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Äspö Hard Rock Laboratory

TRUE Block Scale project
Preliminary characterisation stage

Combined interference tests and tracer tests

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January 1999

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Keywords: TRUE, block scale, interference test

Abstract

This report presents the evaluation plots of the hydraulic tests performed within the project TRUE Block Scale – Preliminary Characterisation Stage - Combined Interference Tests and Tracer Tests, Performance and Preliminary Evaluation (SKB IPR-01-44).

The hydraulic tests have been evaluated by the code AquiferTest, version 2.0 by Waterloo Hydrogeologic Inc. The source sections together with the observation borehole sections with the most significant responses are evaluated. Either of the drawdown or the recovery phase is analysed depending on disturbances of other activities in the tunnel on some of the tests. In general, evaluation has been performed both in logarithmic and semi-logarithmic diagrams for each section. In the source sections evaluation is only made in semi-logarithmic diagrams.

In the plots, drawdown data files are denoted *.DRA and the corresponding drawdown derivative files *.DRD. Drawdown (m) is plotted versus real time t(s) on the data curves. Similarly, recovery data files are denoted *.REC and the corresponding recovery derivative *.RED. Recovery (m) is plotted versus equivalent time dte(s) when recovery data are analysed.

In the Appendices the order of boreholes and sections for each test is according to the report SKB IPR-01-44.

Sammanfattning

Denna rapport presenterar utvärderingsplottarna från de hydrauliska testerna utförda inom projektet TRUE Block Scale – Preliminary Characterisation Stage - Combined Interference Tests and Tracer Tests, Performance and Preliminary Evaluation (SKB IPR-01-44).

De hydrauliska testerna har utvärderats med programmet AquiferTest, version 2.0 från Waterloo Hydrogeologic Inc. De observationssektioner med mest signifikant respons har tillsammans med tillhörande sänka utvärderats. Endera avsänknings- eller återhämtningsfasen är analyserad beroende på störningar från andra tunnelaktiviteter i några av försöken. Generellt har utvärderingen för varje sektion utförts i både logaritmiska och semilogaritmiska diagram. Utvärderingen av de sektioner som är sänkor är endast gjord i semilogaritmiska diagram.

I plottarna är avsänkningsdatafilen betecknad *.DRA och motsvarande deriverad avsänkning *.DRD. Avsänkningen (m) är plottad mot realtiden t(s) i figurerna. På liknande sätt är återhämtningsdata betecknad *.REC och motsvarande deriverad återhämtning betecknad*.RED. Vid analysen av återhämtningsdata plottas återhämtning (m) mot ekvivalent tid, dte (s).

Ordningen av borrhål och sektioner för varje försök följer beskrivningen i IPR-01-44.

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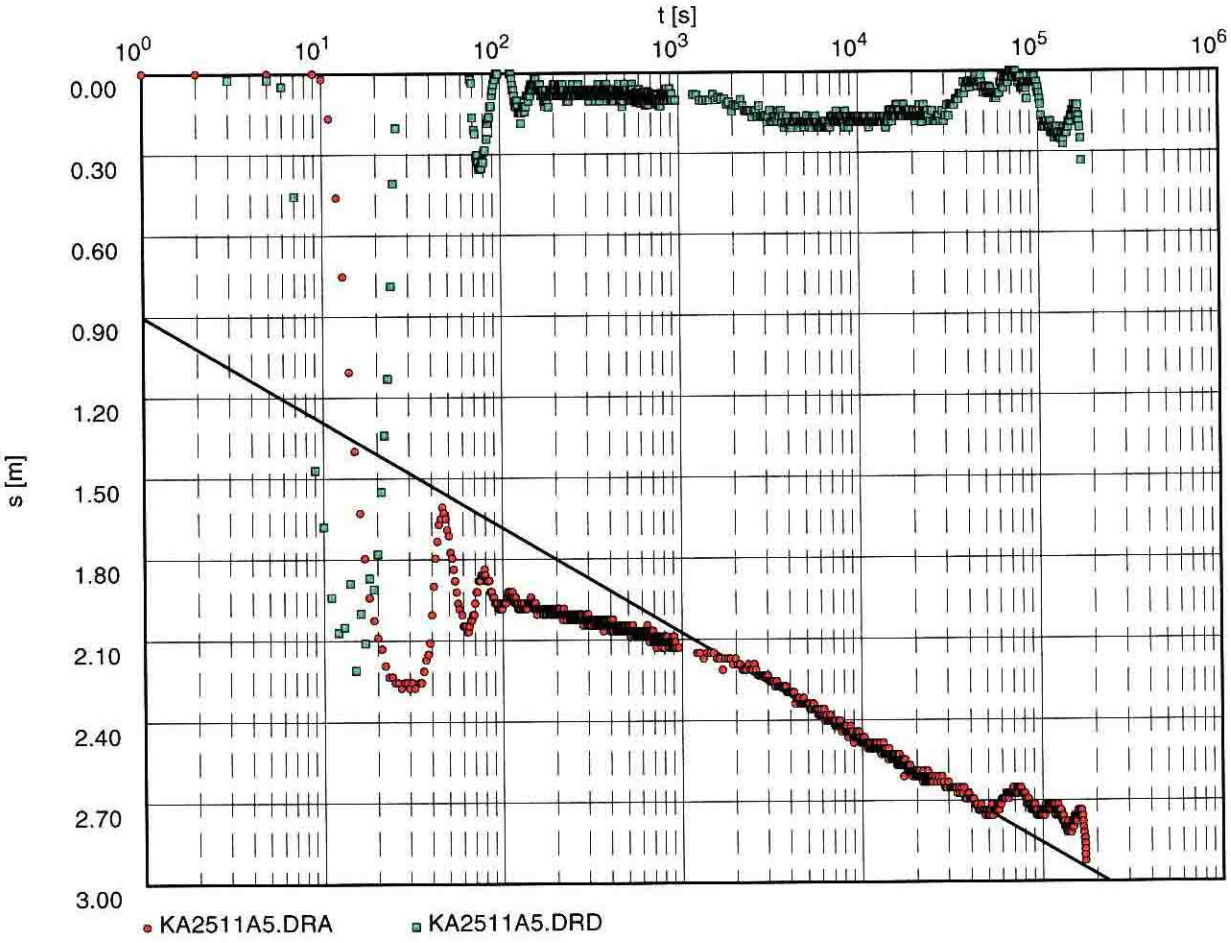
		Evaluated by: JEL	Date: 26.10.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA2511A:S5 (source)	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.42×10^{-5}

Storativity: 3.41×10^{-4}

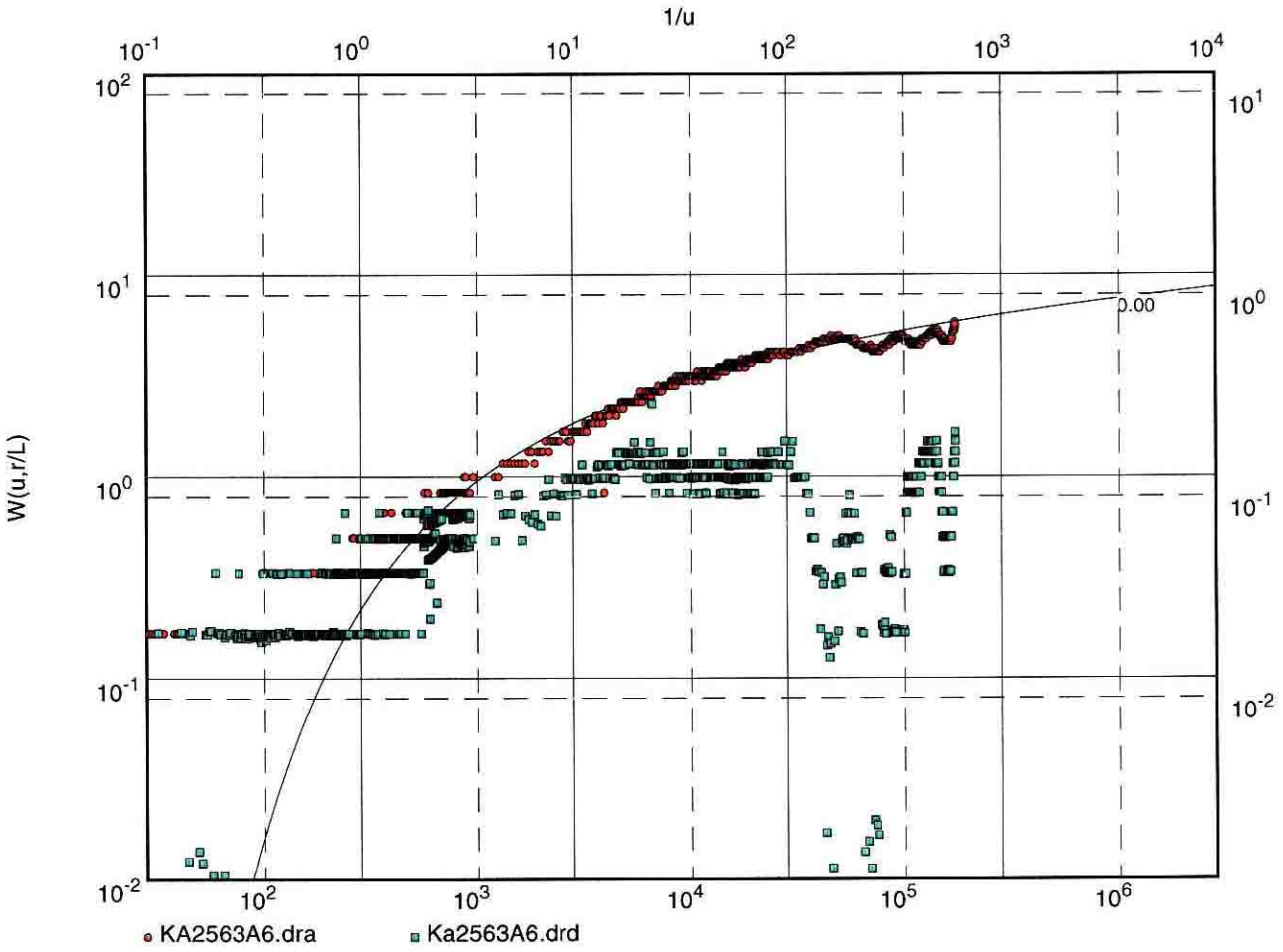
Borehole section skin factor assumed to zero. Presumed negative skin implies overestimated storativity value.

Pseudo-radial flow.

Tidal effects distort late time data .

