02
ξ (-) =	-3.0	ξ (-) =	-4.7
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. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	NA	C (m^3/Pa) =	3.1E-10
dt_2 (min) =	NA	C_D (-) =	3.4E-02
T_T (m^2/s) =	4.1E-07	ξ (-) =	-3.0
S (-) =	1.0E-06		
K_s (m/s) =	8.3E-08		
S_s (1/m) =	2.0E-07		

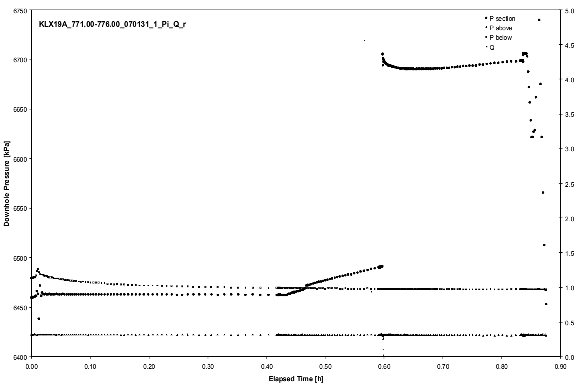
Comments:

The recommended transmissivity of 4.1E-07 m2/s was derived from the analysis of the CHi phase (outer zone). The confidence range for the interval transmissivity is estimated to be 8.0E-08 m2/s to 5.0E-07 m2/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 6,397.2 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	PI
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070131 08:08
Test section from - to (m):	771.00-776.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6460		
p_i (kPa) =	NA		
p_p(kPa) =	NA	p_F (kPa) =	NA
Q_p (m^3/s)=	NA		
tp (s) =	0	t_F (s) =	0
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.8		
Derivative fact.=	NA	Derivative fact.=	NA
Results		**Results**	
Q/s (m^2/s)=	NA		
T_M (m^2/s)=	NA		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	NA
dt_2 (min) =	NA	dt_2 (min) =	NA
T (m^2/s) =	1.0E-11	T (m^2/s) =	NA
S (-) =	NA	S (-) =	NA
K_s (m/s) =	NA	K_s (m/s) =	NA
S_s (1/m) =	NA	S_s (1/m) =	NA
C (m^3/Pa) =	NA	C (m^3/Pa) =	NA
C_D (-) =	NA	C_D (-) =	NA
ξ (-) =	NA	ξ (-) =	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. derivates- flow period

Not Analysed

Log-Log plot incl. derivatives- recovery period

Not Analysed

Selected representative parameters.

dt_1 (min) =	NA	C (m^3/Pa) =	NA
dt_2 (min) =	NA	C_D (-) =	NA
T_T (m^2/s) =	1.0E-11	ξ (-) =	NA
S (-) =	NA		
K_s (m/s) =	NA		
S_s (1/m) =	NA		

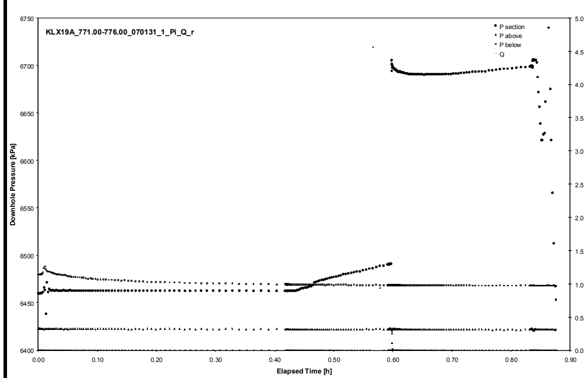
Comments:

Based on the test response (prolonged packer compliance) the interval transmissivity is lower than 1.0E-11 m2/s.

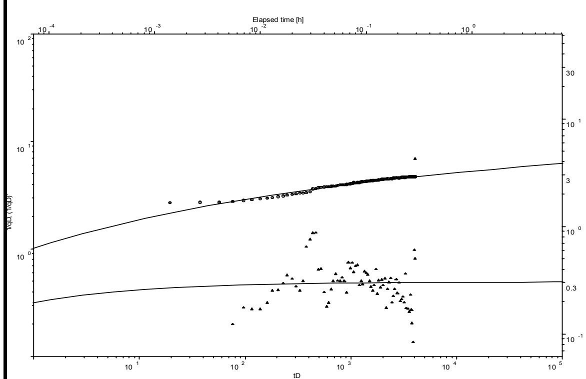
Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CHir
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	070131 09:28
Test section from - to (m):	776.00-781.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

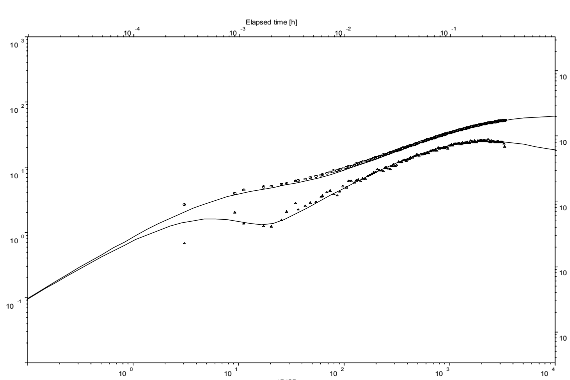
Linear plot Q and p



Log-Log plot incl. derivates- flow period



Log-Log plot incl. derivatives- recovery period



Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6500		
p_i (kPa) =	6492		
p_p(kPa) =	6691	p_F (kPa) =	6508
Q_p (m^3/s)=	5.67E-06		
tp (s) =	1200	t_F (s) =	1200
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.9		
Derivative fact.=	0.05	Derivative fact.=	0.04
Results		**Results**	
Q/s (m^2/s)=	2.8E-07		
T_M (m^2/s)=	2.3E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	2.13	dt_1 (min) =	NA
dt_2 (min) =	13.00	dt_2 (min) =	NA
T (m^2/s) =	2.1E-07	T (m^2/s) =	1.2E-07
S (-) =	1.0E-06	S (-) =	1.0E-06
K_s (m/s) =	4.2E-08	K_s (m/s) =	2.4E-08
S_s (1/m) =	2.0E-07	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.8E-10
C_D (-) =	NA	C_D (-) =	7.5E-02
ξ (-) =	-1.8	ξ (-) =	0.0
T_{GRF}(m^2/s) =	NA	T_{GRF}(m^2/s) =	NA
S_{GRF}(-) =	NA	S_{GRF}(-) =	NA
D_{GRF} (-) =	NA	D_{GRF} (-) =	NA

Selected representative parameters.			
dt_1 (min) =	2.13	C (m^3/Pa) =	6.8E-10
dt_2 (min) =	13.00	C_D (-) =	7.5E-02
T_T (m^2/s) =	2.1E-07	ξ (-) =	-1.8
S (-) =	1.0E-06		
K_s (m/s) =	4.2E-08		
S_s (1/m) =	2.0E-07		

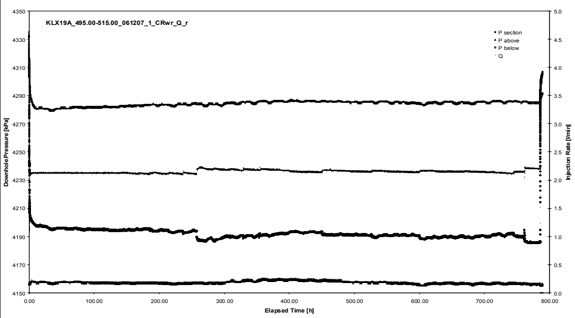
Comments:

The recommended transmissivity of 2.1E-07 m2/s was derived from the analysis of the CHi phase, which shows horizontal stabilization although being noisy. The confidence range for the interval transmissivity is estimated to be 9.0E-08 m2/s to 4.0E-7 m2/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 6,468.9 kPa.

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	Crwr
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	061207 15:07
Test section from - to (m):	495.00-515.00 m	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

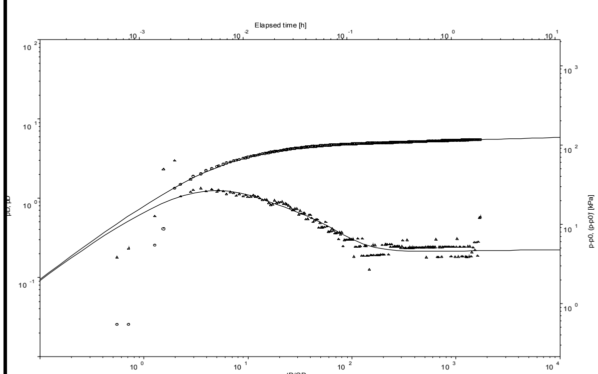


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	4316		
p_i (kPa) =	4311		
p_p(kPa) =	4186	p_F (kPa) =	4306
Q_p (m^3/s)=	3.50E-05		
tp (s) =	2827044	t_F (s) =	12780
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	13.3		
Derivative fact.=	NA	Derivative fact.=	0.08
Results		**Results**	
Q/s (m^2/s)=	2.7E-06		
T_M (m^2/s)=	2.9E-06		
Flow regime:	NA	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	11.44
dt_2 (min) =	NA	dt_2 (min) =	95.51
T (m^2/s) =	NA	T (m^2/s) =	5.8E-06
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	2.9E-07
S_s (1/m) =	NA	S_s (1/m) =	5.0E-08
C (m^3/Pa) =	NA	C (m^3/Pa) =	6.8E-09
C_D (-) =	NA	C_D (-) =	7.4E-01
ξ (-) =	NA	ξ (-) =	-2.15
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.

dt_1 (min) =	11.44	C (m^3/Pa) =	6.8E-09
dt_2 (min) =	95.51	C_D (-) =	7.4E-01
T_T (m^2/s) =	5.8E-06	ξ (-) =	-2.15
S (-) =	1.0E-06		
K_s (m/s) =	2.9E-07		
S_s (1/m) =	5.0E-08		

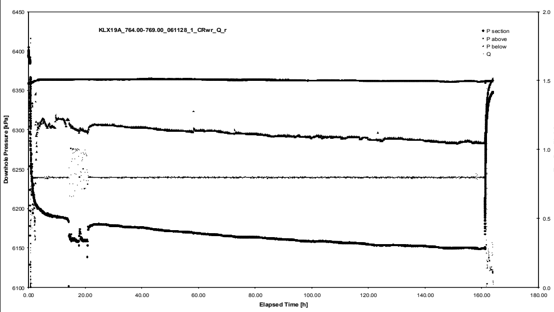
Comments:

The recommended transmissivity of 5.8•10-6 m2/s was derived from the analysis of the CRwr phase. Due to the hydraulic communication to the bottom zone, the derived value should be regarded as at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be 1.0•10-6 to 6.0•10-6 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CRwr phase using type curve extrapolation in the Horner plot to a value of 4,331.2 kPa. Due to the short duration of the recovery compared to the pumping time, this value is slightly uncertain

Test Summary Sheet

Project:	Oskarshamn site investigation	Test type:[1]	CRwr
Area:	Laxemar	Test no:	1
Borehole ID:	KLX19A	Test start:	061128 19:53
Test section from - to (m):	764.00-769.00	Responsible for test execution:	Stephan Rohs Philipp Wolf
Section diameter, $2 \cdot r_w$ (m):	0.076	Responsible for test evaluation:	Cristian Enachescu

Linear plot Q and p

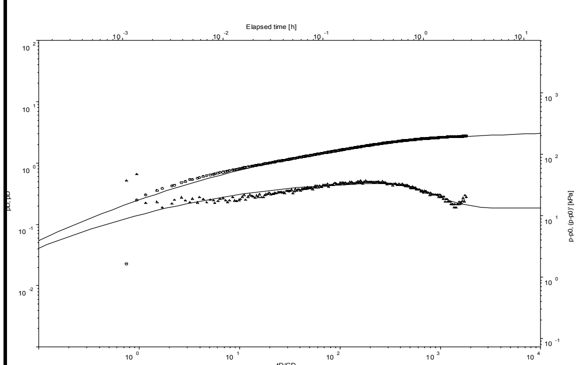


Flow period		Recovery period	
Indata		**Indata**	
p_0 (kPa) =	6404		
p_i (kPa) =	6391		
p_p(kPa) =	6150	p_F (kPa) =	6347
Q_p (m^3/s)=	1.33E-05		
tp (s) =	578490	t_F (s) =	9588
S el S^* (-)=	1.00E-06	S el S^* (-)=	1.00E-06
EC_w (mS/m)=			
$Temp_w$(gr C)=	16.8		
Derivative fact.=	NA	Derivative fact.=	0.06
Results		**Results**	
Q/s (m^2/s)=	5.4E-07		
T_M (m^2/s)=	4.5E-07		
Flow regime:	transient	Flow regime:	transient
dt_1 (min) =	NA	dt_1 (min) =	0.60
dt_2 (min) =	NA	dt_2 (min) =	23.34
T (m^2/s) =	NA	T (m^2/s) =	2.9E-07
S (-) =	NA	S (-) =	1.0E-06
K_s (m/s) =	NA	K_s (m/s) =	5.7E-08
S_s (1/m) =	NA	S_s (1/m) =	2.0E-07
C (m^3/Pa) =	NA	C (m^3/Pa) =	9.7E-10
C_D (-) =	NA	C_D (-) =	1.1E-01
ξ (-) =	NA	ξ (-) =	-4.6
T_{GRF}(m^2/s) =		T_{GRF}(m^2/s) =	
S_{GRF}(-) =		S_{GRF}(-) =	
D_{GRF} (-) =		D_{GRF} (-) =	

Log-Log plot incl. derivates- flow period

Not analysed

Log-Log plot incl. derivatives- recovery period



Selected representative parameters.			
dt_1 (min) =	0.60	C (m^3/Pa) =	9.7E-10
dt_2 (min) =	23.34	C_D (-) =	1.1E-01
T_T (m^2/s) =	2.9E-07	ξ (-) =	-4.6
S (-) =	1.0E-06		
K_s (m/s) =	5.7E-08		
S_s (1/m) =	2.0E-07		

Comments:

The recommended transmissivity of 2.9E-7 m2/s was derived from the analysis of the CRwr phase. Due to the hydraulic communication to the bottom zone, the derived value should be regarded as at the upper limit of the confidence range. The confidence range for the interval transmissivity is estimated to be 5.0E-8 to 3.0E-7 m2/s. The flow dimension displayed during the test is 2. The static pressure measured at transducer depth, was derived from the CRwr phase using type curve extrapolation in the Horner plot to a value of 6,404.6 kPa. Due to the short duration of the recovery compared to the pumping time, this value is slightly uncertain.

APPENDIX 4

Nomenclature

Character	SICADA designation	Explanation	Dimension	Unit
Variables, constants				
A_w		Horizontal area of water surface in open borehole, not including area of signal cables, etc.	$[L^2]$	m^2
b		Aquifer thickness (Thickness of 2D formation)	[L]	m
B		Width of channel	[L]	m
L		Corrected borehole length	[L]	m
L_0		Uncorrected borehole length	[L]	m
L_p		Point of application for a measuring section based on its centre point or centre of gravity for distribution of transmissivity in the measuring section.	[L]	m
L_w		Test section length.	[L]	m
dL		Step length, Positive Flow Log - overlapping flow logging. (step length, PFL)	[L]	m
r		Radius	[L]	m
r_w		Borehole, well or soil pipe radius in test section.	[L]	m
r_{we}		Effective borehole, well or soil pipe radius in test section. (Consideration taken to skin factor)	[L]	m
r_s		Distance from test section to observation section, the shortest distance.	[L]	m
r_t		Distance from test section to observation section, the **interpreted** shortest distance via conductive structures.	[L]	m
r_D		Dimensionless radius, $r_D=r/r_w$	-	-
z		Level above reference point	[L]	m
z_r		Level for reference point on borehole	[L]	m
z_{wu}		Level for test section (section that is being flowed), upper limitation	[L]	m
z_{wl}		Level for test section (section that is being flowed), lower limitation	[L]	m
z_{ws}		Level for sensor that measures response in test section (section that is flowed)	[L]	m
z_{ou}		Level for observation section, upper limitation	[L]	m
z_{ol}		Level for observation section, lower limitation	[L]	m
z_{os}		Level for sensor that measures response in observation section	[L]	m
E		Evaporation: hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
ET		Evapotranspiration hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
P		Precipitation hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
R		Groundwater recharge hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
D		Groundwater discharge hydrological budget:	$[L^3/(T\ L^2)]$ $[L^3/T]$	mm/y, mm/d, m^3/s
Q_R		Run-off rate	$[L^3/T]$	m^3/s
Q_p		Pumping rate	$[L^3/T]$	m^3/s
Q_I		Infiltration rate	$[L^3/T]$	m^3/s
Q		Volumetric flow. Corrected flow in flow logging ($Q_1 – Q_0$) (Flow rate)	$[L^3/T]$	m^3/s
Q_0		Flow in test section during undisturbed conditions (flow logging).	$[L^3/T]$	m^3/s
Q_p		Flow in test section immediately before stop of flow. Stabilised pump flow in flow logging.	$[L^3/T]$	m^3/s

Character	SICADA designation	Explanation	Dimension	Unit
Q_m		Arithmetical mean flow during perturbation phase.	$[L^3/T]$	m^3/s
Q_1		Flow in test section during pumping with pump flow Q_{p1}, (flow logging).	$[L^3/T]$	m^3/s
Q_2		Flow in test section during pumping with pump flow Q_{p1}, (flow logging).	$[L^3/T]$	m^3/s
ΣQ	SumQ	Cumulative volumetric flow along borehole	$[L^3/T]$	m^3/s
ΣQ_0	SumQ0	Cumulative volumetric flow along borehole, undisturbed conditions (ie, not pumped)	$[L^3/T]$	m^3/s
ΣQ_1	SumQ1	Cumulative volumetric flow along borehole, with pump flow Q_{p1}	$[L^3/T]$	m^3/s
ΣQ_2	SumQ2	Cumulative volumetric flow along borehole, with pump flow Q_{p2}	$[L^3/T]$	m^3/s
ΣQ_{C1}	SumQC1	Corrected cumulative volumetric flow along borehole, ΣQ_1-ΣQ_0	$[L^3/T]$	m^3/s
ΣQ_{C2}	SumQC2	Corrected cumulative volumetric flow along borehole, ΣQ_2-ΣQ_0	$[L^3/T]$	m^3/s
q		Volumetric flow per flow passage area (Specific discharge (Darcy velocity, Darcy flux, Filtration velocity)).	$([L^3/T*L^2]$	m/s
V		Volume	$[L^3]$	m^3
V_w		Water volume in test section.	$[L^3]$	m^3
V_p		Total water volume injected/pumped during perturbation phase.	$[L^3]$	m^3
v		Velocity	$([L^3/T*L^2]$	m/s
v_a		Mean transport velocity (Average linear velocity (Average linear groundwater velocity, Mean microscopic velocity));. $v_a=q/n_e$	$([L^3/T*L^2]$	m/s
t		Time	[T]	hour,min,s
t_0		Duration of rest phase before perturbation phase.	[T]	s
t_p		Duration of perturbation phase. (from flow start as far as p_p).	[T]	s
t_F		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,min,s
dt		Running time from start of flow phase and recovery phase respectively.	[T]	s
dt_e		$dt_e = (dt \cdot tp) / (dt + tp)$ Agarwal equivalent time with dt as running time for recovery phase.	[T]	s
t_D		$t_D = T \cdot t / (S \cdot r_w^2)$. Dimensionless time	-	-
p		Static pressure; including non-dynamic pressure which depends on water velocity. Dynamic pressure is normally ignored in estimating the potential in groundwater flow relations.	$[M/(LT)^2]$	kPa
p_a		Atmospheric pressure	$[M/(LT)^2]$	kPa
p_t		Absolute pressure; $p_t=p_a+p_g$	$[M/(LT)^2]$	kPa
p_g		Gauge pressure; Difference between absolute pressure and atmospheric pressure.	$[M/(LT)^2]$	kPa
p_0		Initial pressure before test begins, prior to packer expansion.	$[M/(LT)^2]$	kPa
p_i		Pressure in measuring section before start of flow.	$[M/(LT)^2]$	kPa
p_f		Pressure during perturbation phase.	$[M/(LT)^2]$	kPa
p_s		Pressure during recovery.	$[M/(LT)^2]$	kPa
p_p		Pressure in measuring section before flow stop.	$[M/(LT)^2]$	kPa
p_F		Pressure in measuring section at end of recovery.	$[M/(LT)^2]$	kPa
p_D		$p_D=2\pi \cdot T \cdot p/(Q \cdot \rho_w g)$, Dimensionless pressure	-	-
dp		Pressure difference, drawdown of pressure surface between two points of time.	$[M/(LT)^2]$	kPa

Character	SICADA designation	Explanation	Dimension	Unit
dp_f		$dp_f = p_i - p_f$ or $= p_f – p_i$, drawdown/pressure increase of pressure surface between two points of time during perturbation phase. dp_f usually expressed positive.	$[M/(LT)^2]$	kPa
dp_s		$dp_s = p_s – p_p$ or $= p_p – p_s$, pressure increase/drawdown of pressure surface between two points of time during recovery phase. dp_s usually expressed positive.	$[M/(LT)^2]$	kPa
dp_p		$dp_p = p_i – p_p$ or $= p_p – p_i$, **maximal** pressure increase/drawdown of pressure surface between two points of time during perturbation phase. dp_p expressed positive.	$[M/(LT)^2]$	kPa
dp_F		$dp_F = p_p – p_F$ or $= p_F – p_p$, **maximal** pressure increase/drawdown of pressure surface between two points of time during recovery phase. dp_F expressed positive.	$[M/(LT)^2]$	kPa
H		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_e		Height of measuring point (Elevation head); Level above reference level for measuring point.	[L]	m
h_p		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_v		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_p, positive)	[L]	m
s_p		Drawdown in measuring section before flow stop.	[L]	m
			[L]	
h_0		Initial above reference level before test begins, prior to packer expansion.	[L]	m
h_i		Level above reference level in measuring section before start of flow.	[L]	m
h_f		Level above reference level during perturbation phase.	[L]	m
h_s		Level above reference level during recovery phase.	[L]	m
h_p		Level above reference level in measuring section before flow stop.	[L]	m
h_F		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_f		$dh_f = h_i - h_f$ 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_s		$dh_s = h_s – h_p$ 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_p		$dh_p = h_i – h_p$ 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_F		$dh_F = h_p – h_F$ 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_w		Temperature in the test section (taken from temperature logging). Temperature		^oC
Te_{w0}		Temperature in the test section during undisturbed conditions (taken from temperature logging).		^oC

Character	SICADA designation	Explanation	Dimension	Unit
Te_o		Temperature in the observation section (taken from temperature logging). Temperature		°C
EC_w		Electrical conductivity of water in test section.		mS/m
EC_{w0}		Electrical conductivity of water in test section during undisturbed conditions.		mS/m
EC_o		Electrical conductivity of water in observation section		mS/m
TDS_w		Total salinity of water in the test section.	$[M/L^3]$	mg/L
TDS_{w0}		Total salinity of water in the test section during undisturbed conditions.	$[M/L^3]$	mg/L
TDS_o		Total salinity of water in the observation section.	$[M/L^3]$	mg/L
g		Constant of gravitation (9.81 $m*s^{-2}$) (Acceleration due to gravity)	$[L/T^2]$	m/s^2
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_{MAX}-x_{MIN}), x: measured variable considered.		
MAE		Mean absolute error. $MAE = \frac{1}{n}\sum_{i=1}^{n} \lvert r_i \rvert$		
NMAE		Normalized MAE. NMAE=MAE/(x_{MAX}-x_{MIN}), 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_{MAX}-x_{MIN}), 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. $SEMR = \left(\frac{1}{n(n-1)}\sum_{i=1}^{n} (r_i - ME)^2\right)^{0.5}$		
Parameters				
Q/s		Specific capacity $s=dp_p$ or $s=s_p=h_0-h_p$ (open borehole)	$[L^2/T]$	m^2/s
D		Interpreted flow dimension according to Barker, 1988.	[-]	-
dt_1		Time of starting for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	s
dt_2		End of time for semi-log or log-log evaluated characteristic counted from start of flow phase and recovery phase respectively.	[T]	s
dt_L		Response time to obtain 0.1 m (or 1 kPa) drawdown in observation section counted from start of recovery phase.	[T]	s
TB		Flow capacity in a one-dimensional structure of width B and transmissivity T. Transient evaluation of one-dimensional structure	$[L^3/T]$	m^3/s
T		Transmissivity	$[L^2/T]$	m^2/s
T_M		Transmissivity according to Moye (1967)	$[L^2/T]$	m^2/s
T_Q		Evaluation based on Q/s and regression curve between Q/s and T, as example see Rhén et al (1997) p. 190.	$[L^2/T]$	m^2/s
T_S		Transmissivity evaluated from slug test	$[L^2/T]$	m^2/s

Character	SICADA designation	Explanation	Dimension	Unit
T_D		Transmissivity evaluated from PFL-Difference Flow Meter	$[L^2/T]$	m^2/s
T_I		Transmissivity evaluated from Impeller flow log	$[L^2/T]$	m^2/s
T_{Sf}, T_{Lf}		Transient evaluation based on semi-log or log-log diagram for perturbation phase in injection or pumping.	$[L^2/T]$	m^2/s
T_{Ss}, T_{Ls}		Transient evaluation based on semi-log or log-log diagram for recovery phase in injection or pumping.	$[L^2/T]$	m^2/s
T_T		Transient evaluation (log-log or lin-log). Judged best evaluation of T_{Sf}, T_{Lf}, T_{Ss}, T_{Ls}	$[L^2/T]$	m^2/s
T_{NLR}		Evaluation based on non-linear regression.	$[L^2/T]$	m^2/s
T_{Tot}		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).	$[L^2/T]$	m^2/s
K		Hydraulic conductivity	[L/T]	m/s
K_s		Hydraulic conductivity based on spherical flow model	[L/T]	m/s
K_m		Hydraulic conductivity matrix, intact rock	[L/T]	m/s
k		Intrinsic permeability	$[L^2]$	m^2
kb		Permeability-thickness product: kb=k·b	$[L^3]$	m^3
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*		Assumed storage coefficient	[-]	-
S_y		Theoretical specific yield of water (Specific yield; unconfined storage. Defined as total porosity (n) minus retention capacity (S_r)	[-]	-
S_{ya}		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)	[-]	-
S_r		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_f		Fracture storage coefficient	[-]	-
S_m		Matrix storage coefficient	[-]	-
S_{NLR}		Storage coefficient, evaluation based on non-linear regression	[-]	-
S_{Tot}		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).	[-]	-
S_s		Specific storage coefficient; confined storage.	[1/L]	1/m
S_s*		Assumed specific storage coefficient; confined storage.	[1/L]	1/m
c_f		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_f=b´/K´ where b´ is thickness of the aquitard and K´ its hydraulic conductivity across the aquitard.	[T]	s
L_f		Leakage factor: $L_f = (K \cdot b \cdot c_f)^{0.5}$ where K represents characteristics of the aquifer.	[L]	m
ξ	Skin	Skin factor	[-]	-