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 2 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA2563A:R6	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 3.26×10^{-5}

Storativity: 3.09×10^{-6}

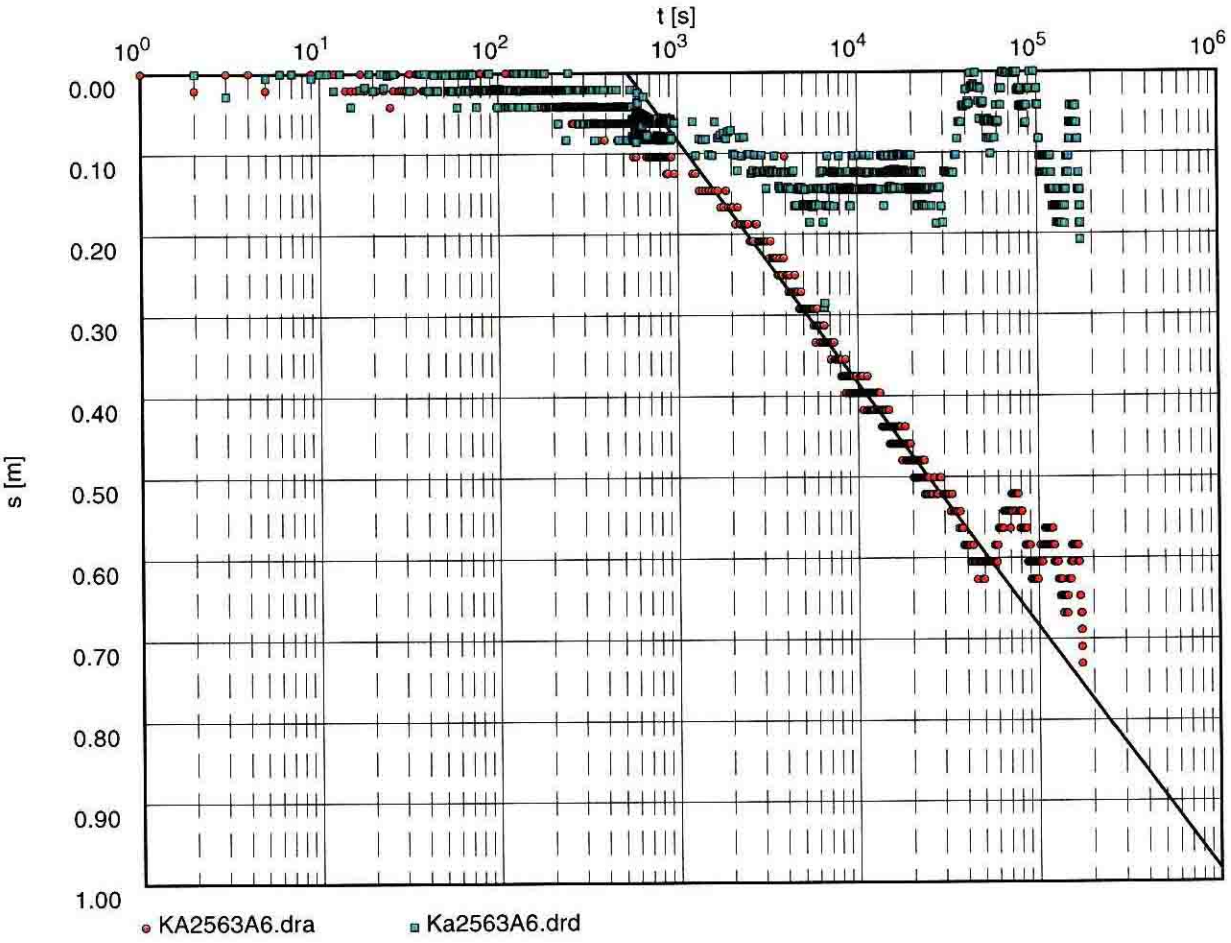
Indications of early fracture flow.

Pseudo-radial flow dominating.

Tidal effects distort late time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 3	
		Project: TRUE Block Scale	
		Evaluated by: JEL	Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA2563A:R6	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 3.15×10^{-5}

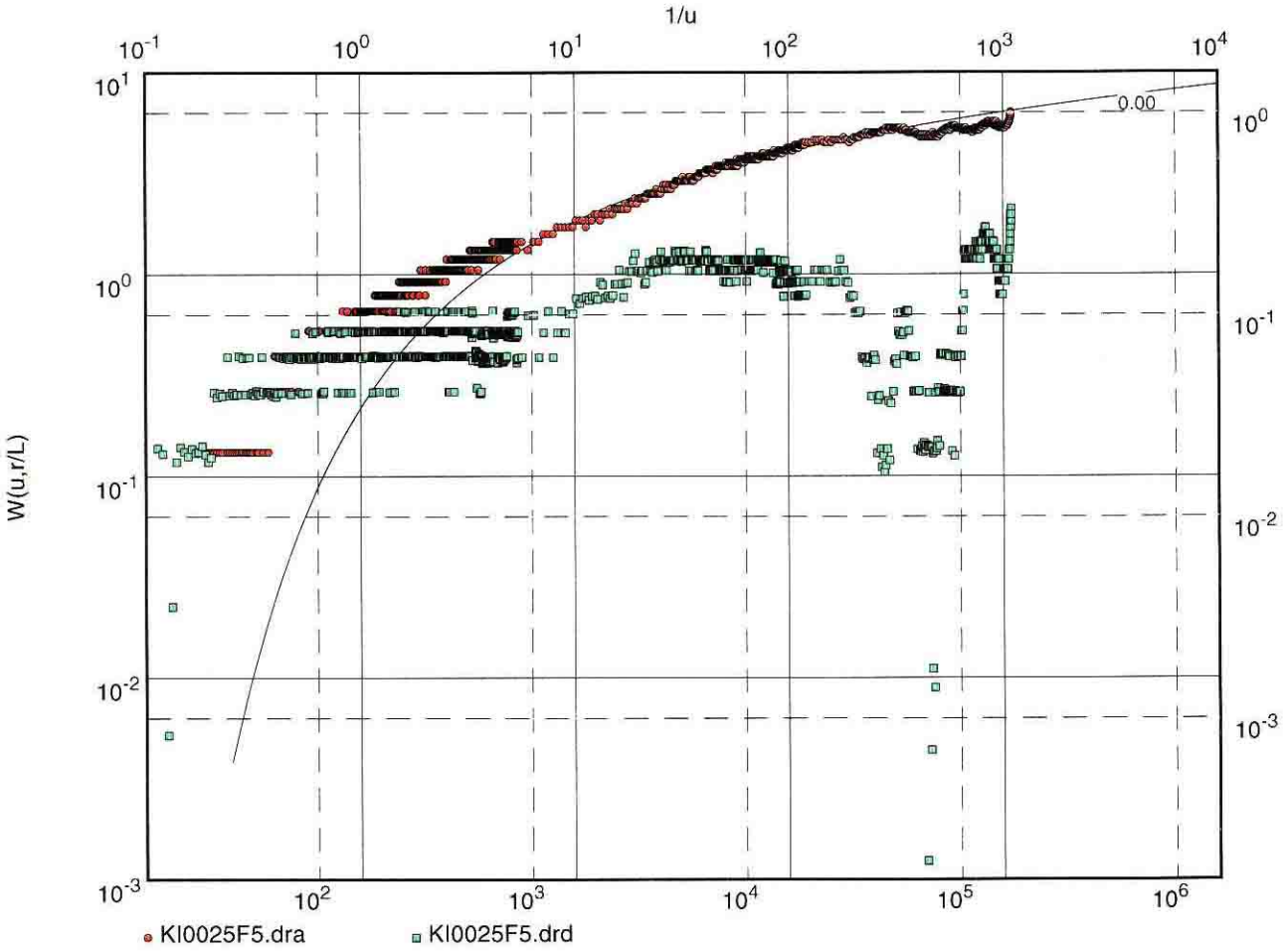
Storativity: 3.12×10^{-6}

Pseudo-radial flow dominating.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 4 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KI0025F:R5	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.59×10^{-5}

Storativity: 1.33×10^{-6}

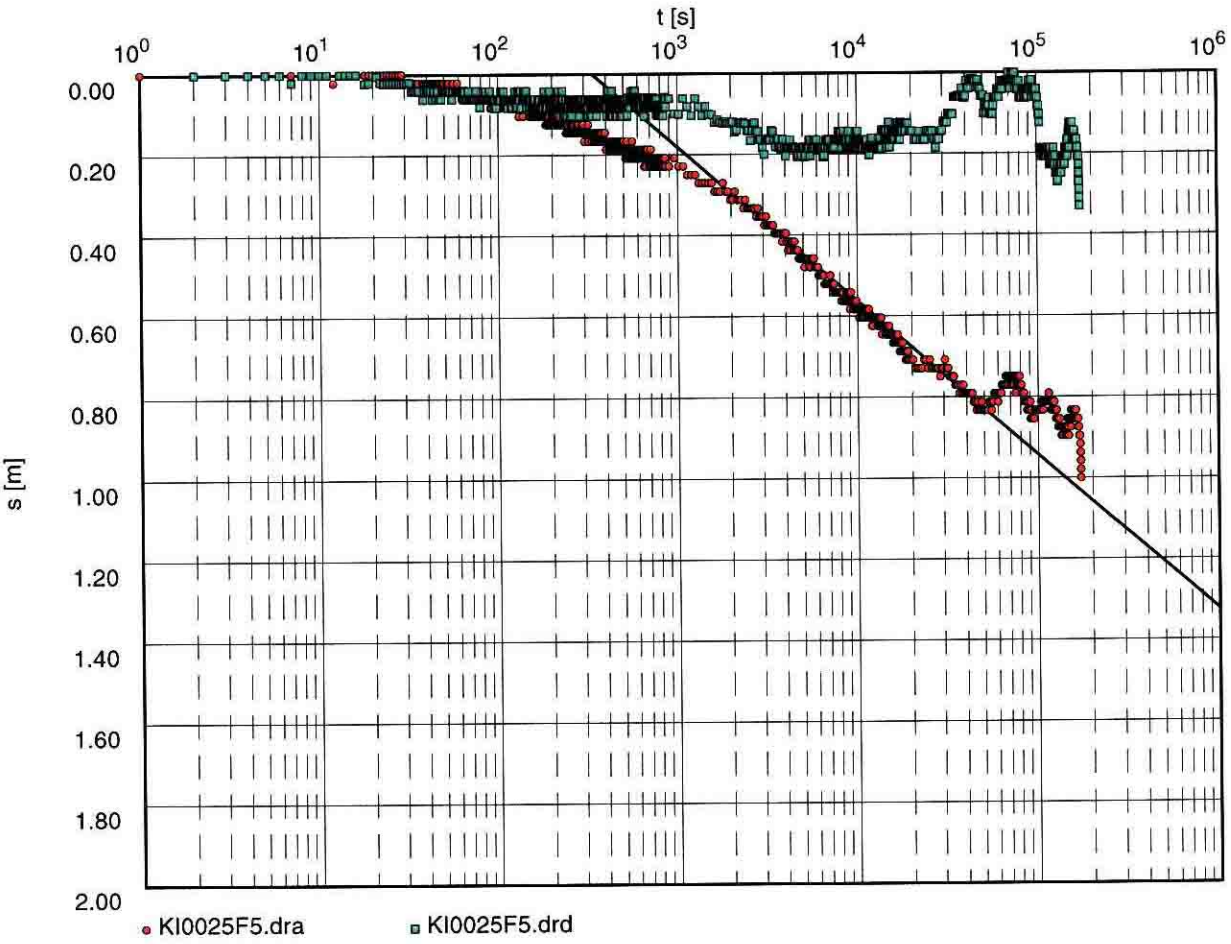
Indications of early fracture flow.

Dominating pseudo-radial flow.

Tidal effects distort late time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 5 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KI0025F:R5	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.48×10^{-5}

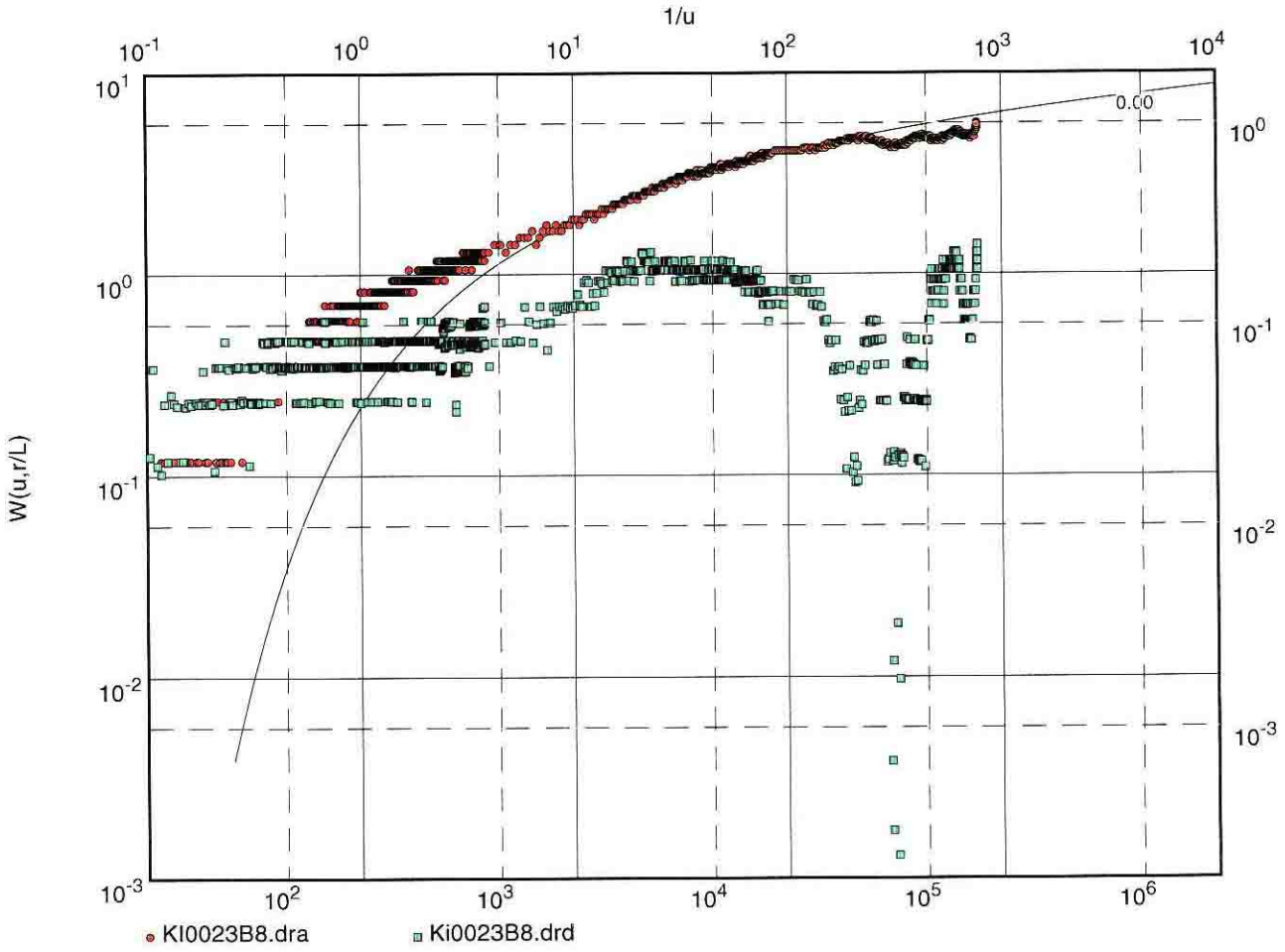
Storativity: 1.51×10^{-6}

Indications of early fracture flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KI0023B:P8	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.31×10^{-5}

Storativity: 1.59×10^{-6}

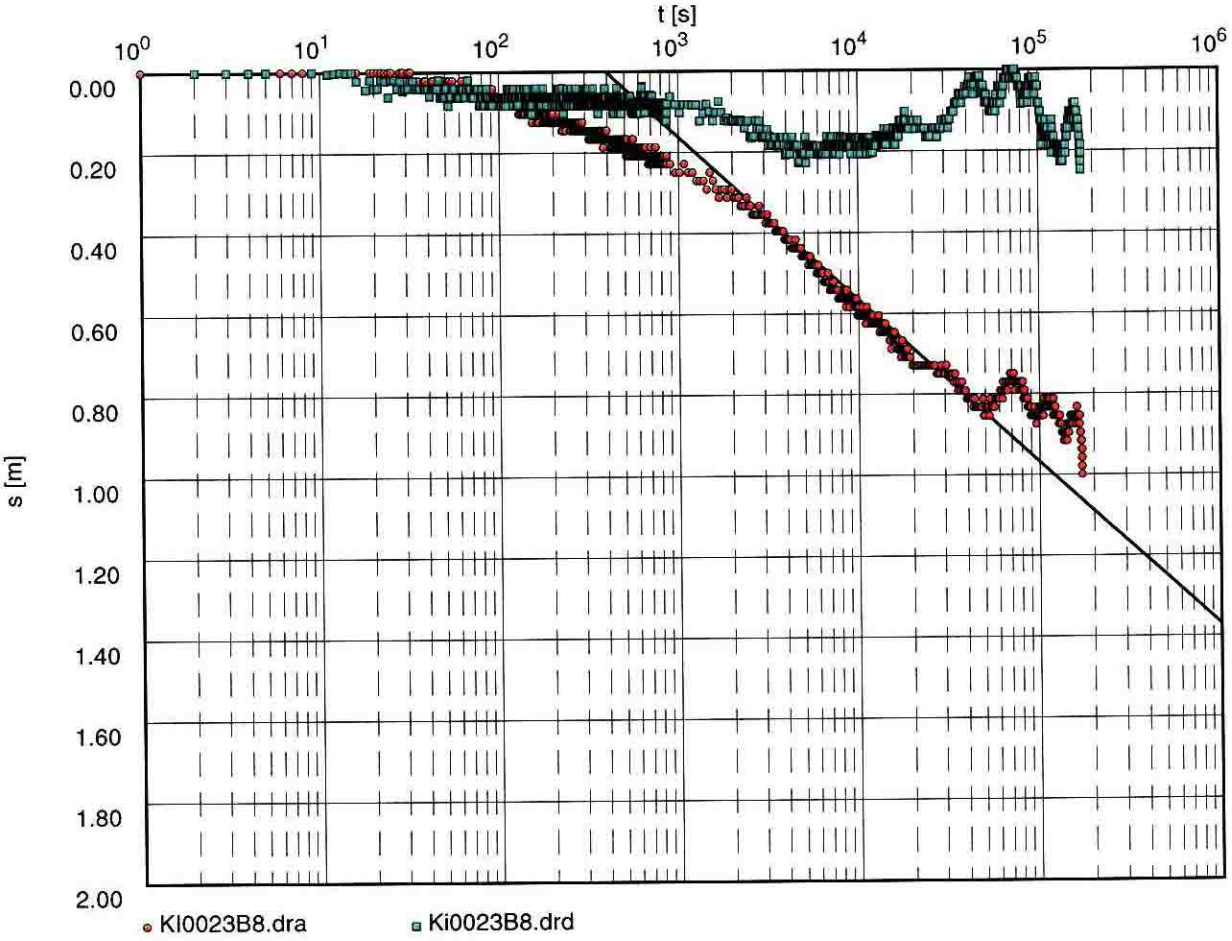
Indications of early fracture flow.

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KI0023B:P8	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.34×10^{-5}

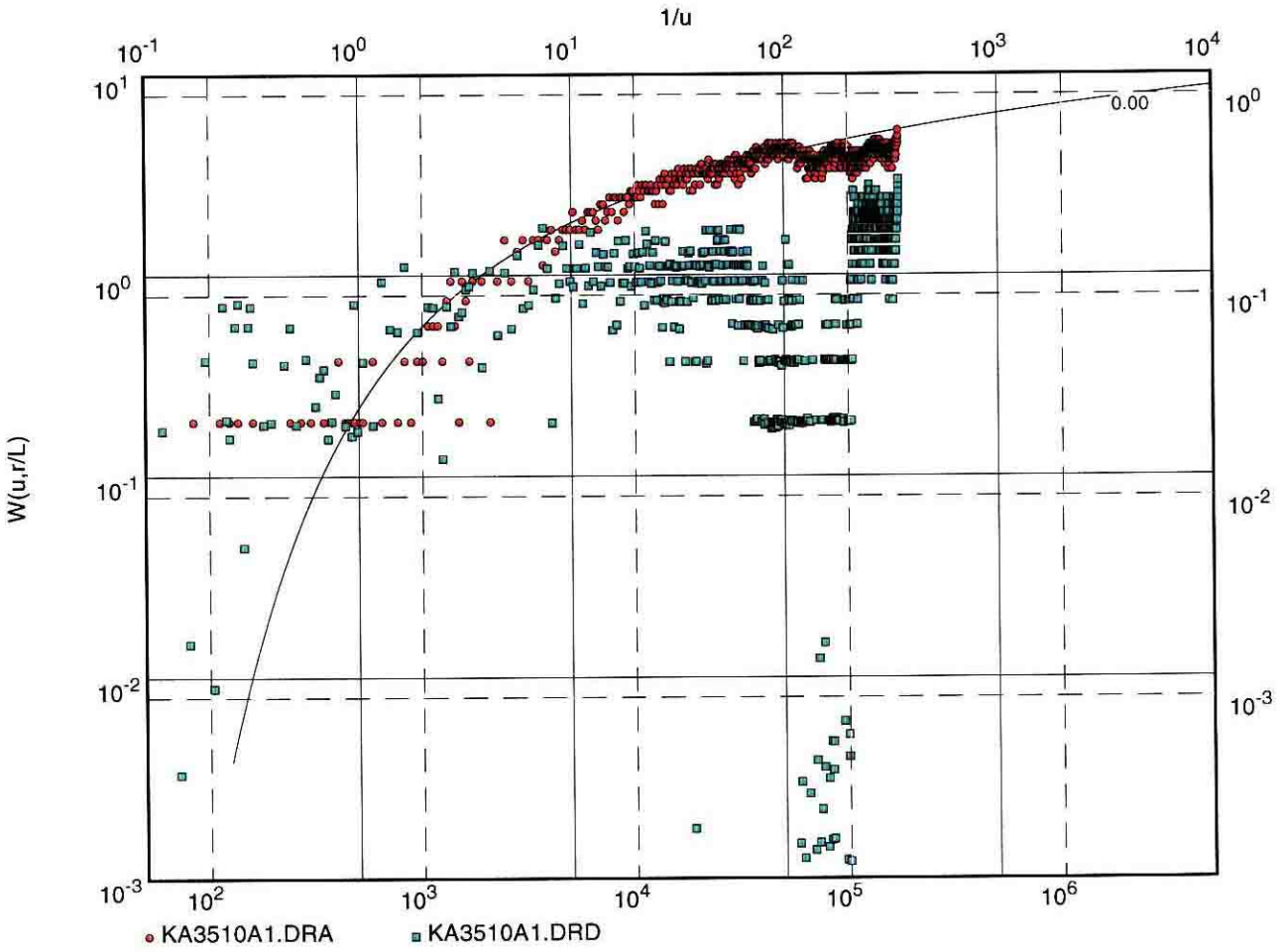
Storativity: 1.60×10^{-6}

Dominating pseudo-radial flow .