Character	SICADA designation	Explanation	Dimension	Unit
ξ*	Skin	Assumed skin factor	[-]	-
C		Wellbore storage coefficient	$[(LT^2)\cdot M^2]$	m^3/Pa
C_D		$C_D = C\cdot\rho_w g / (2\pi\cdot S\cdot r_w^2)$, 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_{GRF}		Transmissivity interpreted using the GRF method	$[L^2/T]$	m^2/s
S_{GRF}		Storage coefficient interpreted using the GRF method	[1/L]	1/m
D_{GRF}		Flow dimension interpreted using the GRF method	[-]	-
c_w		Water compressibility; corresponding to β in hydrogeological literature.	$[(LT^2)/M]$	1/Pa
c_r		Pore-volume compressibility, (rock compressibility); Corresponding to α/n in hydrogeological literature.	$[(LT^2)/M]$	1/Pa
c_t		$c_t = c_r + c_w$, 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)	$[(LT^2)/M]$	1/Pa
nc_t		Porosity-compressibility factor: $nc_t = n\cdot c_t$	$[(LT^2)/M]$	1/Pa
nc_tb		Porosity-compressibility-thickness product: $nc_tb = n\cdot c_t.b$	$[(L^2T^2)/M]$	m/Pa
n		Total porosity	-	-
n_e		Kinematic porosity, (Effective porosity)	-	-
e		Transport aperture. $e = n_e\cdot b$	[L]	m
ρ	Density	Density	$[M/L^3]$	$kg/(m^3)$
ρ_w	Density-w	Fluid density in measurement section during pumping/injection	$[M/L^3]$	$kg/(m^3)$
ρ_o	Density-o	Fluid density in observation section	$[M/L^3]$	$kg/(m^3)$
ρ_{sp}	Density-sp	Fluid density in standpipes from measurement section	$[M/L^3]$	$kg/(m^3)$
μ	my	Dynamic viscosity	[M/LT]	Pa s
μ_w	my	Dynamic viscosity (Fluid density in measurement section during pumping/injection)	[M/LT]	Pa s
FC_T		Fluid coefficient for intrinsic permeability, transference of k to K; $K=FC_T\cdot k$; $FC_T=\rho_w\cdot g/\mu_w$	[1/LT]	1/(ms)
FC_S		Fluid coefficient for porosity-compressibility, transference of c_t to S_s; $S_s=FC_S\cdot n\cdot c_t$; $FC_S=\rho_w\cdot g$	$[M/T^2L^2]$	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 sequence, perturbation and recovery		
M		Moye		
GRF		Generalised Radial Flow according to Barker (1988)		
m		Matrix		
f		Fracture		
T		Judged best evaluation based on transient evaluation.		

Character	SICADA designation	Explanation	Dimension	Unit
Tot		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				
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 perturbation period		
F		Pressure in measuring section at end of recovery period.		
m		Arithmetical mean value		
c		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 miscellaneous indexes 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”)		
o		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_{opf}; the first index shows “where” and the second index shows “what” and the last one “recalculation”)		

APPENDIX 5

SICADA data tables

APPENDIX 5-1

SICADA data tables (Injection tests)

(Simplified version v1.4)

SICADA/Data Import Template

File Identity	
Created By	
Created	

Compiled By	
Quality Check For Delivery	
Delivery Approval	

Activity Type	KLX 19A KLX 19A - Injection test

Project	AP PS 400-06-144

Activity Information						**Additional Activity Data**				
						C10	P20	P200	P220	R25
Idcode	**Start Date**	**Stop Date**	**Secup (m)**	**Seclow (m)**	**Section No**	**Company**	**Field crew manager**	**Field crew**	**evaluating data**	**Report**
KLX 19A	2007-01-11 08:17	2007-01-31 11:02	111.00	781.00		Golder Associates	Philipp Wolf	Philipp Wolf, Thomas Cronquist, Mesgena Gebrezghi, Daniel Nordbörg	Reinder van der Wall, Philipp Wolf, Stephan Rohs	Stephan Rohs

Table	plu_s_hole_test_d
	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
mean_flow_rate_qm	FLOAT	m**3/s	Arithmetic mean flow rate during flow period
q_measl__l	FLOAT	m**3/s	Estimated lower measurement limit of flow rate
q_measl__u	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_h	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_p	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

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	start_flow_period	stop_flow_period	flow_rate_end_qp	value_type_qp	mean_flow_rate_qm	q_measl__l	q_measl__u	tot_volume_vp
KLX 19A	070111 08:17	070111 10:39	111.00	211.00		3	1	2007-01-11 09:37:07	2007-01-11 10:07:17	7.77E-04	0	7.85E-04	1.67E-08	8.33E-04	1.41E+00
KLX 19A	070112 09:13	070112 14:01	211.00	311.00		3	1	2007-01-12 13:00:58	2007-01-12 13:31:08	4.50E-04	0	4.76E-04	1.67E-08	8.33E-04	8.57E-01
KLX 19A	070112 14:03	070112 15:20	211.00	311.00		3	1	2007-01-12 14:17:58	2007-01-12 14:48:08	6.43E-04	0	6.62E-04	1.67E-08	8.33E-04	1.19E+00
KLX 19A	070112 16:54	070112 18:28	311.00	411.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070113 09:30	070113 11:44	411.00	511.00		3	1	2007-01-13 10:42:20	2007-01-13 11:12:30	2.68E-05	0	2.92E-05	1.67E-08	8.33E-04	5.25E-02
KLX 19A	070113 11:46	070113 12:57	411.00	511.00		3	1	2007-01-13 11:55:31	2007-01-13 12:25:41	5.00E-05	0	5.53E-05	1.67E-08	8.33E-04	9.95E-02
KLX 19A	070113 14:17	070113 16:33	511.00	611.00		3	1	2007-01-13 15:31:38	2007-01-13 16:01:48	5.85E-05	0	6.20E-05	1.67E-08	8.33E-04	1.12E-01
KLX 19A	070113 16:35	070113 17:43	511.00	611.00		3	1	2007-01-13 16:41:16	2007-01-13 17:11:26	1.01E-04	0	1.07E-04	1.67E-08	8.33E-04	1.92E-01
KLX 19A	070114 08:48	070114 11:01	611.00	711.00		3	1	2007-01-14 09:43:57	2007-01-14 10:04:07	7.67E-06	0	9.00E-06	1.67E-08	8.33E-04	1.62E-02
KLX 19A	070114 11:03	070114 12:42	611.00	711.00		3	1	2007-01-14 11:39:50	2007-01-14 12:10:00	1.55E-05	0	2.00E-05	1.67E-08	8.33E-04	3.60E-02
KLX 19A	070115 15:33	070115 17:24	694.00	794.00		3	1	2007-01-15 16:22:43	2007-01-15 16:52:53	1.93E-05	0	2.63E-05	1.67E-08	8.33E-04	4.74E-02
KLX 19A	070115 17:27	070115 21:48	694.00	794.00		3	1	2007-01-15 18:16:32	2007-01-15 18:36:42	3.80E-05	0	4.95E-05	1.67E-08	8.33E-04	8.91E-02
KLX 19A	070117 11:33	070117 13:30	111.00	131.00		3	1	2007-01-17 12:48:39	2007-01-17 13:08:49	7.50E-04	0	7.64E-04	1.67E-08	8.33E-04	9.17E-01
KLX 19A	070117 14:04	070117 15:56	131.00	151.00		3	1	2007-01-17 15:14:15	2007-01-17 15:34:25	1.33E-07	0	2.33E-07	1.67E-08	8.33E-04	2.80E-04
KLX 19A	070117 16:30	070117 17:52	151.00	171.00		3	1	2007-01-17 17:10:22	2007-01-17 17:30:32	3.17E-05	0	3.28E-05	1.67E-08	8.33E-04	3.94E-02
KLX 19A	070118 08:17	070118 10:20	191.00	211.00		3	1	2007-01-18 09:38:42	2007-01-18 09:58:52	2.00E-08	0	3.17E-08	1.67E-08	8.33E-04	3.80E-05
KLX 19A	070118 10:53	070118 12:18	211.00	231.00		3	1	2007-01-18 11:36:06	2007-01-18 11:56:16	1.33E-06	0	1.57E-06	1.67E-08	8.33E-04	1.88E-03
KLX 19A	070118 13:06	070118 14:00	231.00	251.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070118 16:24	070118 17:13	271.00	291.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070118 17:44	070118 19:04	291.00	311.00		3	1	2007-01-18 18:22:36	2007-01-18 18:42:46	4.60E-04	0	4.98E-04	1.67E-08	8.33E-04	5.98E-01
KLX 19A	070119 09:23	070119 10:47	411.00	431.00		3	1	2007-01-19 10:05:49	2007-01-19 10:25:59	2.33E-07	0	2.83E-07	1.67E-08	8.33E-04	3.40E-04
KLX 19A	070119 11:20	070119 12:40	431.00	451.00		3	1	2007-01-19 11:58:48	2007-01-19 12:18:58	5.50E-06	0	5.82E-06	1.67E-08	8.33E-04	6.98E-03
KLX 19A	070119 13:38	070119 14:58	451.00	471.00		3	1	2007-01-19 14:15:59	2007-01-19 14:36:09	2.50E-05	0	2.73E-05	1.67E-08	8.33E-04	3.28E-02
KLX 19A	070119 15:30	070119 16:52	471.00	491.00		3	1	2007-01-19 16:10:32	2007-01-19 16:30:42	4.67E-06	0	4.83E-06	1.67E-08	8.33E-04	5.80E-03
KLX 19A	070119 17:26	070119 18:46	491.00	511.00		3	1	2007-01-19 18:03:58	2007-01-19 18:24:08	3.17E-06	0	3.33E-06	1.67E-08	8.33E-04	4.00E-03
KLX 19A	070120 08:21	070120 09:42	511.00	531.00		3	1	2007-01-20 09:00:32	2007-01-20 09:20:42	6.13E-05	0	6.47E-05	1.67E-08	8.33E-04	7.76E-02
KLX 19A	070120 10:18	070120 11:14	530.00	550.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070120 11:45	070120 13:02	550.00	570.00		3	1	2007-01-20 12:20:58	2007-01-20 12:41:08	5.00E-08	0	5.00E-08	1.67E-08	8.33E-04	6.00E-05
KLX 19A	070120 16:19	070120 17:09	591.00	611.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070120 17:41	070120 18:38	611.00	631.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070121 08:29	070121 10:11	631.00	651.00		3	1	2007-01-21 09:30:55	2007-01-21 09:51:05	4.67E-08	0	5.33E-08	1.67E-08	8.33E-04	6.40E-05
KLX 19A	070121 13:18	070121 14:22	651.00	671.00		3	1	2007-01-21 13:40:08	2007-01-21 14:00:18	1.00E-06	0	1.70E-06	1.67E-08	8.33E-04	2.04E-03
KLX 19A	070121 14:52	070121 16:23	671.00	691.00		3	1	2007-01-21 15:41:11	2007-01-21 16:01:21	6.30E-06	0	6.95E-06	1.67E-08	8.33E-04	8.34E-03
KLX 19A	070121 16:56	070121 19:26	691.00	711.00		3	1	2007-01-21 18:04:32	2007-01-21 18:24:42	2.17E-06	0	2.67E-06	1.67E-08	8.33E-04	3.20E-03
KLX 19A	070122 08:46	070122 09:58	711.00	731.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070122 10:50	070122 12:17	731.00	751.00		3	1	2007-01-22 11:35:24	2007-01-22 11:55:34	1.33E-06	0	1.38E-06	1.67E-08	8.33E-04	1.66E-03
KLX 19A	070122 13:36	070122 15:00	751.00	771.00		3	1	2007-01-22 14:18:48	2007-01-22 14:38:58	1.83E-05	0	2.35E-05	1.67E-08	8.33E-04	2.82E-02
KLX 19A	070122 15:43	070122 17:52	771.00	791.00		3	1	2007-01-22 17:10:43	2007-01-22 17:30:53	5.83E-06	0	6.57E-06	1.67E-08	8.33E-04	7.88E-03
KLX 19A	070124 09:08	070124 10:32	104.00	109.00		3	1	2007-01-24 09:50:16	2007-01-24 10:10:26	6.52E-04	0	6.69E-04	1.67E-08	8.33E-04	8.03E-01
KLX 19A	070124 10:57	070124 13:05	109.00	114.00		3	1	2007-01-24 12:23:09	2007-01-24 12:43:19	6.98E-04	0	7.04E-04	1.67E-08	8.33E-04	8.45E-01
KLX 19A	070124 17:05	070124 18:29	411.00	416.00		3	1	2007-01-24 17:47:20	2007-01-24 18:07:30	2.83E-07	0	3.17E-07	1.67E-08	8.33E-04	3.80E-04
KLX 19A	070125 10:04	070125 10:52	421.00	426.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070125 13:20	070125 14:43	431.00	436.00		3	1	2007-01-25 14:01:19	2007-01-25 14:21:29	1.67E-08	0	1.83E-08	1.67E-08	8.33E-04	2.20E-05
KLX 19A	070125 16:48	070125 18:12	441.00	446.00		3	1	2007-01-25 17:30:09	2007-01-25 17:50:19	4.00E-07	0	4.17E-07	1.67E-08	8.33E-04	5.00E-04
KLX 19A	070125 18:36	070125 19:58	446.00	451.00		3	1	2007-01-25 19:16:11	2007-01-25 19:36:21	5.17E-06	0	5.50E-06	1.67E-08	8.33E-04	6.60E-03
KLX 19A	070126 09:34	070126 11:08	551.00	556.00		3	1	2007-01-26 10:26:12	2007-01-26 10:46:22	4.17E-08	0	4.50E-08	1.67E-08	8.33E-04	5.40E-05
KLX 19A	070126 13:58	070126 14:36	561.00	566.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070127 11:03	070127 12:37	646.00	651.00		3	1	2007-01-27 11:55:34	2007-01-27 12:15:44	7.67E-08	0	8.83E-08	1.67E-08	8.33E-04	1.0600E-04
KLX 19A	070127 13:03	070127 13:58	651.00	656.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070127 14:22	070127 16:11	656.00	661.00		3	1	2007-01-27 15:29:14	2007-01-27 15:49:24	8.33E-08	0	1.67E-07	1.67E-08	8.33E-04	2.00E-04
KLX 19A	070128 08:17	070128 09:42	666.00	671.00		3	1	2007-01-28 09:00:01	2007-01-28 09:20:11	1.00E-06	0	1.55E-06	1.67E-08	8.33E-04	1.86E-03
KLX 19A	070128 12:22	070128 13:51	676.00	681.00		3	1	2007-01-28 13:09:17	2007-01-28 13:29:27	4.33E-08	0	4.33E-08	1.67E-08	8.33E-04	5.20E-05
KLX 19A	070128 14:19	070128 15:44	681.00	686.00		3	1	2007-01-28 15:02:47	2007-01-28 15:22:57	6.95E-06	0	7.57E-06	1.67E-08	8.33E-04	9.08E-03
KLX 19A	070128 17:33	070128 18:59	691.00	696.00		3	1	2007-01-28 18:17:17	2007-01-28 18:37:27	6.17E-07	0	6.83E-07	1.67E-08	8.33E-04	8.20E-04
KLX 19A	070129 08:23	070129 09:47	696.00	701.00		3	1	2007-01-29 09:04:59	2007-01-29 09:25:09	1.55E-06	0	1.78E-06	1.67E-08	8.33E-04	2.14E-03
KLX 19A	070129 10:16	070129 11:59	701.00	706.00		3	1	2007-01-29 11:17:00	2007-01-29 11:37:10	2.67E-07	0	4.17E-07	1.67E-08	8.33E-04	5.00E-04
KLX 19A	070129 12:42	070129 14:12	706.00	711.00		3	1	2007-01-29 13:30:18	2007-01-29 13:50:28	8.33E-08	0	6.83E-08	1.67E-08	8.33E-04	8.20E-05
KLX 19A	070129 14:49	070129 16:18	731.00	736.00		3	1	2007-01-29 15:36:25	2007-01-29 15:56:35	1.33E-06	0	1.40E-06	1.67E-08	8.33E-04	1.68E-03
KLX 19A	070129 18:54	070129 19:33	741.00	746.00		3	1	#N/A	#N/A	#N/A	-1	#N/A	1.67E-08	8.33E-04	#N/A
KLX 19A	070130 08:14	070130 09:54	746.00	751.00		3	1	2007-01-30 09:12:35	2007-01-30 09:32:45	1.67E-08	0	2.33E-08	1.67E-08	8.33E-04	2.80E-05
KLX 19A	070130 10:20	070130 12:02	751.00	756.00		3	1	2007-01-30 11:20:05	2007-01-30 11:40:15	2.67E-08	0	3.67E-08	1.67E-08	8.33E-04	4.40E-05
KLX 19A	070130 12:47	070130 14:29	756.00	761.00		3	1	2007-01-30 13:47:06	2007-01-30 14:07:16	2.83E-08	0	3.00E-08	1.67E-08	8.33E-04	3.60E-05
KLX 19A	070130 17:00	070130 18:21	766.00	771.00		3	1	2007-01-30 17:39:27	2007-01-30 17:59:37	1.91E-05	0	2.48E-05	1.67E-08	8.33E-04	2.97E-02
KLX 19A	070131 09:28	070131 11:02	776.00	781.00		3	1	2007-01-31 10:20:20	2007-01-31 10:40:30	5.67E-06	0	6.45E-06	1.67E-08	8.33E-04	7.74E-03