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 25.08.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3510A:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 3.16×10^{-5}

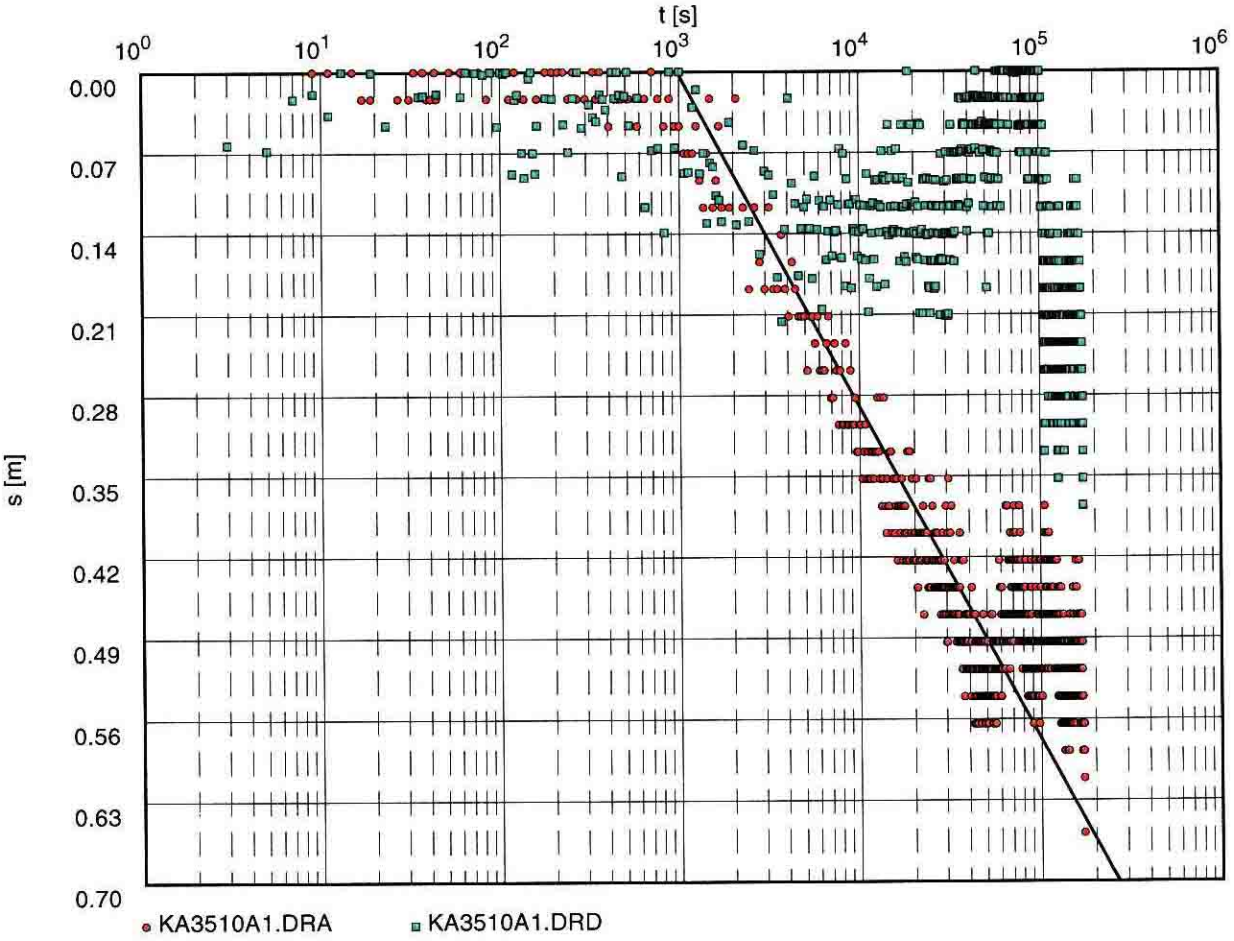
Storativity: 2.36×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 25.08.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3510A:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 3.18×10^{-5}

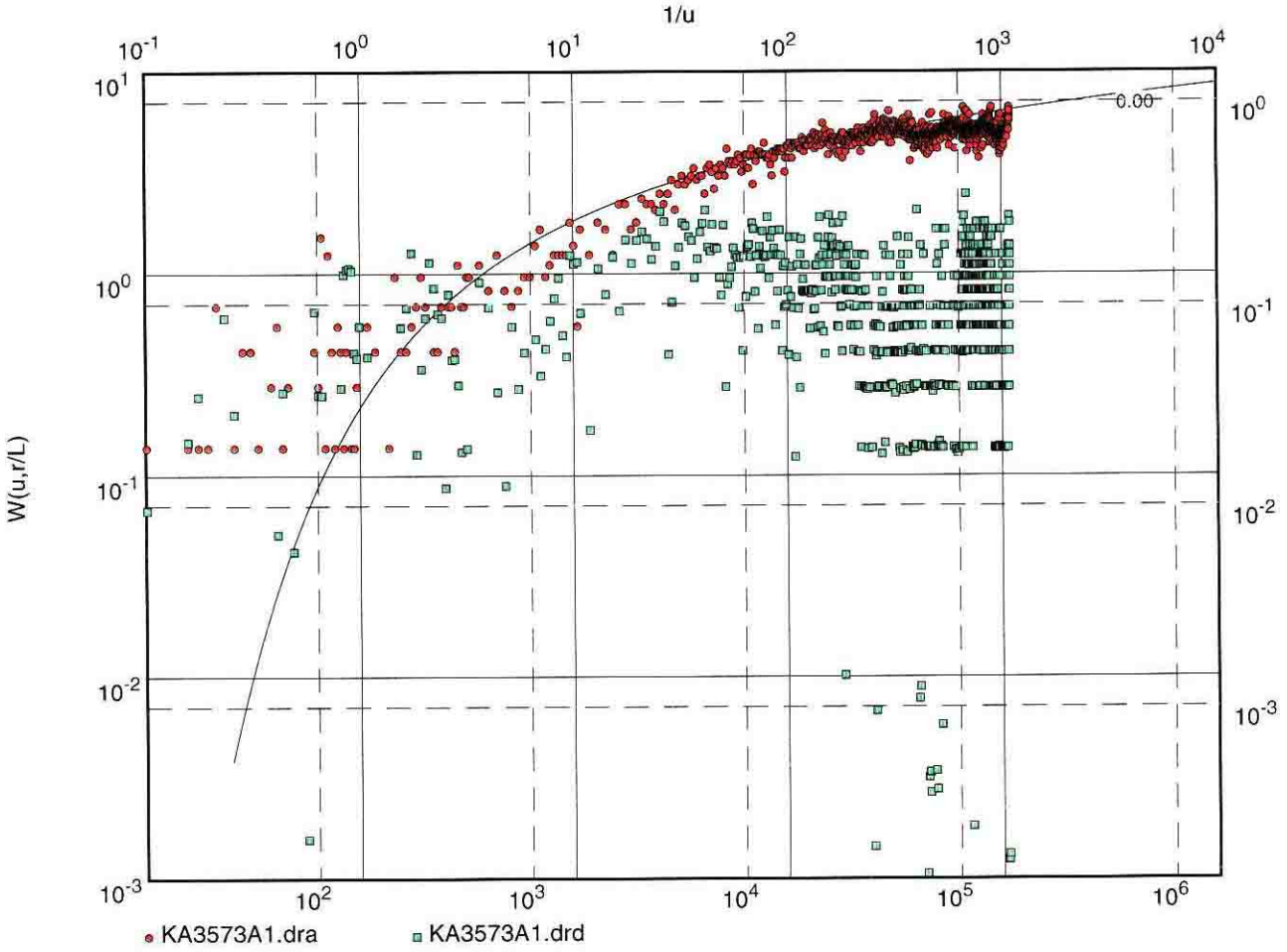
Storativity: 2.61×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 10 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3573A:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.81×10^{-5}

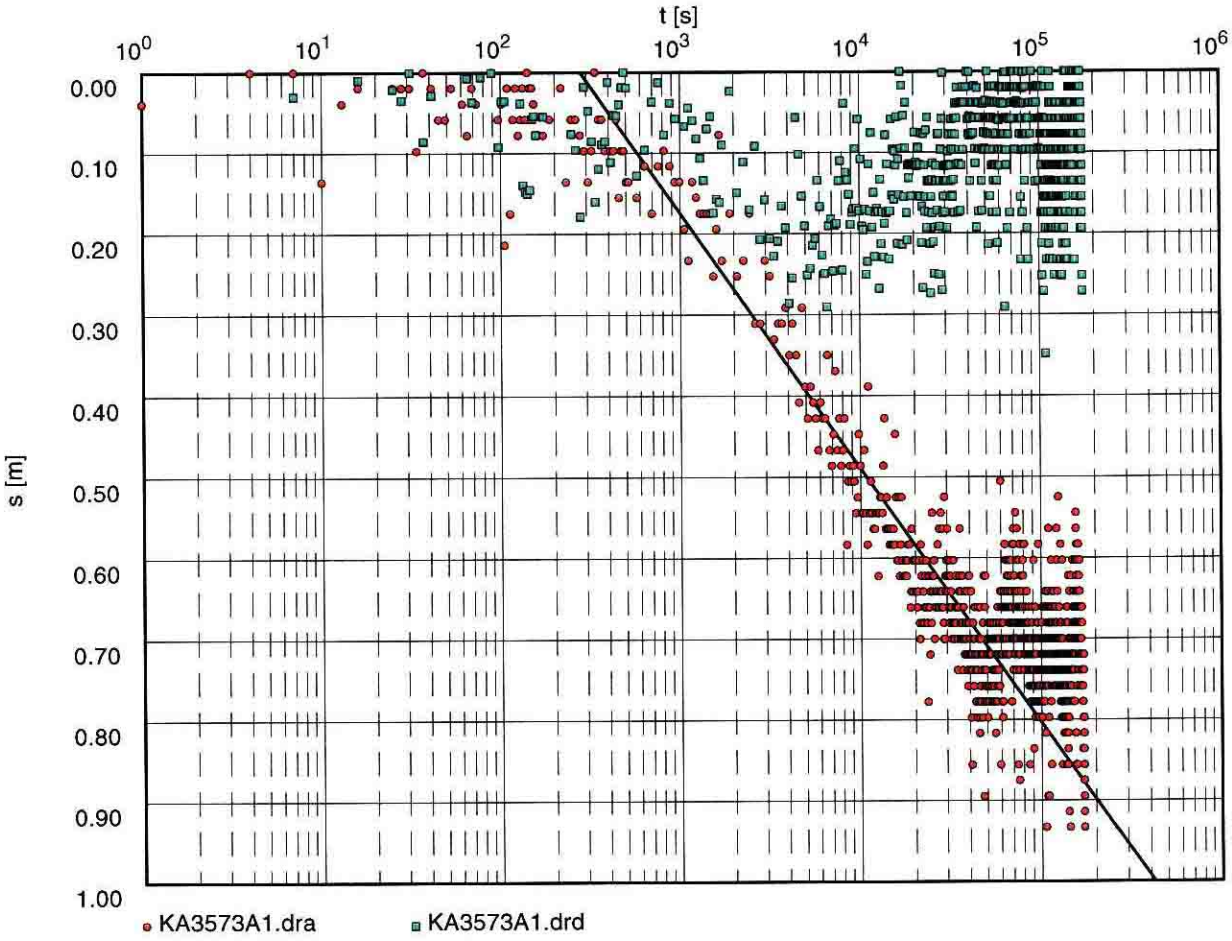
Storativity: 9.51×10^{-7}

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3573A:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.90×10^{-5}

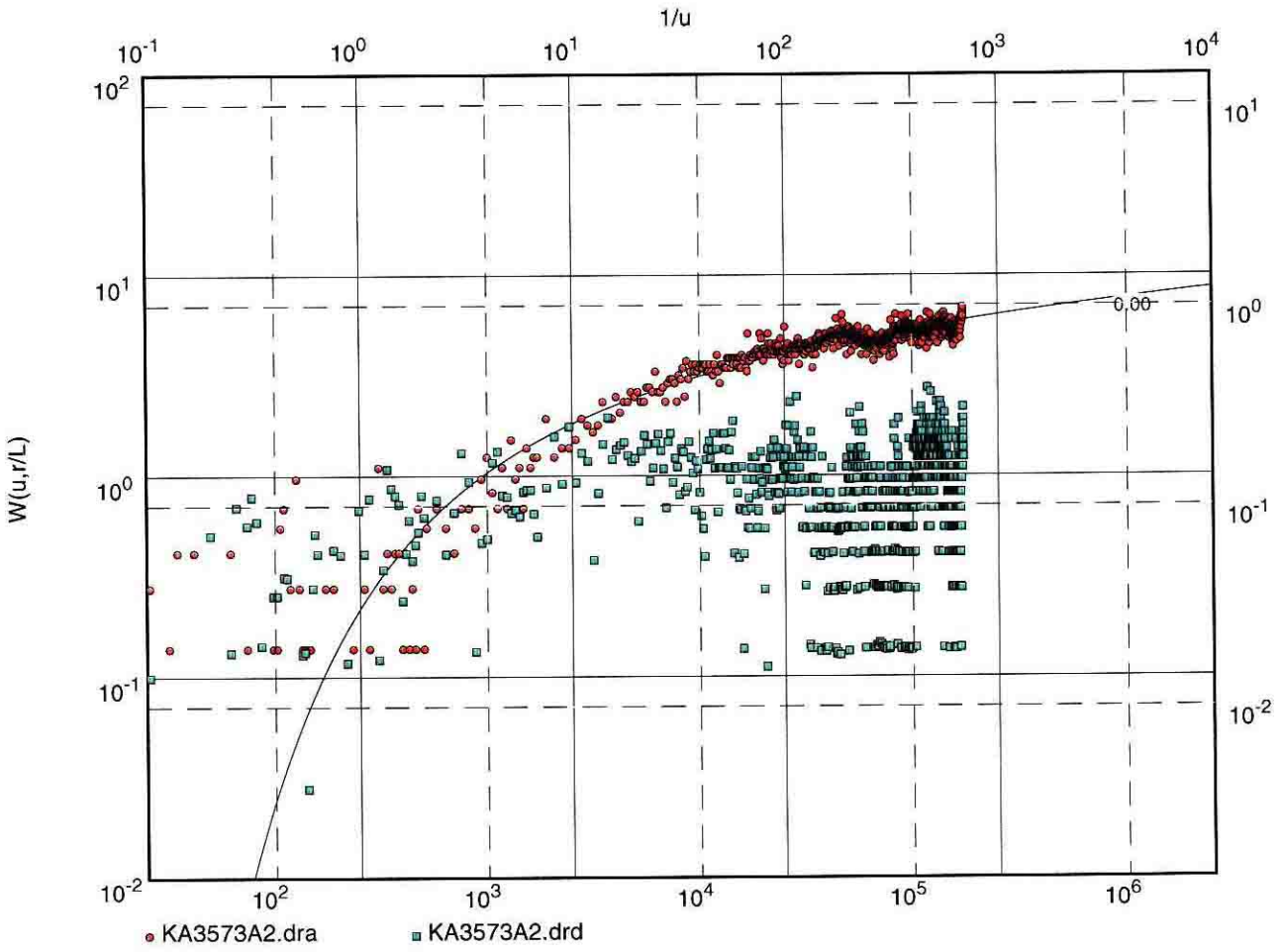
Storativity: 9.71×10^{-7}

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 12 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3573A:P2	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.91×10^{-5}

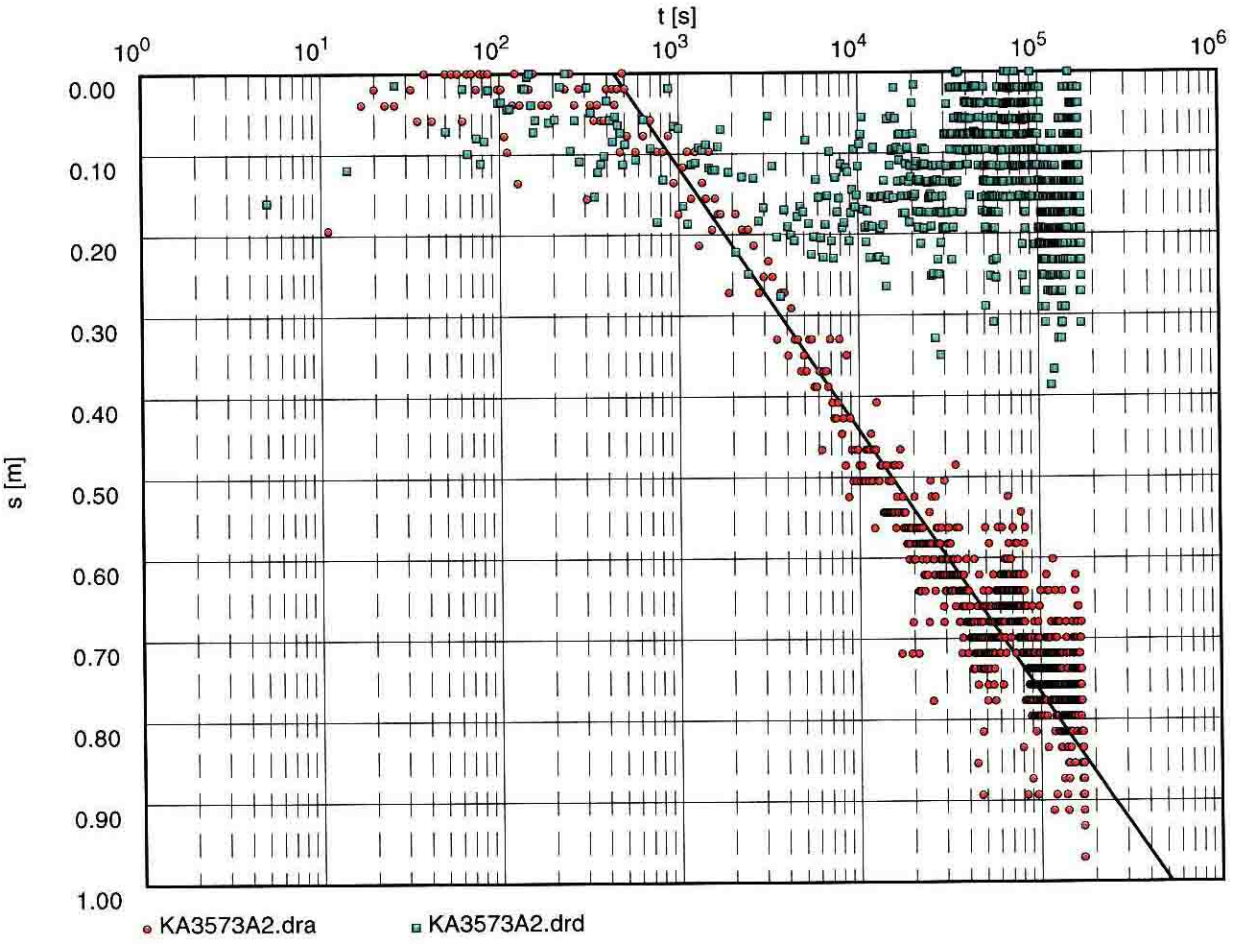
Storativity: 1.42×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort the late-time test data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 13 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3573A:P2	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.90×10^{-5}

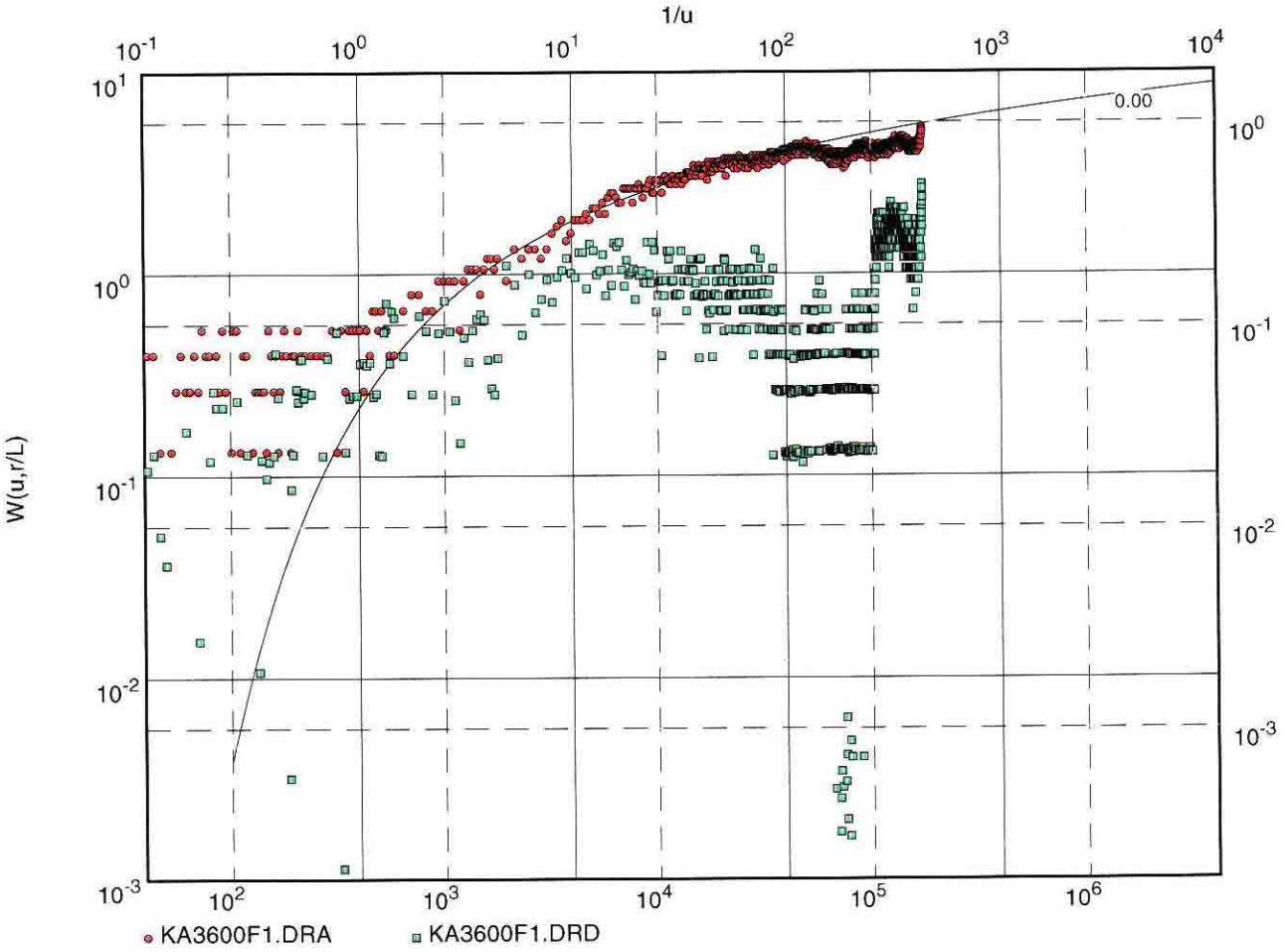
Storativity: 1.39×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late-time test data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 14 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3600F:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.31×10^{-5}