idcode	secup	seclow	dur_flow_phase_tp	dur_rec_phase_tf	initial_head_hi	head_at_flow_end_hp	final_head_hf	initial_press_pi	press_at_flow_end_pp	final_press_pf	fluid_temp_tew	fluid_elcond_ecw	fluid_salinity_tdsw	fluid_salinity_tdswm	reference	comments	lp
KLX 19A	111.00	211.00	1800	1800			13.39	1804	2004	1806	9.5						161.00
KLX 19A	211.00	311.00	1800	1800			13.61	2630	2834	2637	10.8						261.00
KLX 19A	211.00	311.00	1800	1800			13.82	2636	2989	2643	10.8						261.00
KLX 19A	311.00	411.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	12.0						361.00
KLX 19A	411.00	511.00	1800	1800			13.97	4275	4479	4281	13.2						461.00
KLX 19A	411.00	511.00	1800	1800			14.04	4280	4723	4288	13.2						461.00
KLX 19A	511.00	611.00	1800	1800			15.39	5102	5304	5110	14.6						561.00
KLX 19A	511.00	611.00	1800	1800			15.66	5110	5561	5118	14.6						561.00
KLX 19A	611.00	711.00	1800	2700			13.47	5911	6112	5938	16.0						661.00
KLX 19A	611.00	711.00	1800	1800			12.15	5915	6365	5986	16.0						661.00
KLX 19A	694.00	794.00	1800	1800			13.45	6578	6783	6619	17.0						744.00
KLX 19A	694.00	794.00	1800	1800			13.63	6594	7047	6598	17.0						744.00
KLX 19A	111.00	131.00	1200	1200			13.39	1143	1348	1146	8.5						121.00
KLX 19A	131.00	151.00	1200	1200			12.00	1317	1517	1381	8.8						141.00
KLX 19A	151.00	171.00	1200	1200			13.45	1479	1679	1481	9.0						161.00
KLX 19A	191.00	211.00	1200	1200			11.88	1819	2024	1861	9.5						201.00
KLX 19A	211.00	231.00	1200	1200			15.88	1973	2172	2002	9.7						221.00
KLX 19A	231.00	251.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	9.9						241.00
KLX 19A	271.00	291.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	10.4						281.00
KLX 19A	291.00	311.00	1200	1200			13.40	2629	2834	2636	10.7						301.00
KLX 19A	411.00	431.00	1200	1200			14.39	3622	3822	3639	12.2						421.00
KLX 19A	431.00	451.00	1200	1200			13.84	3783	3983	3783	12.5						441.00
KLX 19A	451.00	471.00	1200	1200			13.66	3950	4151	3954	12.8						461.00
KLX 19A	471.00	491.00	1200	1200			14.34	4114	4314	4114	13.0						481.00
KLX 19A	491.00	511.00	1200	1200			14.28	4277	4477	4278	13.3						501.00
KLX 19A	511.00	531.00	1200	1200			14.56	4444	4644	4449	13.5						521.00
KLX 19A	530.00	550.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	13.8						540.00
KLX 19A	550.00	570.00	1200	1200			9.68	4730	4981	4733	14.0						560.00
KLX 19A	591.00	611.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	14.6						601.00
KLX 19A	611.00	631.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	14.9						621.00
KLX 19A	631.00	651.00	1200	1200			11.83	5441	5646	5459	15.2						641.00
KLX 19A	651.00	671.00	1200	1200			17.15	5588	5788	5673	15.4						661.00
KLX 19A	671.00	691.00	1200	1200			13.85	5743	5955	5761	15.7						681.00
KLX 19A	691.00	711.00	1200	3600			13.81	5920	6121	5915	16.0						701.00
KLX 19A	711.00	731.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	16.2						721.00
KLX 19A	731.00	751.00	1200	1200			14.11	6235	6435	6238	16.5						741.00
KLX 19A	751.00	771.00	1200	1200			14.06	6405	6608	6434	16.7						761.00
KLX 19A	771.00	791.00	1200	1200			12.59	6571	6776	6588	17.0						781.00
KLX 19A	104.00	109.00	1200	1200			13.57	964	1164	965	8.8						106.50
KLX 19A	109.00	114.00	1200	1200			13.62	1006	1204	1007	8.8						111.50
KLX 19A	411.00	416.00	1200	1200			14.38	3500	3700	3513	12.0						413.50
KLX 19A	421.00	426.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	12.2						423.50
KLX 19A	431.00	436.00	1200	1200			11.90	3722	3902	3793	12.3						433.50
KLX 19A	441.00	446.00	1200	1200			14.31	3749	3955	3749	12.5						443.50
KLX 19A	446.00	451.00	1200	1200			14.25	3789	3989	3789	12.5						448.50
KLX 19A	551.00	556.00	1200	1200			10.59	4613	4898	4612	13.9						553.50
KLX 19A	561.00	566.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	14.0						563.50
KLX 19A	646.00	651.00	1200	1200			10.97	5418	5656	5443	15.2						648.50
KLX 19A	651.00	656.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	15.2						653.50
KLX 19A	656.00	661.00	1200	1200			26.59	5536	5770	5686	15.3						658.50
KLX 19A	666.00	671.00	1200	1200			17.61	5595	5793	5671	15.4						668.50
KLX 19A	676.00	681.00	1200	1200			12.93	5664	5879	5661	15.6						678.50
KLX 19A	681.00	686.00	1200	1200			13.31	5706	5938	5724	15.6						683.50
KLX 19A	691.00	696.00	1200	1200			13.61	5792	6006	5792	15.8						693.50
KLX 19A	696.00	701.00	1200	1200			13.30	5838	6043	5852	15.8						698.50
KLX 19A	701.00	706.00	1200	1200			11.83	5886	6095	5993	15.9						703.50
KLX 19A	706.00	711.00	1200	1200			14.66	5923	6118	5916	16.0						708.50
KLX 19A	731.00	736.00	1200	1200			14.34	6118	6321	6118	16.3						733.50
KLX 19A	741.00	746.00	#N/A	#N/A			#N/A	#N/A	#N/A	#N/A	16.4						743.50
KLX 19A	746.00	751.00	1200	1200			14.51	6262	6483	6273	16.5						748.50
KLX 19A	751.00	756.00	1200	1200			14.30	6307	6527	6340	16.6						753.50
KLX 19A	756.00	761.00	1200	1200			13.50	6347	6568	6365	16.6						758.50
KLX 19A	766.00	771.00	1200	1200			14.00	6409	6620	6441	16.8						768.50
KLX 19A	776.00	781.00	1200	1200			13.02	6492	6691	6508	16.9						778.50

Table	plu_s_hole_test_ed1
	PLU Single hole tests, pumping/injection. Basic evaluation

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		Formation type code. 1: Rock, 2: Soil (superficial deposits)
lp	FLOAT	m	Hydraulic point of application for test section, see descr.
seclen_class	FLOAT	m	Planned ordinary test interval during test campaign.
spec_capacity_c	FLOAT	m**2/s	Specific capacity (Q/s) of test section, see table descript.
value_type_q_s	CHAR		0:true value,-1:Q/s<lower meas.limit,1:Q/s>upper meas.limit
transmissivity_tc	FLOAT	m**2/s	Tranmissivity based on Q/s, see table description
value_type_tq	CHAR		0:true value,-1:TQ<lower meas.limit,1:TQ>upper meas.limit.
bc_tq	CHAR		Best choice code. 1 means TQ is best choice of T, else 0
transmissivity_m	FLOAT	m**2/s	Transmissivity,TM, based on Moye (1967)
bc_tm	CHAR		Best choice code. 1 means Tmoye is best choice of T, else 0
value_type_tm	CHAR		0:true value,-1:TM<lower meas.limit,1:TM>upper meas.limit.
hydr_cond_moy	FLOAT	m/s	K_M: Hydraulic conductivity based on Moye (1967)
formation_width	FLOAT	m	b:Aquifer thickness repr. for T(generally b=Lw) ,see descr.
width_of_chann	FLOAT	m	B:Inferred width of formation for evaluated TB
tb	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 for evaluated TB,see description
u_measl_tb	FLOAT	m**3/s	Estimated upper meas. limit of evaluated TB,see description
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_	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...
value_type_tt	CHAR		0:true value,-1:TT<lower meas.limit,1:TT>upper meas.limit,
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 lower meas. limit for evaluated TT,see table descr
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		Best choice of S (Storativity) ,see descr.
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 leakage coeff,see desc
hydr_cond_ksf	FLOAT	m/s	Ksf:3D model evaluation of hydraulic conductivity,see desc.
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 descr
spec_storage_s	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 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 stop time of evaluation. see table description
t1	FLOAT	s	Start time for evaluated parameter from start flow period
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	Stop time for evaluated parameter from start of recovery
p_horner	FLOAT	kPa	p*:Horner extrapolated pressure, see table description
transmissivity_t_	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_nl	CHAR		0:true value,-1:T_NLR<lower meas.limit,1:>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_	FLOAT	m**2/s	T_GRF:Transmissivity based on Genelized Radial Flow,see...
value_type_t_gr	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
storativity_s_grf	FLOAT		S_GRF:Storativity based on Generalized Radial Flow, 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
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)