Storativity: 1.04×10^{-6}

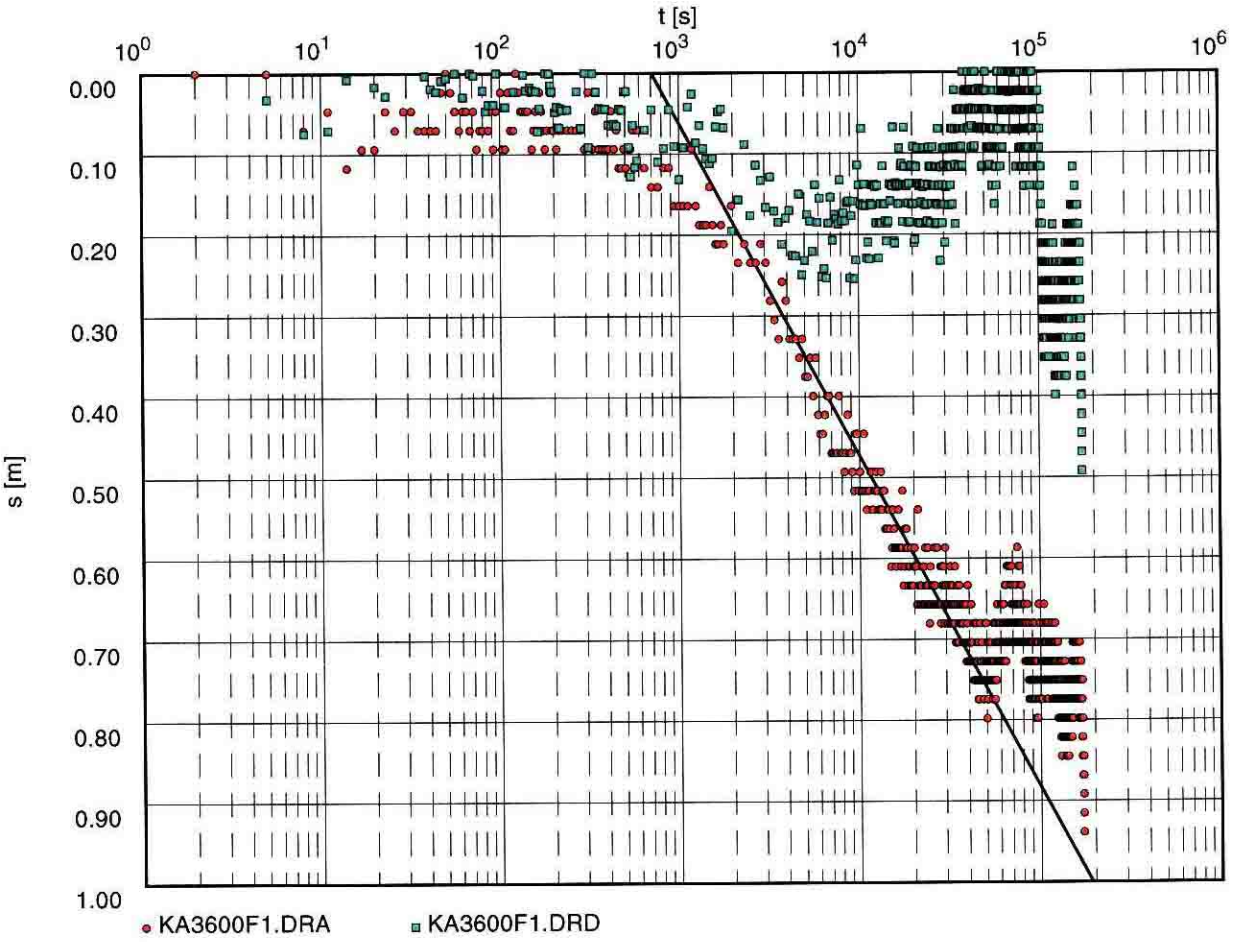
Indications of early fracture flow.

Dominating pseudo-radial flow.

Tidal effects distort the late-time test data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 15 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3600F:P1	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.30×10^{-5}

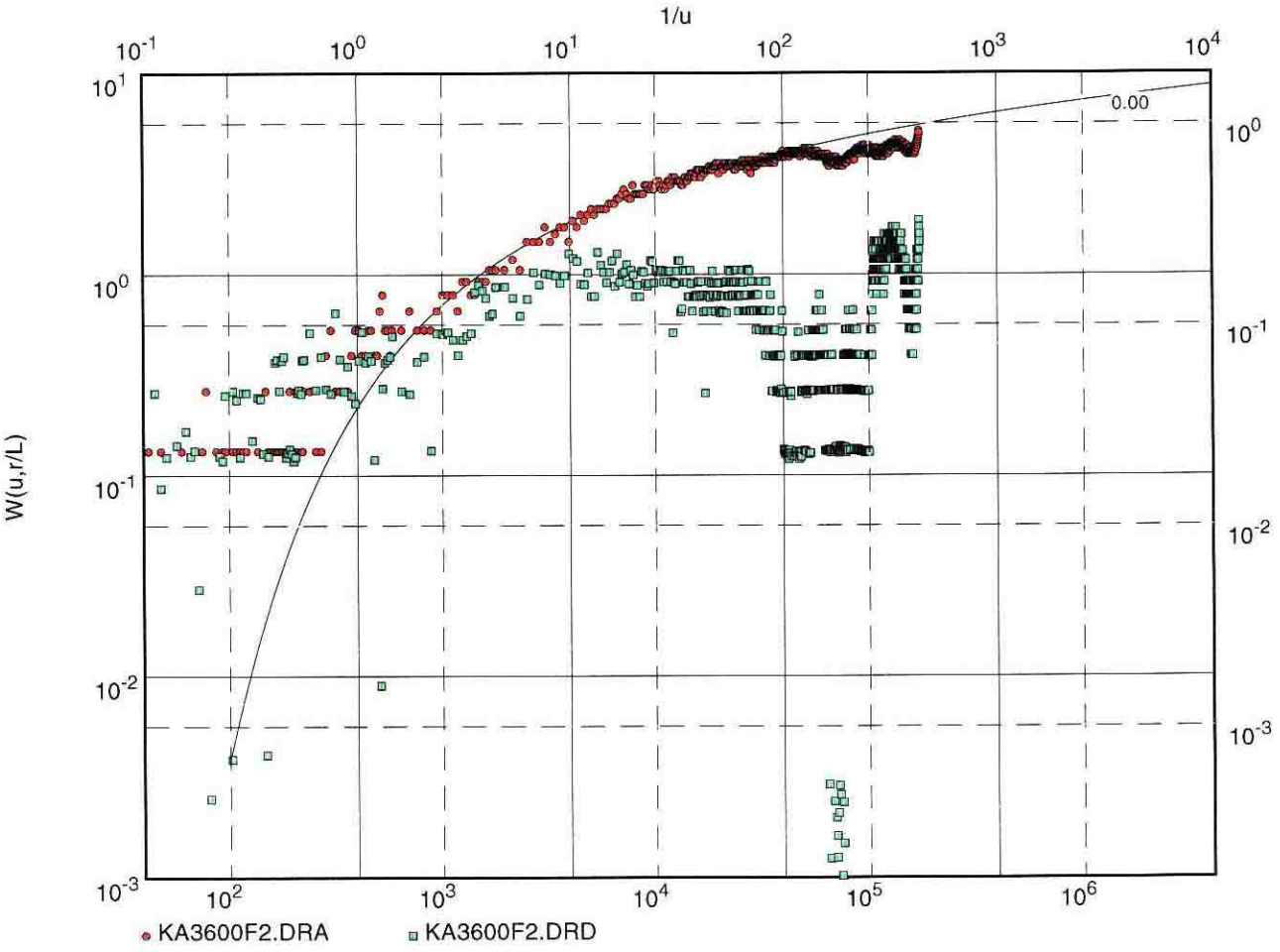
Storativity: 1.03×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late time test data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 1, Page 16 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3600F:P2	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.31×10^{-5}

Storativity: 1.20×10^{-6}

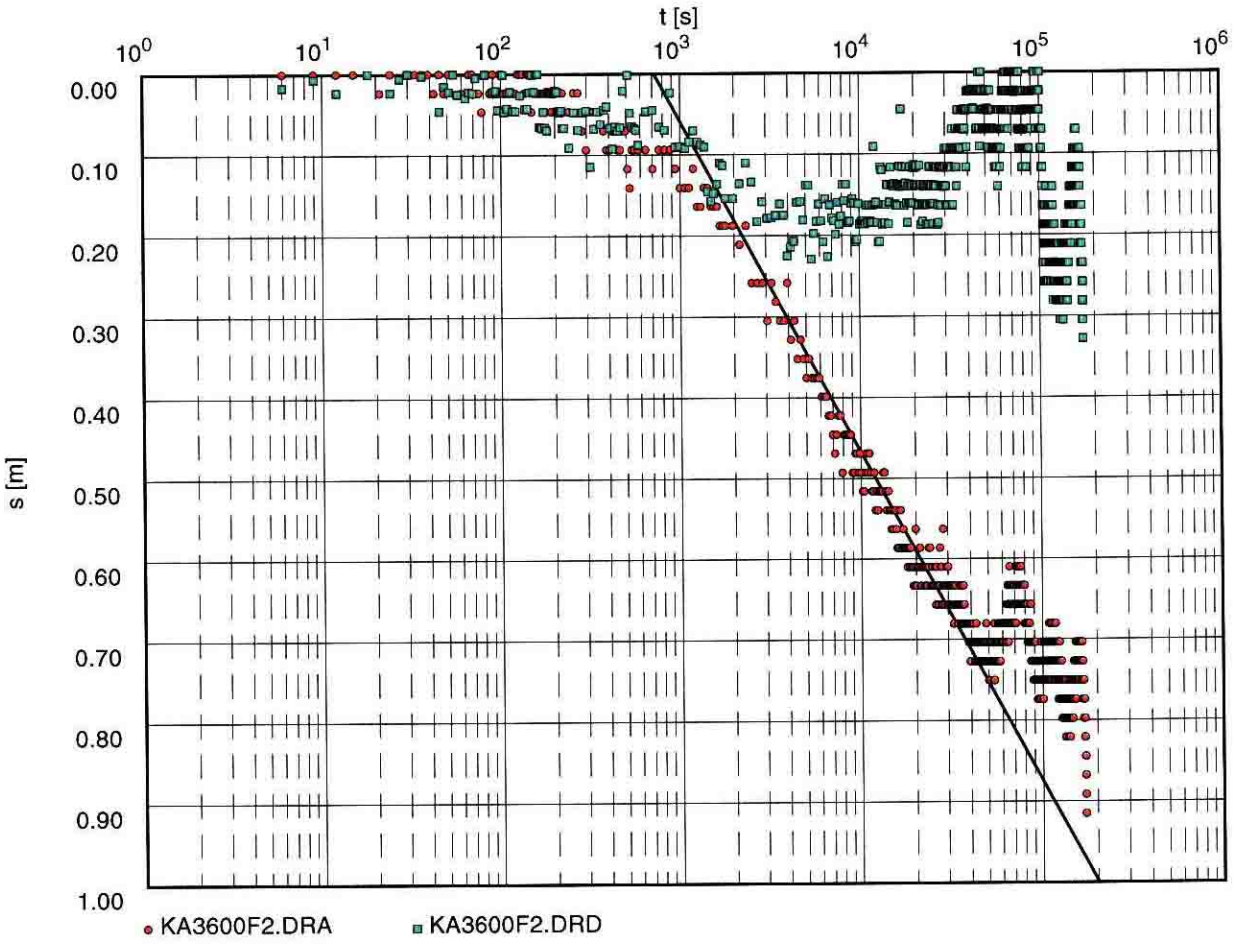
Indications of early fracture flow.