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	lp	seclen_class	spec_capacity_q_s	value_type_q_s	transmissivity_tq	value_type_tq	bc_tq	transmissivity_moye
KLX 19A	070111 08:17	070111 10:39	111.00	211.00		3	1	161.00	100	3.81E-05	0				4.96E-05
KLX 19A	070112 09:13	070112 14:01	211.00	311.00		3	1	261.00	100	2.16E-05	0				2.82E-05
KLX 19A	070112 14:03	070112 15:20	211.00	311.00		3	1	261.00	100	1.79E-05	0				2.33E-05
KLX 19A	070112 16:54	070112 18:28	311.00	411.00		3	1	361.00	100	#N/A	-1				#N/A
KLX 19A	070113 09:30	070113 11:44	411.00	511.00		3	1	461.00	100	1.29E-06	0				1.68E-06
KLX 19A	070113 11:46	070113 12:57	411.00	511.00		3	1	461.00	100	1.11E-06	0				1.44E-06
KLX 19A	070113 14:17	070113 16:33	511.00	611.00		3	1	561.00	100	2.84E-06	0				3.70E-06
KLX 19A	070113 16:35	070113 17:43	511.00	611.00		3	1	561.00	100	2.20E-06	0				2.86E-06
KLX 19A	070114 08:48	070114 11:01	611.00	711.00		3	1	661.00	100	3.74E-07	0				4.87E-07
KLX 19A	070114 11:03	070114 12:42	611.00	711.00		3	1	661.00	100	3.38E-07	0				4.40E-07
KLX 19A	070115 15:33	070115 17:24	694.00	794.00		3	1	744.00	100	9.25E-07	0				1.20E-06
KLX 19A	070115 17:27	070115 21:48	694.00	794.00		3	1	744.00	100	8.23E-07	0				1.07E-06
KLX 19A	070117 11:33	070117 13:30	111.00	131.00		3	1	121.00	20	3.59E-05	0				3.75E-05
KLX 19A	070117 14:04	070117 15:56	131.00	151.00		3	1	141.00	20	6.54E-09	0				6.84E-09
KLX 19A	070117 16:30	070117 17:52	151.00	171.00		3	1	161.00	20	1.55E-06	0				1.62E-06
KLX 19A	070118 08:17	070118 10:20	191.00	211.00		3	1	201.00	20	9.57E-10	0				1.00E-09
KLX 19A	070118 10:53	070118 12:18	211.00	231.00		3	1	221.00	20	6.57E-08	0				6.88E-08
KLX 19A	070118 13:06	070118 14:00	231.00	251.00		3	1	241.00	20	#N/A	-1				#N/A
KLX 19A	070118 16:24	070118 17:13	271.00	291.00		3	1	281.00	20	#N/A	-1				#N/A
KLX 19A	070118 17:44	070118 19:04	291.00	311.00		3	1	301.00	20	2.20E-05	0				2.30E-05
KLX 19A	070119 09:23	070119 10:47	411.00	431.00		3	1	421.00	20	1.14E-08	0				1.20E-08
KLX 19A	070119 11:20	070119 12:40	431.00	451.00		3	1	441.00	20	2.70E-07	0				2.82E-07
KLX 19A	070119 13:38	070119 14:58	451.00	471.00		3	1	461.00	20	1.22E-06	0				1.28E-06
KLX 19A	070119 15:30	070119 16:52	471.00	491.00		3	1	481.00	20	2.29E-07	0				2.39E-07
KLX 19A	070119 17:26	070119 18:46	491.00	511.00		3	1	501.00	20	1.55E-07	0				1.62E-07
KLX 19A	070120 08:21	070120 09:42	511.00	531.00		3	1	521.00	20	3.01E-06	0				3.15E-06
KLX 19A	070120 10:18	070120 11:14	530.00	550.00		3	1	540.00	20	#N/A	-1				#N/A
KLX 19A	070120 11:45	070120 13:02	550.00	570.00		3	1	560.00	20	1.95E-09	0				2.04E-09
KLX 19A	070120 16:19	070120 17:09	591.00	611.00		3	1	601.00	20	#N/A	-1				#N/A
KLX 19A	070120 17:41	070120 18:38	611.00	631.00		3	1	621.00	20	#N/A	-1				#N/A
KLX 19A	070121 08:29	070121 10:11	631.00	651.00		3	1	641.00	20	2.23E-09	0				2.34E-09
KLX 19A	070121 13:18	070121 14:22	651.00	671.00		3	1	661.00	20	4.91E-08	0				5.13E-08
KLX 19A	070121 14:52	070121 16:23	671.00	691.00		3	1	681.00	20	2.92E-07	0				3.05E-07
KLX 19A	070121 16:56	070121 19:26	691.00	711.00		3	1	701.00	20	1.06E-07	0				1.11E-07
KLX 19A	070122 08:46	070122 09:58	711.00	731.00		3	1	721.00	20	#N/A	-1				#N/A
KLX 19A	070122 10:50	070122 12:17	731.00	751.00		3	1	741.00	20	6.54E-08	0				6.84E-08
KLX 19A	070122 13:36	070122 15:00	751.00	771.00		3	1	761.00	20	8.86E-07	0				9.27E-07
KLX 19A	070122 15:43	070122 17:52	771.00	791.00		3	1	781.00	20	2.79E-07	0				2.92E-07
KLX 19A	070124 09:08	070124 10:32	104.00	109.00		3	1	106.50	5	3.20E-05	0				2.64E-05
KLX 19A	070124 10:57	070124 13:05	109.00	114.00		3	1	111.50	5	3.46E-05	0				2.86E-05
KLX 19A	070124 17:05	070124 18:29	411.00	416.00		3	1	413.50	5	1.39E-08	0				1.15E-08
KLX 19A	070125 10:04	070125 10:52	421.00	426.00		3	1	423.50	5	#N/A	-1				#N/A
KLX 19A	070125 13:20	070125 14:43	431.00	436.00		3	1	433.50	5	9.08E-10	0				7.50E-10
KLX 19A	070125 16:48	070125 18:12	441.00	446.00		3	1	443.50	5	1.90E-08	0				1.57E-08
KLX 19A	070125 18:36	070125 19:58	446.00	451.00		3	1	448.50	5	2.53E-07	0				2.09E-07
KLX 19A	070126 09:34	070126 11:08	551.00	556.00		3	1	553.50	5	1.43E-09	0				1.18E-09
KLX 19A	070126 13:58	070126 14:36	561.00	566.00		3	1	563.50	5	#N/A	-1				#N/A
KLX 19A	070127 11:03	070127 12:37	646.00	651.00		3	1	648.50	5	3.16E-09	0				2.61E-09
KLX 19A	070127 13:03	070127 13:58	651.00	656.00		3	1	653.50	5	#N/A	-1				#N/A
KLX 19A	070127 14:22	070127 16:11	656.00	661.00		3	1	658.50	5	3.49E-09	0				2.88E-09
KLX 19A	070128 08:17	070128 09:42	666.00	671.00		3	1	668.50	5	4.95E-08	0				4.09E-08
KLX 19A	070128 12:22	070128 13:51	676.00	681.00		3	1	678.50	5	1.98E-09	0				1.63E-09
KLX 19A	070128 14:19	070128 15:44	681.00	686.00		3	1	683.50	5	2.94E-07	0				2.43E-07
KLX 19A	070128 17:33	070128 18:59	691.00	696.00		3	1	693.50	5	2.83E-08	0				2.33E-08
KLX 19A	070129 08:23	070129 09:47	696.00	701.00		3	1	698.50	5	7.42E-08	0				6.12E-08
KLX 19A	070129 10:16	070129 11:59	701.00	706.00		3	1	703.50	5	1.25E-08	0				1.03E-08
KLX 19A	070129 12:42	070129 14:12	706.00	711.00		3	1	708.50	5	4.19E-09	0				3.46E-09
KLX 19A	070129 14:49	070129 16:18	731.00	736.00		3	1	733.50	5	6.44E-08	0				5.32E-08
KLX 19A	070129 18:54	070129 19:33	741.00	746.00		3	1	743.50	5	#N/A	-1				#N/A
KLX 19A	070130 08:14	070130 09:54	746.00	751.00		3	1	748.50	5	7.40E-10	0				6.11E-10
KLX 19A	070130 10:20	070130 12:02	751.00	756.00		3	1	753.50	5	1.19E-09	0				9.82E-10
KLX 19A	070130 12:47	070130 14:29	756.00	761.00		3	1	758.50	5	1.26E-09	0				1.04E-09
KLX 19A	070130 17:00	070130 18:21	766.00	771.00		3	1	768.50	5	8.88E-07	0				7.33E-07
KLX 19A	070131 09:28	070131 11:02	776.00	781.00		3	1	778.50	5	2.79E-07	0				2.31E-07

idcode	secup	seclow	bc_tm	value_type_tm	hydr_cond_moye	formation_width_b	width_of_channel_b	tb	l_measl_tb	u_measl_tb	sb	assumed_sb	leakage_factor_lf	transmissivity_tt	value_type_tt	bc_tt	l_measl_q_s	u_measl_q_s
KLX 19A	111.00	211.00	0	0	4.96E-07									2.98E-04	0	1	7.00E-05	5.00E-04
KLX 19A	211.00	311.00	0	0	2.82E-07									1.09E-05	0	1	9.00E-06	5.00E-05
KLX 19A	211.00	311.00	0	0	2.33E-07									9.70E-06	0	1	8.00E-06	5.00E-05
KLX 19A	311.00	411.00	0	0	#N/A									1.00E-10	0	1	1.00E-12	1.00E-10
KLX 19A	411.00	511.00	0	0	1.68E-08									9.47E-07	0	1	6.00E-07	3.00E-06
KLX 19A	411.00	511.00	0	0	1.44E-08									6.12E-07	0	1	4.00E-07	2.00E-06
KLX 19A	511.00	611.00	0	0	3.70E-08									5.53E-06	0	1	3.00E-06	8.00E-06
KLX 19A	511.00	611.00	0	0	2.86E-08									6.20E-06	0	1	2.00E-06	8.00E-06
KLX 19A	611.00	711.00	0	0	4.87E-09									1.23E-07	0	1	8.00E-08	4.00E-07
KLX 19A	611.00	711.00	0	0	4.40E-09									1.77E-07	0	1	8.00E-08	4.00E-07
KLX 19A	694.00	794.00	0	0	1.20E-08									4.62E-07	0	1	9.00E-08	6.00E-07
KLX 19A	694.00	794.00	0	-1	1.07E-08									4.11E-07	-1	1	9.00E-08	6.00E-07
KLX 19A	111.00	131.00	0	0	1.88E-06									3.01E-04	0	1	6.00E-05	4.00E-04
KLX 19A	131.00	151.00	0	0	3.42E-10									1.71E-09	0	1	9.00E-10	7.00E-09
KLX 19A	151.00	171.00	0	0	8.10E-08									4.07E-06	0	1	1.00E-06	6.00E-06
KLX 19A	191.00	211.00	0	0	5.00E-11									3.80E-10	0	1	8.00E-11	8.00E-10
KLX 19A	211.00	231.00	0	0	3.44E-09									2.03E-07	0	1	6.00E-08	4.00E-07
KLX 19A	231.00	251.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-11
KLX 19A	271.00	291.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-11
KLX 19A	291.00	311.00	0	0	1.15E-06									1.13E-05	0	1	9.00E-06	5.00E-05
KLX 19A	411.00	431.00	0	0	6.00E-10									3.16E-08	0	1	9.00E-09	5.00E-08
KLX 19A	431.00	451.00	0	0	1.41E-08									2.96E-07	0	1	2.00E-07	7.00E-07
KLX 19A	451.00	471.00	0	0	6.40E-08									1.52E-06	0	1	7.00E-07	4.00E-06
KLX 19A	471.00	491.00	0	0	1.20E-08									4.79E-07	0	1	2.00E-07	8.00E-07
KLX 19A	491.00	511.00	0	0	8.10E-09									4.13E-07	0	1	1.00E-07	8.00E-07
KLX 19A	511.00	531.00	0	0	1.58E-07									4.90E-06	0	1	1.00E-06	8.00E-06
KLX 19A	530.00	550.00	0	0	#N/A									1.00E-10	0	1	1.00E-13	1.00E-10
KLX 19A	550.00	570.00	0	0	1.02E-10									1.95E-09	0	1	8.00E-10	5.00E-09
KLX 19A	591.00	611.00	0	-1	#N/A									1.00E-11	-1	1	1.00E-13	1.00E-11
KLX 19A	611.00	631.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-10
KLX 19A	631.00	651.00	0	-1	1.17E-10									1.23E-09	-1	1	8.00E-10	3.00E-09
KLX 19A	651.00	671.00	0	0	2.57E-09									5.36E-08	0	1	1.00E-08	7.00E-08
KLX 19A	671.00	691.00	0	-1	1.53E-08									2.30E-07	-1	1	9.00E-08	6.00E-07
KLX 19A	691.00	711.00	0	0	5.55E-09									5.36E-08	0	1	1.00E-08	8.00E-08
KLX 19A	711.00	731.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-11
KLX 19A	731.00	751.00	0	0	3.42E-09									2.28E-07	0	1	8.00E-08	5.00E-07
KLX 19A	751.00	771.00	0	0	4.64E-08									3.59E-07	0	1	7.00E-08	4.00E-07
KLX 19A	771.00	791.00	0	0	1.46E-08									1.80E-07	0	1	7.00E-08	4.00E-07
KLX 19A	104.00	109.00	0	-1	5.28E-06									6.79E-05	-1	1	3.00E-05	8.00E-05
KLX 19A	109.00	114.00	0	0	5.72E-06									4.95E-04	0	1	8.00E-05	5.00E-04
KLX 19A	411.00	416.00	0	0	2.30E-09									3.87E-08	0	1	8.00E-09	5.00E-08
KLX 19A	421.00	426.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-11
KLX 19A	431.00	436.00	0	0	1.50E-10									1.56E-10	0	1	8.00E-11	8.00E-10
KLX 19A	441.00	446.00	0	0	3.14E-09									2.93E-08	0	1	1.00E-08	8.00E-08
KLX 19A	446.00	451.00	0	0	4.18E-08									3.20E-07	0	1	8.00E-08	8.00E-07
KLX 19A	551.00	556.00	0	0	2.36E-10									1.35E-09	0	1	8.00E-10	6.00E-09
KLX 19A	561.00	566.00	0	0	#N/A									1.00E-11	0	1	1.00E-13	1.00E-11
KLX 19A	646.00	651.00	0	-1	5.22E-10									2.02E-09	-1	1	9.00E-09	5.00E-09
KLX 19A	651.00	656.00	0	-1	#N/A									1.00E-11	-1	1	1.00E-13	1.00E-11
KLX 19A	656.00	661.00	0	0	5.76E-10									6.53E-10	0	1	3.00E-10	3.00E-09
KLX 19A	666.00	671.00	0	0	8.18E-09									3.11E-07	0	1	8.00E-08	4.00E-07
KLX 19A	676.00	681.00	0	0	3.26E-10									2.44E-09	0	1	8.00E-10	6.00E-09
KLX 19A	681.00	686.00	0	0	4.86E-08									2.49E-07	0	1	9.00E-08	4.00E-07
KLX 19A	691.00	696.00	0	0	4.66E-09									8.60E-09	0	1	7.00E-09	5.00E-08
KLX 19A	696.00	701.00	0	0	1.22E-08									1.52E-07	0	1	8.00E-08	3.00E-07
KLX 19A	701.00	706.00	0	0	2.06E-09									7.76E-09	0	1	3.00E-09	3.00E-08
KLX 19A	706.00	711.00	0	0	6.92E-10									3.80E-09	0	1	1.00E-09	8.00E-09
KLX 19A	731.00	736.00	0	-1	1.06E-08									1.44E-07	-1	1	7.00E-08	3.00E-07
KLX 19A	741.00	746.00	0	-1	#N/A									1.00E-11	-1	1	1.00E-13	1.00E-11
KLX 19A	746.00	751.00	0	-1	1.22E-10									8.42E-10	-1	1	6.00E-10	3.00E-09
KLX 19A	751.00	756.00	0	0	1.96E-10									6.80E-10	0	1	4.00E-10	2.00E-09
KLX 19A	756.00	761.00	0	-1	2.08E-10									3.82E-10	-1	1	9.00E-11	9.00E-09
KLX 19A	766.00	771.00	0	0	1.47E-07									4.13E-07	0	1	8.00E-08	5.00E-07
KLX 19A	776.00	781.00	0	0	4.62E-08									2.12E-07	0	1	9.00E-08	4.00E-07

idcode	secup	seclow	storativity_s	assumed_s	bc_s	ri	ri_index	leakage_coeff	hydr_cond_ksf	value_type_ksf	l_measl_ksf	u_measl_ksf	spec_storage_ssf	assumed_ssf	c	cd	skin	dt1	dt2
KLX 19A	111.00	211.00	1.00E-06	1.00E-06		398.03	0								4.39E-09	4.8E-01	30.30	0.4	16.7
KLX 19A	211.00	311.00	1.00E-06	1.00E-06		51.76	-1								1.65E-08	1.8E+00	-4.89	0.9	2.7
KLX 19A	211.00	311.00	1.00E-06	1.00E-06		55.24	-1								1.01E-08	1.1E+00	-4.64	1.0	3.2
KLX 19A	311.00	411.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	411.00	511.00	1.00E-06	1.00E-06		94.54	-1								4.68E-10	5.2E-02	-4.90	#N/A	#N/A
KLX 19A	411.00	511.00	1.00E-06	1.00E-06		36.43	-1								2.32E-10	2.6E-02	-3.50	0.5	5.5
KLX 19A	511.00	611.00	1.00E-06	1.00E-06		147.00	0								1.13E-09	1.2E-01	-4.14	8.9	25.9
KLX 19A	511.00	611.00	1.00E-06	1.00E-06		151.23	0								4.60E-09	5.1E-01	-1.95	9.9	27.1
KLX 19A	611.00	711.00	1.00E-06	1.00E-06		69.51	0								1.27E-09	1.4E-01	-4.76	#N/A	#N/A
KLX 19A	611.00	711.00	1.00E-06	1.00E-06		62.16	0								4.12E-09	4.5E-01	-3.57	1.6	20.2
KLX 19A	694.00	794.00	1.00E-06	1.00E-06		79.01	1								1.12E-09	1.2E-01	-4.00	7.8	23.6
KLX 19A	694.00	794.00	1.00E-06	1.00E-06		76.76	1								1.35E-09	1.5E-01	-0.90	8.8	24.9
KLX 19A	111.00	131.00	1.00E-06	1.00E-06		325.95	0								3.67E-09	4.0E-01	0.00	0.4	18.5
KLX 19A	131.00	151.00	1.00E-06	1.00E-06		#N/A	1								1.08E-10	1.2E-02	-1.85	#N/A	#N/A
KLX 19A	151.00	171.00	1.00E-06	1.00E-06		111.15	0								5.39E-10	5.9E-02	8.33	1.0	15.9
KLX 19A	191.00	211.00	1.00E-06	1.00E-06		10.93	0								6.23E-11	6.9E-03	-0.95	#N/A	#N/A
KLX 19A	211.00	231.00	1.00E-06	1.00E-06		25.00	1								8.57E-11	9.4E-03	7.30	1.3	4.5
KLX 19A	231.00	251.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	271.00	291.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	291.00	311.00	1.00E-06	1.00E-06		78.26	-1								1.48E-08	1.6E+00	-4.84	0.8	6.0
KLX 19A	411.00	431.00	1.00E-06	1.00E-06		18.00	1								5.73E-11	6.3E-03	7.50	3.2	6.0
KLX 19A	431.00	451.00	1.00E-06	1.00E-06		57.72	0								6.06E-11	6.7E-03	0.38	0.6	11.5
KLX 19A	451.00	471.00	1.00E-06	1.00E-06		#N/A	0								1.05E-09	1.2E-01	-4.10	#N/A	#N/A
KLX 19A	471.00	491.00	1.00E-06	1.00E-06		86.17	0								8.32E-11	9.2E-03	6.45	0.7	16.8
KLX 19A	491.00	511.00	1.00E-06	1.00E-06		62.73	0								9.07E-11	1.0E-02	9.23	0.5	16.2
KLX 19A	511.00	531.00	1.00E-06	1.00E-06		116.43	0								2.72E-09	3.0E-01	-2.00	4.4	18.8
KLX 19A	530.00	550.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	550.00	570.00	1.00E-06	1.00E-06		16.44	0								6.26E-11	6.9E-03	2.50	0.3	13.9
KLX 19A	591.00	611.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	611.00	631.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	631.00	651.00	1.00E-06	1.00E-06		14.65	0								5.40E-11	6.0E-03	-0.38	1.9	12.7
KLX 19A	651.00	671.00	1.00E-06	1.00E-06		14.41	1								1.91E-10	2.1E-02	-3.27	0.5	2.9
KLX 19A	671.00	691.00	1.00E-06	1.00E-06		54.19	0								4.52E-09	5.0E-01	1.94	#N/A	#N/A
KLX 19A	691.00	711.00	1.00E-06	1.00E-06		37.65	0								4.61E-11	5.1E-03	-2.80	0.7	17.1
KLX 19A	711.00	731.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	731.00	751.00	1.00E-06	1.00E-06		54.07	0								5.52E-11	6.1E-03	3.71	1.7	15.8
KLX 19A	751.00	771.00	1.00E-06	1.00E-06		55.73	1								3.40E-10	3.7E-02	-2.57	7.3	16.9
KLX 19A	771.00	791.00	1.00E-06	1.00E-06		50.97	0								4.87E-10	5.4E-02	-2.40	1.2	10.8
KLX 19A	104.00	109.00	1.00E-06	1.00E-06		224.63	0								4.97E-09	5.5E-01	4.23	1.1	16.8
KLX 19A	109.00	114.00	1.00E-06	1.00E-06		257.77	0								3.57E-09	3.9E-01	10.40	0.6	14.8
KLX 19A	411.00	416.00	1.00E-06	1.00E-06		11.09	1								1.86E-11	2.1E-03	8.10	1.0	2.3
KLX 19A	421.00	426.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	431.00	436.00	1.00E-06	1.00E-06		8.75	0								4.12E-11	4.5E-03	-1.50	#N/A	#N/A
KLX 19A	441.00	446.00	1.00E-06	1.00E-06		32.38	0								1.43E-11	1.6E-03	4.47	2.0	13.5
KLX 19A	446.00	451.00	1.00E-06	1.00E-06		58.86	0								3.90E-11	4.3E-03	1.40	0.6	4.7
KLX 19A	551.00	556.00	1.00E-06	1.00E-06		15.00	0								2.02E-11	2.2E-03	1.98	0.7	16.6
KLX 19A	561.00	566.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	646.00	651.00	1.00E-06	1.00E-06		5.92	1								2.56E-11	2.8E-03	-1.11	1.0	2.6
KLX 19A	651.00	656.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	656.00	661.00	1.00E-06	1.00E-06		#N/A	1								1.43E-10	1.6E-02	-0.78	#N/A	#N/A
KLX 19A	666.00	671.00	1.00E-06	1.00E-06		12.80	1								6.43E-11	7.1E-03	4.80	0.4	1.0
KLX 19A	676.00	681.00	1.00E-06	1.00E-06		17.39	0								2.32E-11	2.6E-03	4.22	0.6	11.7
KLX 19A	681.00	686.00	1.00E-06	1.00E-06		55.28	0								3.94E-09	4.3E-01	-1.17	1.1	16.9
KLX 19A	691.00	696.00	1.00E-06	1.00E-06		23.83	0								4.66E-11	5.1E-03	-2.56	#N/A	#N/A
KLX 19A	696.00	701.00	1.00E-06	1.00E-06		11.87	1								6.54E-11	7.2E-03	2.48	0.5	1.2
KLX 19A	701.00	706.00	1.00E-06	1.00E-06		23.23	1								1.86E-11	2.1E-03	-1.00	6.5	16.5
KLX 19A	706.00	711.00	1.00E-06	1.00E-06		19.43	0								1.18E-11	1.3E-03	2.52	0.9	12.5
KLX 19A	731.00	736.00	1.00E-06	1.00E-06		48.21	0								2.61E-11	2.9E-03	7.89	0.6	3.8
KLX 19A	741.00	746.00	1.00E-06	1.00E-06		#N/A	#N/A								#N/A	#N/A	#N/A	#N/A	#N/A
KLX 19A	746.00	751.00	1.00E-06	1.00E-06		13.33	0								3.06E-11	3.4E-03	1.61	1.0	14.5
KLX 19A	751.00	756.00	1.00E-06	1.00E-06		12.64	0								1.79E-11	2.0E-03	0.22	3.7	17.1
KLX 19A	756.00	761.00	1.00E-06	1.00E-06		10.94	0								2.37E-11	2.6E-03	-1.07	10.0	14.0
KLX 19A	766.00	771.00	1.00E-06	1.00E-06		62.73	1								3.05E-10	3.4E-02	-3.00	#N/A	#N/A
KLX 19A	776.00	781.00	1.00E-06	1.00E-06		53.10	0								6.79E-10	7.5E-02	-1.82	2.1	13.0

idcode	secup	seclow	t1	t2	dte1	dte2	p_horner	transmissivity_t_nlr	storativity_s_nlr	value_type_t_nlr	bc_t_nlr	c_nlr	cd_nlr	skin_nlr	transmissivity_t_grf	value_type_t_grf	bc_t_grf	storativity_s_grf	flow_dim_grf	comment
KLX 19A	111.00	211.00					1806.1													
KLX 19A	211.00	311.00					2630.9													
KLX 19A	211.00	311.00					2633.0													
KLX 19A	311.00	411.00					#N/A													
KLX 19A	411.00	511.00					4274.7													
KLX 19A	411.00	511.00					4275.4													
KLX 19A	511.00	611.00					5105.8													
KLX 19A	511.00	611.00					5108.4													
KLX 19A	611.00	711.00					5902.9													
KLX 19A	611.00	711.00					5889.9													
KLX 19A	694.00	794.00					6578.9													
KLX 19A	694.00	794.00					6580.7													
KLX 19A	111.00	131.00					1145.8													
KLX 19A	131.00	151.00					1297.7													
KLX 19A	151.00	171.00					1477.0													
KLX 19A	191.00	211.00					1791.3													
KLX 19A	211.00	231.00					1995.2													
KLX 19A	231.00	251.00					#N/A													
KLX 19A	271.00	291.00					#N/A													
KLX 19A	291.00	311.00					2628.8													
KLX 19A	411.00	431.00					3623.9													
KLX 19A	431.00	451.00					3782.2													
KLX 19A	451.00	471.00					3944.1													
KLX 19A	471.00	491.00					4114.6													
KLX 19A	491.00	511.00					4277.7													
KLX 19A	511.00	531.00					4444.2													
KLX 19A	530.00	550.00					#N/A													
KLX 19A	550.00	570.00					4715.0													
KLX 19A	591.00	611.00					#N/A													
KLX 19A	611.00	631.00					#N/A													
KLX 19A	631.00	651.00					5397.2													
KLX 19A	651.00	671.00					5612.5													
KLX 19A	671.00	691.00					5743.3													
KLX 19A	691.00	711.00					5906.2													
KLX 19A	711.00	731.00					#N/A													
KLX 19A	731.00	751.00					6235.3													
KLX 19A	751.00	771.00					6397.8													
KLX 19A	771.00	791.00					6546.2													
KLX 19A	104.00	109.00					965.3													
KLX 19A	109.00	114.00					1007.1													
KLX 19A	411.00	416.00					3500.9													
KLX 19A	421.00	426.00					#N/A													
KLX 19A	431.00	436.00					3640.3													
KLX 19A	441.00	446.00					3745.9													
KLX 19A	446.00	451.00					3786.3													
KLX 19A	551.00	556.00					4609.5													
KLX 19A	561.00	566.00					#N/A													
KLX 19A	646.00	651.00					5388.8													
KLX 19A	651.00	656.00					#N/A													
KLX 19A	656.00	661.00					5623.5													
KLX 19A	666.00	671.00					5617.0													
KLX 19A	676.00	681.00					5652.7													
KLX 19A	681.00	686.00					5697.2													
KLX 19A	691.00	696.00					5781.8													
KLX 19A	696.00	701.00					5819.5													
KLX 19A	701.00	706.00					5845.9													
KLX 19A	706.00	711.00					5914.6													
KLX 19A	731.00	736.00					6115.3													
KLX 19A	741.00	746.00					#N/A													
KLX 19A	746.00	751.00					6239.3													
KLX 19A	751.00	756.00					6278.0													
KLX 19A	756.00	761.00					6310.8													
KLX 19A	766.00	771.00					6397.2													
KLX 19A	776.00	781.00					6468.9													