Dominating pseudo-radial flow.

Tidal effects distort the late-time test data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 1, Page 17 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ENW-2	Test conducted on: 1998-03-11
KA3600F:P2	
Discharge 0.05 l/s	



Transmissivity [m²/s]: 2.31×10^{-5}

Storativity: 1.22×10^{-6}

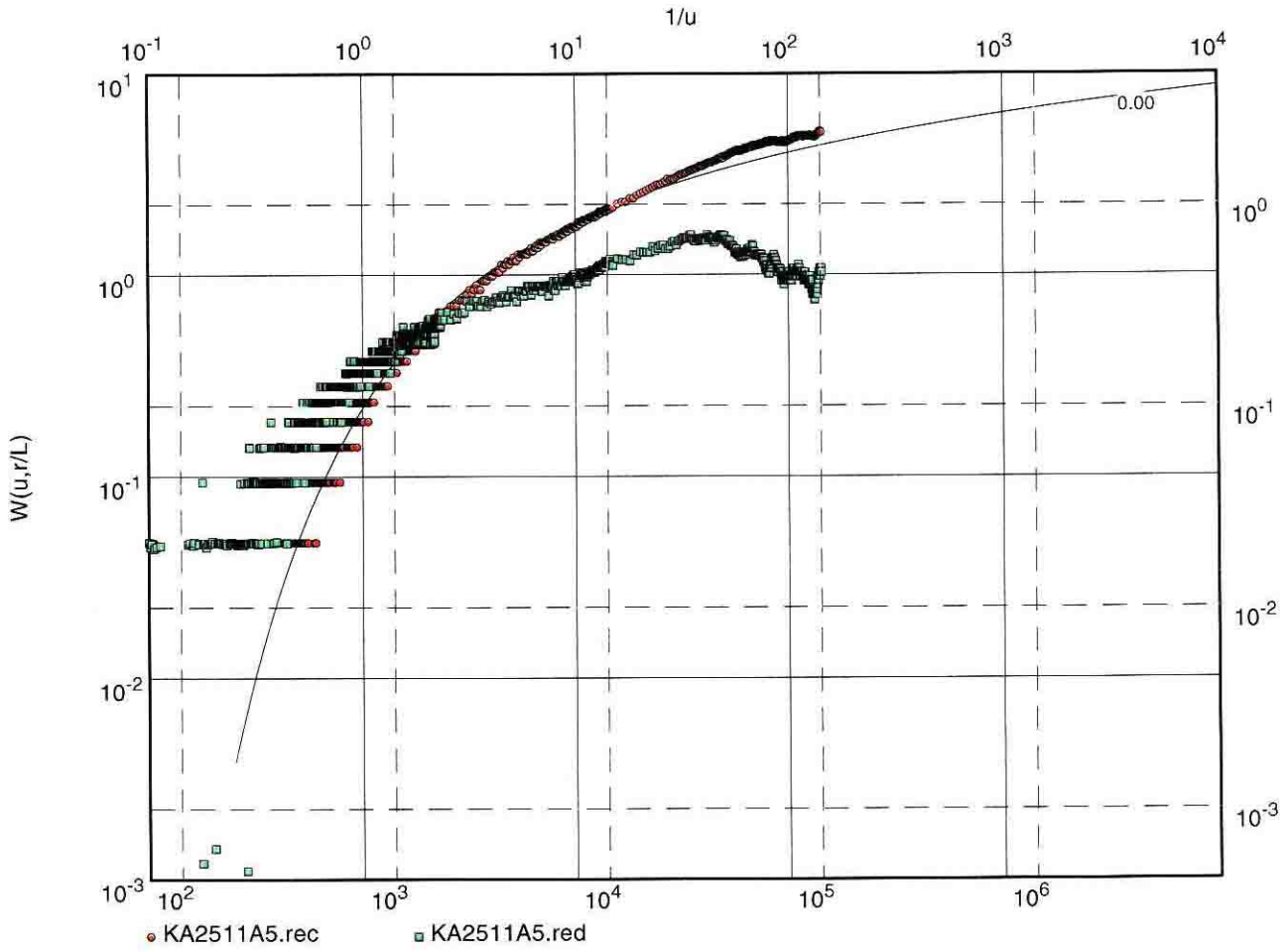
Dominating pseudo-radial flow.

Tidal effects distort late-time test data.

ENCLOSURE 2 – TEST ENW-1

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 1 Project: TRUE-Block Scale Evaluated by: JEL | Date: 5.07.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2511A5	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.65×10^{-5}

Storativity: 3.65×10^{-6}

Indications of early fracture flow.

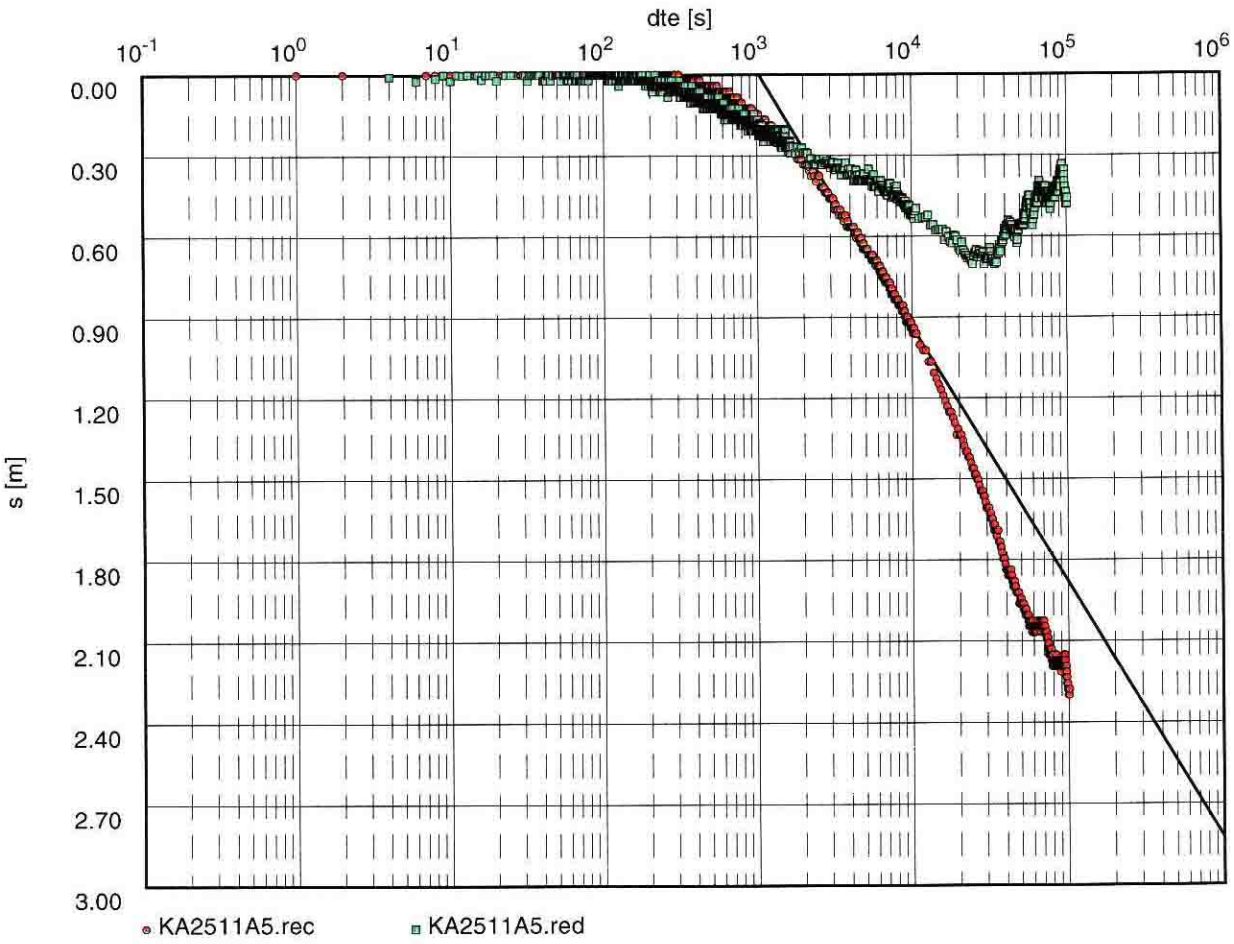
Pseudo-radial flow during intermediate times.

Apparent no-flow hydraulic boundary at late times.