Table	plu_s_hole_test_obs Data of observation 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 19A	070111 08:17	070111 10:39	111.00	211.00		212.00	800.07	993	998	994	1826	1827	1827	
KLX 19A	070112 09:13	070112 14:01	211.00	311.00		312.00	800.07	1821	1823	1822	2649	2653	2655	
KLX 19A	070112 14:03	070112 15:20	211.00	311.00		312.00	800.07	1821	1823	1822	2649	2653	2655	
KLX 19A	070112 16:54	070112 18:28	311.00	411.00		412.00	800.07	2646	2646	2646	3478	3478	3478	
KLX 19A	070113 09:30	070113 11:44	411.00	511.00		512.00	800.07	3467	3468	3469	4296	4306	4300	
KLX 19A	070113 11:46	070113 12:57	411.00	511.00		512.00	800.07	3467	3468	3469	4296	4306	4300	
KLX 19A	070113 14:17	070113 16:33	511.00	611.00		612.00	800.07	4292	4293	4293	5102	5100	5099	
KLX 19A	070113 16:35	070113 17:43	511.00	611.00		612.00	800.07	4292	4293	4293	5102	5100	5099	
KLX 19A	070114 08:48	070114 11:01	611.00	711.00		712.00	800.07	5111	5111	5111	5927	5964	5939	
KLX 19A	070114 11:03	070114 12:42	611.00	711.00		712.00	800.07	5111	5111	5111	5927	5964	5939	
KLX 19A	070115 15:33	070115 17:24	694.00	794.00		795.00	800.07	5784	5786	5787	7135	7218	7243	
KLX 19A	070115 17:27	070115 21:48	694.00	794.00		795.00	800.07	5784	5786	5787	7135	7218	7243	
KLX 19A	070117 11:33	070117 13:30	111.00	131.00		132.00	800.07	993	999	996	1168	1169	1169	
KLX 19A	070117 14:04	070117 15:56	131.00	151.00		152.00	800.07	1162	1162	1163	1335	1336	1335	
KLX 19A	070117 16:30	070117 17:52	151.00	171.00		172.00	800.07	1328	1328	1328	1500	1500	1500	
KLX 19A	070118 08:17	070118 10:20	191.00	211.00		212.00	800.07	1656	1656	1656	1829	1829	1829	
KLX 19A	070118 10:53	070118 12:18	211.00	231.00		232.00	800.07	1820	1820	1820	1993	1993	1993	
KLX 19A	070118 13:06	070118 14:00	231.00	251.00		252.00	800.07	1986	1985	1985	2158	2158	2158	
KLX 19A	070118 16:24	070118 17:13	271.00	291.00		292.00	800.07	2315	2315	2315	2488	2487	2488	
KLX 19A	070118 17:44	070118 19:04	291.00	311.00		312.00	800.07	2479	2481	2480	2650	2651	2653	
KLX 19A	070119 09:23	070119 10:47	411.00	431.00		432.00	800.07	3467	3467	3467	3640	3640	3640	
KLX 19A	070119 11:20	070119 12:40	431.00	451.00		452.00	800.07	3632	3632	3632	3804	3809	3804	
KLX 19A	070119 13:38	070119 14:58	451.00	471.00		472.00	800.07	3797	3797	3797	3969	3974	3971	
KLX 19A	070119 15:30	070119 16:52	471.00	491.00		492.00	800.07	3961	3961	3961	4134	4134	4133	
KLX 19A	070119 17:26	070119 18:46	491.00	511.00		512.00	800.07	4126	4126	4126	4300	4302	4298	
KLX 19A	070120 08:21	070120 09:42	511.00	531.00		532.00	800.07	4289	4289	4289	4452	4449	4447	
KLX 19A	070120 10:18	070120 11:14	530.00	550.00		551.00	800.07	4445	4445	4445	4606	4603	4603	
KLX 19A	070120 11:45	070120 13:02	550.00	570.00		571.00	800.07	4608	4609	4609	4771	4767	4766	
KLX 19A	070120 16:19	070120 17:09	591.00	611.00		612.00	800.07	4947	4947	4947	5108	5107	5107	
KLX 19A	070120 17:41	070120 18:38	611.00	631.00		632.00	800.07	5111	5111	5111	5273	5271	5271	
KLX 19A	070121 08:29	070121 10:11	631.00	651.00		652.00	800.07	5276	5276	5276	5436	5434	5433	
KLX 19A	070121 13:18	070121 14:22	651.00	671.00		672.00	800.07	5433	5434	5435	5588	5589	5590	
KLX 19A	070121 14:52	070121 16:23	671.00	691.00		692.00	800.07	5600	5601	5601	5763	5790	5776	
KLX 19A	070121 16:56	070121 19:26	691.00	711.00		712.00	800.07	5766	5766	5768	5932	5937	5930	
KLX 19A	070122 08:46	070122 09:58	711.00	731.00		732.00	800.07	5928	5928	5928	6095	6093	6093	
KLX 19A	070122 10:50	070122 12:17	731.00	751.00		752.00	800.07	6091	6092	6092	6258	6262	6258	
KLX 19A	070122 13:36	070122 15:00	751.00	771.00		772.00	800.07	6258	6258	6258	6422	6478	6448	
KLX 19A	070122 15:43	070122 17:52	771.00	791.00		792.00	800.07	6419	6420	6420	7371	7423	7459	
KLX 19A	070124 09:08	070124 10:32	104.00	109.00		110.00	800.07	938	940	940	991	993	991	
KLX 19A	070124 10:57	070124 13:05	109.00	114.00		115.00	800.07	980	987	983	1030	1032	1031	
KLX 19A	070124 17:05	070124 18:29	411.00	416.00		417.00	800.07	3461	3462	3461	3519	3519	3519	
KLX 19A	070125 10:04	070125 10:52	421.00	426.00		427.00	800.07	3555	3556	3556	3605	3605	3605	
KLX 19A	070125 13:20	070125 14:43	431.00	436.00		437.00	800.07	3638	3638	3638	3687	3687	3687	
KLX 19A	070125 16:48	070125 18:12	441.00	446.00		447.00	800.07	3719	3719	3719	3768	3768	3768	
KLX 19A	070125 18:36	070125 19:58	446.00	451.00		452.00	800.07	3761	3761	3761	3810	3814	3809	
KLX 19A	070126 09:34	070126 11:08	551.00	556.00		557.00	800.07	4617	4618	4618	4658	4655	4654	
KLX 19A	070126 13:58	070126 14:36	561.00	566.00		567.00	800.07	4702	4702	4702	4744	4742	4741	
KLX 19A	070127 11:03	070127 12:37	646.00	651.00		652.00	800.07	5397	5397	5398	5436	5434	5433	
KLX 19A	070127 13:03	070127 13:58	651.00	656.00		657.00	800.07	5438	5438	5438	5479	5476	5476	
KLX 19A	070127 14:22	070127 16:11	656.00	661.00		662.00	800.07	5479	5480	5479	5516	5515	5514	
KLX 19A	070128 08:17	070128 09:42	666.00	671.00		672.00	800.07	5560	5560	5560	5602	5600	5599	
KLX 19A	070128 12:22	070128 13:51	676.00	681.00		682.00	800.07	5643	5643	5643	5681	5679	5677	
KLX 19A	070128 14:19	070128 15:44	681.00	686.00		687.00	800.07	5683	5684	5684	5723	5754	5738	
KLX 19A	070128 17:33	070128 18:59	691.00	696.00		697.00	800.07	5765	5765	5765	5808	5809	5807	
KLX 19A	070129 08:23	070129 09:47	696.00	701.00		702.00	800.07	5808	5808	5808	5852	5855	5852	
KLX 19A	070129 10:16	070129 11:59	701.00	706.00		707.00	800.07	5849	5849	5849	5892	5892	5891	
KLX 19A	070129 12:42	070129 14:12	706.00	711.00		712.00	800.07	5890	5889	5890	5933	5933	5932	
KLX 19A	070129 14:49	070129 16:18	731.00	736.00		737.00	800.07	6093	6093	6093	6138	6141	6137	
KLX 19A	070129 18:54	070129 19:33	741.00	746.00		747.00	800.07	6175	6175	6175	6221	6220	6220	
KLX 19A	070130 08:14	070130 09:54	746.00	751.00		752.00	800.07	6219	6219	6219	6263	6262	6261	
KLX 19A	070130 10:20	070130 12:02	751.00	756.00		757.00	800.07	6259	6259	6259	6303	6303	6302	
KLX 19A	070130 12:47	070130 14:29	756.00	761.00		762.00	800.07	6300	6300	6300	6344	6343	6343	
KLX 19A	070130 17:00	070130 18:21	766.00	771.00		772.00	800.07	6381	6381	6380	6424	6482	6451	
KLX 19A	070131 09:28	070131 11:02	776.00	781.00		782.00	800.07	6462	6461	6461	7332	7427	7432	

APPENDIX 5-2

SICADA data tables (Pump tests)

(Simplified version v1.4)

SICADA/Data Import Template

File Identity	
Created By	
Created	

Compiled By	
Quality Check For Delivery	
Delivery Approval	

Activity Type	KLX 19A KLX 19A - pump test

Project	AP PS 400-06-144

Activity Information						**Additional Activity Data**				
						C10	P20	P200	P220	R25
Idcode	**Start Date**	**Stop Date**	**Secup (m)**	**Seclow (m)**	**Section No**	**Company**	**Field crew manager**	**Field crew**	**evaluating data**	**Report**
KLX 19A	2006-11-28 19:53	2007-01-09 12:28	495.00	769.00		Golder Associates	Stephan Rohs	Stephan Rohs, Philipp Wolf	Jörg Böhner, Philipp Wolf, Stephan Rohs	Stephan Rohs

Table	plu_s_hole_test_d
	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
mean_flow_rate_qm	FLOAT	m**3/s	Arithmetic mean flow rate during flow period
q_measl__l	FLOAT	m**3/s	Estimated lower measurement limit of flow rate
q_measl__u	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_h	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_p	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

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	start_flow_period	stop_flow_period	flow_rate_end_qp	value_type_qp	mean_flow_rate_qm	q_measl__l	q_measl__u	tot_volume_vp
KLX 19A	061128 19:53	061205 15:52	764.00	769.00		1B	1	2006-11-28 20:28:47	2006-12-05 13:10:14	1.33E-05	0	1.33E-05	1.67E-08	8.33E-04	7.71E+00
KLX 19A	061207 15:07	070109 12:28	495.00	515.00		1B	1	2006-12-07 15:38:40	2007-01-09 08:56:49	3.50E-05	0	3.57E-05	1.67E-08	8.33E-04	1.01E+02

idcode	secup	seclow	dur_flow_phase_tp	dur_rec_phase_tf	initial_head_hi	ow_end_hp	final_head_hf	initial_press_pi	press_at_flow_end_pp	final_press_pf	fluid_temp_tew	fluid_elcond_ecw	fluid_salinity_tdsw	fluid_salinity_tdswm	reference	comments	lp
KLX 19A	764.00	769.00	578490	9588			16.37	6391	6150	6347	16.8						766.50
KLX 19A	495.00	515.00	2827044	12780			16.38	4311	4186	4306	13.3						505.00

Table	plu_s_hole_test_ed1
	PLU Single hole tests, pumping/injection. Basic evaluation

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		Formation type code. 1: Rock, 2: Soil (superficial deposits)
lp	FLOAT	m	Hydraulic point of application for test section, see descr.
seclen_class	FLOAT	m	Planned ordinary test interval during test campaign.
spec_capacity_q_s	FLOAT	m**2/s	Specific capacity (Q/s) of test section, see table descript.
value_type_q_s	CHAR		0:true value,-1:Q/s<lower meas.limit,1:Q/s>upper meas.limit
transmissivity_tq	FLOAT	m**2/s	Tranmissivity based on Q/s, see table description
value_type_tq	CHAR		0:true value,-1:TQ<lower meas.limit,1:TQ>upper meas.limit.
bc_tq	CHAR		Best choice code. 1 means TQ is best choice of T, else 0
transmissivity_moye	FLOAT	m**2/s	Transmissivity,TM, based on Moye (1967)
bc_tm	CHAR		Best choice code. 1 means Tmoye is best choice of T, else 0
value_type_tm	CHAR		0:true value,-1:TM<lower meas.limit,1:TM>upper meas.limit.
hydr_cond_moye	FLOAT	m/s	K_M: Hydraulic conductivity based on Moye (1967)
formation_width_b	FLOAT	m	b:Aquifer thickness repr. for T(generally b=Lw) ,see descr.
width_of_channel_b	FLOAT	m	B:Inferred width of formation for evaluated TB
tb	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 for evaluated TB,see description
u_measl_tb	FLOAT	m**3/s	Estimated upper meas. limit of evaluated TB,see description
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_lf	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...
value_type_tt	CHAR		0:true value,-1:TT<lower meas.limit,1:TT>upper meas.limit,
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 lower meas. limit for evaluated TT,see table descr
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		Best choice of S (Storativity) ,see descr.
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 leakage coeff,see desc
hydr_cond_ksf	FLOAT	m/s	Ksf:3D model evaluation of hydraulic conductivity,see desc.
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 descr
spec_storage_ssf	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 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 stop time of evaluation. see table description
t1	FLOAT	s	Start time for evaluated parameter from start flow period
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	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		S_NLR=storativity based on None Linear Regression,see..
value_type_t_nlr	CHAR		0:true value,-1:T_NLR<lower meas.limit,1:>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 meas.limit,1:>upper meas.limit
bc_t_grf	CHAR		Best choice code. 1 means T_GRF is best choice of T, else 0
storativity_s_grf	FLOAT		S_GRF:Storativity based on Generalized Radial Flow, 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
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)

idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_type	lp	seclen_class	spec_capacity_q_s	value_type_q_s	transmissivity_tq	value_type_tq	bc_tq	transmissivity_moye
KLX 19A	061128 19:53	061205 15:52	764.00	769.00		1B	1	766.50	5	5.43E-07	0				5.43E-07
KLX 19A	061207 15:07	070109 12:28	495.00	515.00		1B	1	505.00	20	2.70E-06	0				2.90E-06

idcode	secup	seclow	bc_tm	value_type_tm	hydr_cond_moye	formation_width_b	width_of_channel_b	tb	l_measl_tb	u_measl_tb	sb	assumed_sb	leakage_factor_lf	transmissivity_tt	value_type_tt	bc_tt	l_measl_q_s	u_measl_q_s
KLX 19A	764.00	769.00	0	0	1.09E-07									2.90E-07	0	1	5.00E-08	3.00E-07
KLX 19A	495.00	515.00	0	0	1.45E-07									5.80E-06	0	1	1.00E-06	6.00E-06

idcode	secup	seclow	storativity_s	assumed_s	bc_s	ri	ri_index	leakage_coeff	hydr_cond_ksf	value_type_ksf	l_measl_ksf	u_measl_ksf	spec_storage_ssf	assumed_ssf	c	cd	skin	dt1	dt2
KLX 19A	764.00	769.00	1.00E-06	1.00E-06		61.82	-1								9.70E-10	1.1E-01	-4.60	0.6	23.3
KLX 19A	495.00	515.00	1.00E-06	1.00E-06		397.07	0								6.80E-09	7.5E-01	-2.20	11.4	95.5

idcode	secup	seclow	t1	t2	dte1	dte2	p_horner	transmissivity_t_nlr	storativity_s_nlr	value_type_t_nlr	bc_t_nlr	c_nlr	cd_nlr	skin_nlr	transmissivity_t_grf	value_type_t_grf	bc_t_grf	storativity_s_grf	flow_dim_grf	comment
KLX 19A	764.00	769.00					6404.6													
KLX 19A	495.00	515.00					4331.2													

APPENDIX 5-3

SICADA data tables (Pulse injection tests)

(Simplified version v1.8)

SICADA/Data Import Template

File Identity	
Created By	
Created	

File Time Zone

Compiled By	
Quality Check For Delivery	
Delivery Approval	

Activity Type	HY665 PLU Pulse Test

Project	PLU KLX 19A

Activity Information						Additional Activity Data						
						C30	C40	I160	P20	P200	P220	R240
Idcode	Start Date	Stop Date	Secup (m)	Seclow (m)	Section No	Company evaluating data	Company performing field work	Instrument	Field crew manager	Field crew	Person evaluating data	Length calibration type
KLX 19A	2007-01-17 18:23	2007-01-31 09:01	171.00	776.00		Golder Associates	Golder Associates	PSS 2	Philipp Wolf	Philipp Wolf, Thomas Cronquist, Mesgena Gebrezghi, Daniel Nordborg	Philipp Wolf, Stephan Rohs	

Table	plu_slug_test_ed Slug- & pulse test, calculated and evaluated results		
Column	**Datatype**	**Unit**	**Column Description**
site	CHAR		Investigation site name
idcode	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
test_type	CHAR		Type of test, one of 7, see table description
formation_type	CHAR		1: Rock, 2: Soil (superficial deposits)
start_flow_peri	DATE		Date and time of flow phase start (YYYYMMDD hhmmss)
dur_flow_phas	FLOAT	s	Time for the flowing phase of the test (tp)
dur_rec_phase_	FLOAT	s	Time for the recovery phase of the test (tF)
initial_head_h0	FLOAT	m	Initial formation hydraulic head, see table description
initial_displacer	FLOAT	m	Initial displacement of hydraulic head,see table description
displacem_dh0	FLOAT	m	Initial displacement of slugtest,see table description
displacem_dh0	FLOAT	m	Initial displacement of bailtest,see table description
head_at_flow_	FLOAT	m	Hydraulic head at end of flow phase,see table description
final_head_hf	FLOAT	m	Hydraulic head at the end of the recovery,see table descr.
initial_press_pi	FLOAT	kPa	Initial formation pressure
initial_press_di	FLOAT	kPa	Initial pressure change from pi at time dt=0,pulse test
press_change_	FLOAT	kPa	Initial pressure change;pulse test-measured
press_at_flow_	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_widtl	FLOAT	m	b:Interpreted formation thickness repr. for evaluated T,see
transmissivity_t	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
bc_ts	CHAR		Best choice code.1 means Ts is best choice of transm.,else 0
transmissivity_t	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
bc_tp	CHAR		Best choice code.1 means Tp is best choice of transm.,else 0
l_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
c	FLOAT	m**3/pa	Well bore storage coefficient
fluid_temp_tew	FLOAT	oC	Fluid temperature in the test section, see table description
fluid_elcond_ec	FLOAT	mS/m	Fluid electric conductivity in test section,see table descri
fluid_salinity_td	FLOAT	mg/l	Total salinity of the test section fluid (EC), see descr.
fluid_salinity_td	FLOAT	mg/l	Total salinity of the test section fluid (samples),see descr
dt1	FLOAT	s	Estimated start time of evaluation, see table description
dt2	FLOAT	s	Estimated stop time of evaluation, see table description
reference	CHAR		SKB report No for reports describing data and evaluation
comments	CHAR		Short comment to evaluated parameters

			(m)	(m)					(s)	(s)	(m)	(m)	(m)	(m)	(m)	(m)	(kPa)	(kPa)
idcode	start_date	stop_date	secup	seclow	section_no	test_type	formation_t ype	start_flow_period	dur_flow_phase_tp	dur_rec_ phase_tf	initial_hea d_h0	initial_displ acem_dh0	displace m_dh0_p	displace m_dh0_f	ow_end_h p	final_hea d_hf	initial_pr ess_pi	initial_pres s_diff_dp0
KLX 19A	070117 18:23	070118 00:17	171.00	191.00		4B	1	2007-01-17 18:59:55	10	18000							1651	219
KLX 19A	070118 14:30	070118 15:53	251.00	271.00		4B	1	2007-01-18 15:06:04	10	2700							2306	220
KLX 19A	070120 13:39	070120 15:40	571.00	591.00		4B	1	2007-01-20 14:16:22	10	4560							4944	240
KLX 19A	070125 08:23	070125 09:40	416.00	421.00		4B	1	2007-01-25 09:03:39	10	1680							3553	221
KLX 19A	070125 11:16	070125 12:55	426.00	431.00		4B	1	2007-01-25 11:53:15	10	3600							3636	231
KLX 19A	070125 15:07	070125 16:20	436.00	441.00		4B	1	2007-01-25 15:45:05	10	1620							3725	219
KLX 19A	070126 11:34	070126 13:12	556.00	561.00		4B	1	2007-01-26 12:08:44	#N/A	#N/A							#N/A	#N/A
KLX 19A	070126 14:59	070126 16:39	566.00	571.00		4B	1	2007-01-26 15:35:58	10	3600							4797	225
KLX 19A	070126 17:42	070126 19:21	631.00	636.00		4B	1	2007-01-26 18:19:08	#N/A	#N/A							#N/A	#N/A
KLX 19A	070127 08:26	070127 09:20	636.00	641.00		4B	1	2007-01-27 09:02:28	#N/A	#N/A							#N/A	#N/A
KLX 19A	070127 09:47	070127 10:37	641.00	646.00		4B	1	2007-01-27 10:24:00	#N/A	#N/A							#N/A	#N/A
KLX 19A	070127 17:13	070127 19:22	661.00	666.00		4B	1	2007-01-27 17:50:05	10	5400							5560	222
KLX 19A	070128 10:07	070128 11:55	671.00	676.00		4B	1	2007-01-28 10:52:05	10	3600							5642	229
KLX 19A	070128 16:10	070128 17:06	686.00	691.00		4B	1	2007-01-28 16:48:11	#N/A	#N/A							#N/A	#N/A
KLX 19A	070129 16:43	070129 18:22	736.00	741.00		4B	1	2007-01-29 17:20:21	10	3600							6183	213
KLX 19A	070130 14:54	070130 16:35	761.00	766.00		4B	1	2007-01-30 15:33:09	10	3600							6388	228
KLX 19A	070131 08:08	070131 09:01	771.00	776.00		4B	1	2007-01-31 08:44:40	#N/A	#N/A							#N/A	#N/A

	(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)		
idcode	secup	seclow	hange_d p0_p	press_at_fl ow_end_pp	final_pre ss_pf	formation _width_b	transmissi vity_ts	value_typ e_ts	bc_ts	transmis sivity_tp	value_ty pe_tp	bc_tp	l_meas_limit _t	u_meas_limi t_t	storativit y_s	assumed _s	skin	assumed _skin	c	fluid_te mp_tew	ond_ec w	inity_td sw	nity_tds wm	dt1	dt2	reference	comments
KLX 19A	171.00	191.00		1870	1716					4.20E-12	-1	1	1.00E-12	8.00E-12	1.00E-06	1.00E-06	-1.1		3.15E-11	9.2				#N/A	#N/A		
KLX 19A	251.00	271.00		2526	2468					1.20E-11	-1	1	5.00E-12	5.00E-11	1.00E-06	1.00E-06	-0.3		5.40E-11	10.2				#N/A	#N/A		
KLX 19A	571.00	591.00		5184	5026					1.10E-10	-1	1	5.00E-11	5.00E-10	1.00E-06	1.00E-06	2.1		5.90E-11	14.3				#N/A	#N/A		
KLX 19A	416.00	421.00		3774	3554					3.23E-10	-1	1	1.00E-10	6.00E-10	1.00E-06	1.00E-06	1.0		1.72E-11	12.1				0.22	20.84		
KLX 19A	426.00	431.00		3867	3712					2.30E-11	-1	1	9.00E-12	6.00E-11	1.00E-06	1.00E-06	1.1		1.40E-11	12.3				3.30	57.80		
KLX 19A	436.00	441.00		3944	3722					1.82E-10	-1	1	8.00E-11	6.00E-10	1.00E-06	1.00E-06	1.3		1.08E-11	12.4				0.20	7.27		
KLX 19A	556.00	561.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	14.0				#N/A	#N/A		
KLX 19A	566.00	571.00		5022	4862					2.00E-10	-1	1	5.00E-11	5.00E-10	1.00E-06	1.00E-06	0.6		1.64E-11	14.1				0.29	14.10		
KLX 19A	631.00	636.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	15.0				#N/A	#N/A		
KLX 19A	636.00	641.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	15.0				#N/A	#N/A		
KLX 19A	641.00	646.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	15.1				#N/A	#N/A		
KLX 19A	661.00	666.00		5782	5557					3.98E-10	-1	1	1.00E+10	8.00E-10	1.00E-06	1.00E-06	-3.1		1.43E-10	15.4				#N/A	#N/A		
KLX 19A	671.00	676.00		5871	5695					3.70E-11	-1	1	8.00E-12	5.00E-11	1.00E-06	1.00E-06	-0.9		1.83E-11	15.5				#N/A	#N/A		
KLX 19A	686.00	691.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	15.7				#N/A	#N/A		
KLX 19A	736.00	741.00		6396	6211					6.20E-11	-1	1	1.00E-11	7.00E-11	1.00E-06	1.00E-06	0.6		1.77E-11	16.3				1.33	37.77		
KLX 19A	761.00	766.00		6616	6468					2.52E-11	-1	1	8.00E-12	6.00E-11	1.00E-06	1.00E-06	0.4		2.06E-11	16.7				2.50	36.29		
KLX 19A	771.00	776.00		#N/A	#N/A					1.00E-11	-1	1	1.00E-11	1.00E-13	1.00E-06	1.00E-06	#N/A		#N/A	16.8				#N/A	#N/A		

Table	plu_s_hole_test_obs Data of observation 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)
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)

idcode	start_date	stop_date	secup (m)	seclow (m)	section_no	obs_secup (m)	obs_seclow (m)	pi_above (kPa)	pp_above (kPa)	pf_above (kPa)	pi_below (kPa)	pp_below (kPa)	pf_below (kPa)	comments
KLX 19A	070117 18:23	070118 00:17	171.00	191.00		192.00	800.07	1493	1493	1493	1665	1665	1664	
KLX 19A	070118 14:30	070118 15:53	251.00	271.00		272.00	800.07	2150	2150	2150	2323	2323	2323	
KLX 19A	070120 13:39	070120 15:40	571.00	591.00		592.00	800.07	4781	4782	4782	4943	4936	4936	
KLX 19A	070125 08:23	070125 09:40	416.00	421.00		422.00	800.07	3515	3515	3515	3564	3564	3564	
KLX 19A	070125 11:16	070125 12:55	426.00	431.00		432.00	800.07	3596	3598	3597	3646	3646	3646	
KLX 19A	070125 15:07	070125 16:20	436.00	441.00		442.00	800.07	3679	3679	3679	3728	3728	3727	
KLX 19A	070126 11:34	070126 13:12	556.00	561.00		562.00	800.07	4660	4661	4661	4700	4695	4695	
KLX 19A	070126 14:59	070126 16:39	566.00	571.00		572.00	800.07	4744	4743	4743	4783	4777	4777	
KLX 19A	070126 17:42	070126 19:21	631.00	636.00		637.00	800.07	5274	5274	5275	5317	5310	5310	
KLX 19A	070127 08:26	070127 09:20	636.00	641.00		642.00	800.07	5317	5317	5316	5359	5356	5356	
KLX 19A	070127 09:47	070127 10:37	641.00	646.00		647.00	800.07	5356	5356	5356	5398	5396	5395	
KLX 19A	070127 17:13	070127 19:22	661.00	666.00		667.00	800.07	5520	5520	5520	5561	5553	5553	
KLX 19A	070128 10:07	070128 11:55	671.00	676.00		677.00	800.07	5601	5601	5601	5641	5636	5636	
KLX 19A	070128 16:10	070128 17:06	686.00	691.00		692.00	800.07	5725	5724	5724	5768	5767	5767	
KLX 19A	070129 16:43	070129 18:22	736.00	741.00		742.00	800.07	6134	6134	6134	6179	6177	6177	
KLX 19A	070130 14:54	070130 16:35	761.00	766.00		767.00	800.07	6341	6341	6341	6382	6380	6379	
KLX 19A	070131 08:08	070131 09:01	771.00	776.00		777.00	800.07	6422	6422	6422	6469	6469	6468	