Effects of slight leakance (support flow) by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 2 Project: TRUE-Block Scale Evaluated by: JEL | Date: 5.07.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2511A5	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.88×10^{-5}

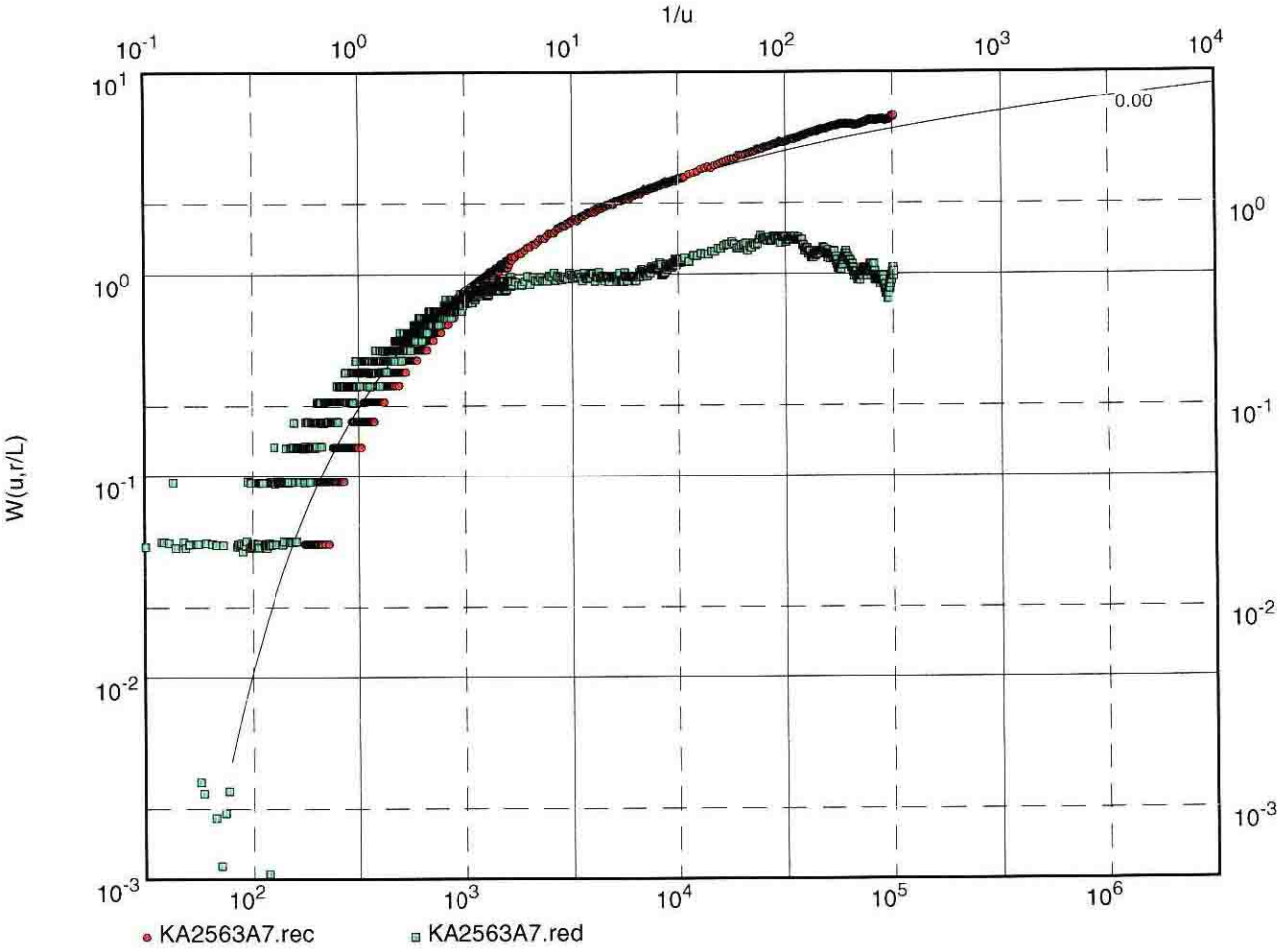
Storativity: 3.23×10^{-6}

Pseudo-radial flow at intermediate times.

Apparent no-flow hydraulic boundary at late times followed by a slight leakance (support flow).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 3 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2563A:R7	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.65×10^{-5}

Storativity: 5.36×10^{-6}

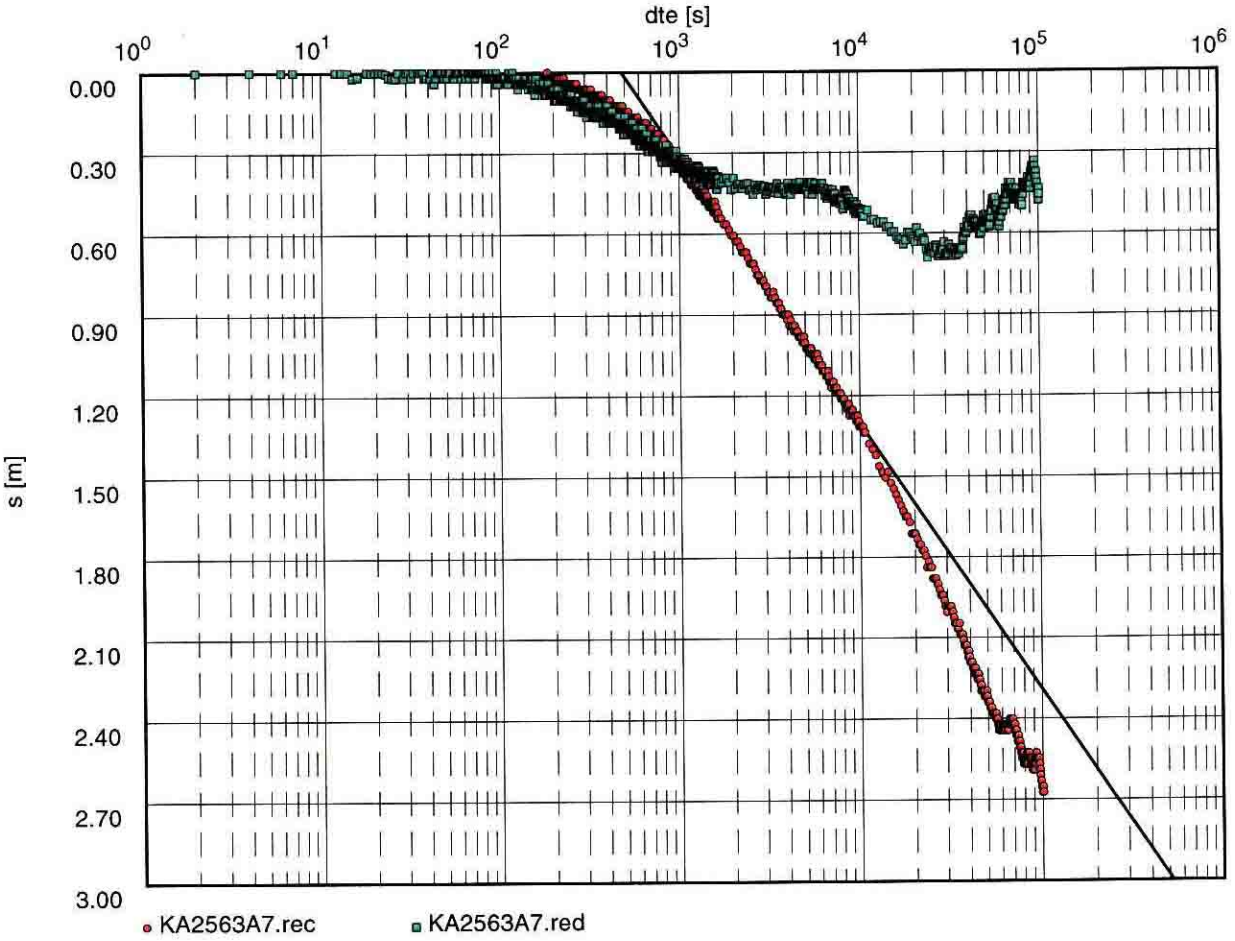
Indications of early fracture flow.

Pseudo-radial flow at intermediate times.

Effects of apparent no-flow hydraulic boundary at intermediate times followed by a slight leakance (support flow) by the end of test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 4 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2563A:R7	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.76×10^{-5}

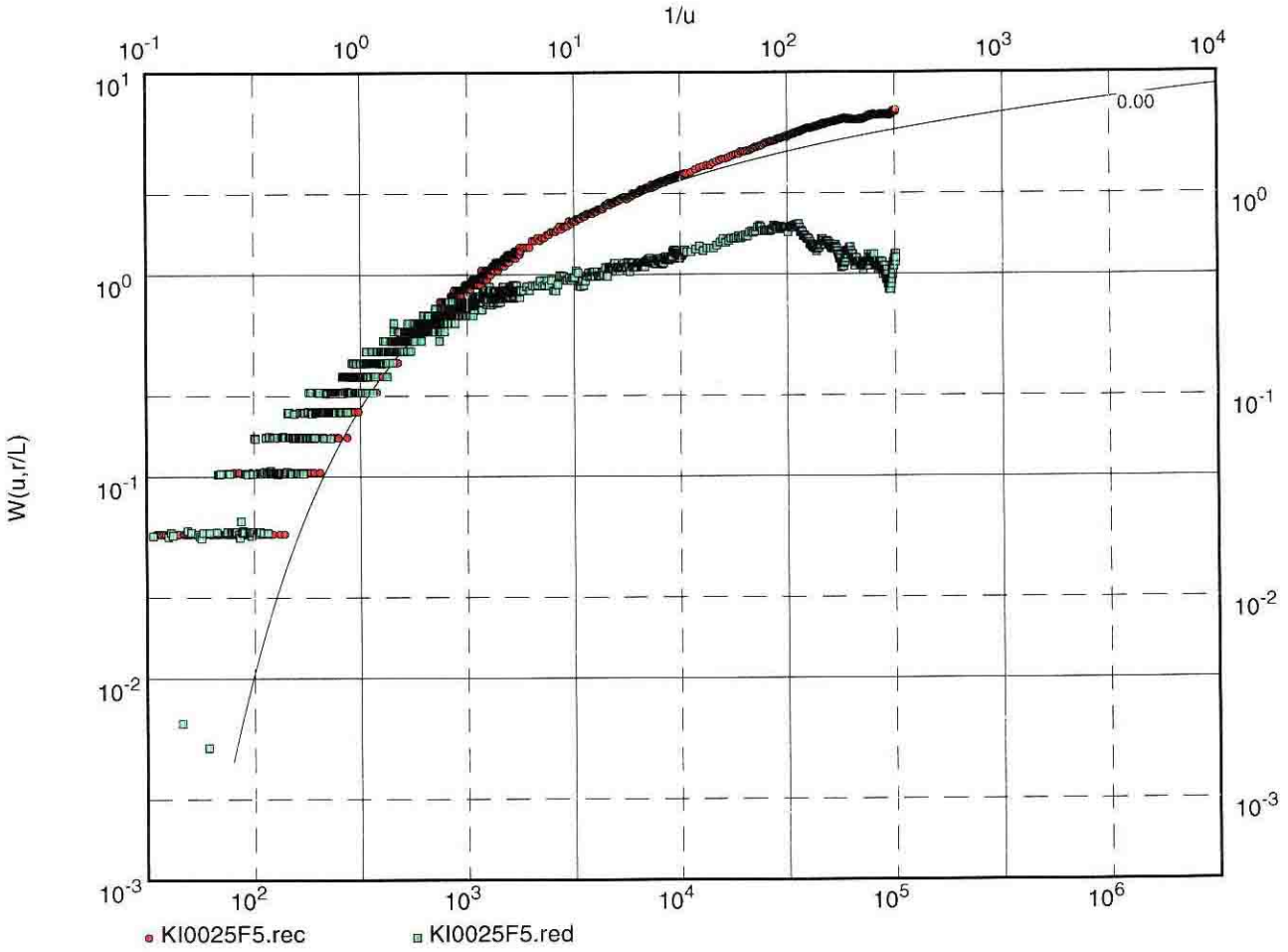
Storativity: 4.77×10^{-6}

Pseudo-radial flow at intermediate times.

Effects of apparent no-flow hydraulic boundary at late times followed by a slight leakance (support flow) by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 5 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0025F:R5	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.97×10^{-5}

Storativity: 3.70×10^{-6}

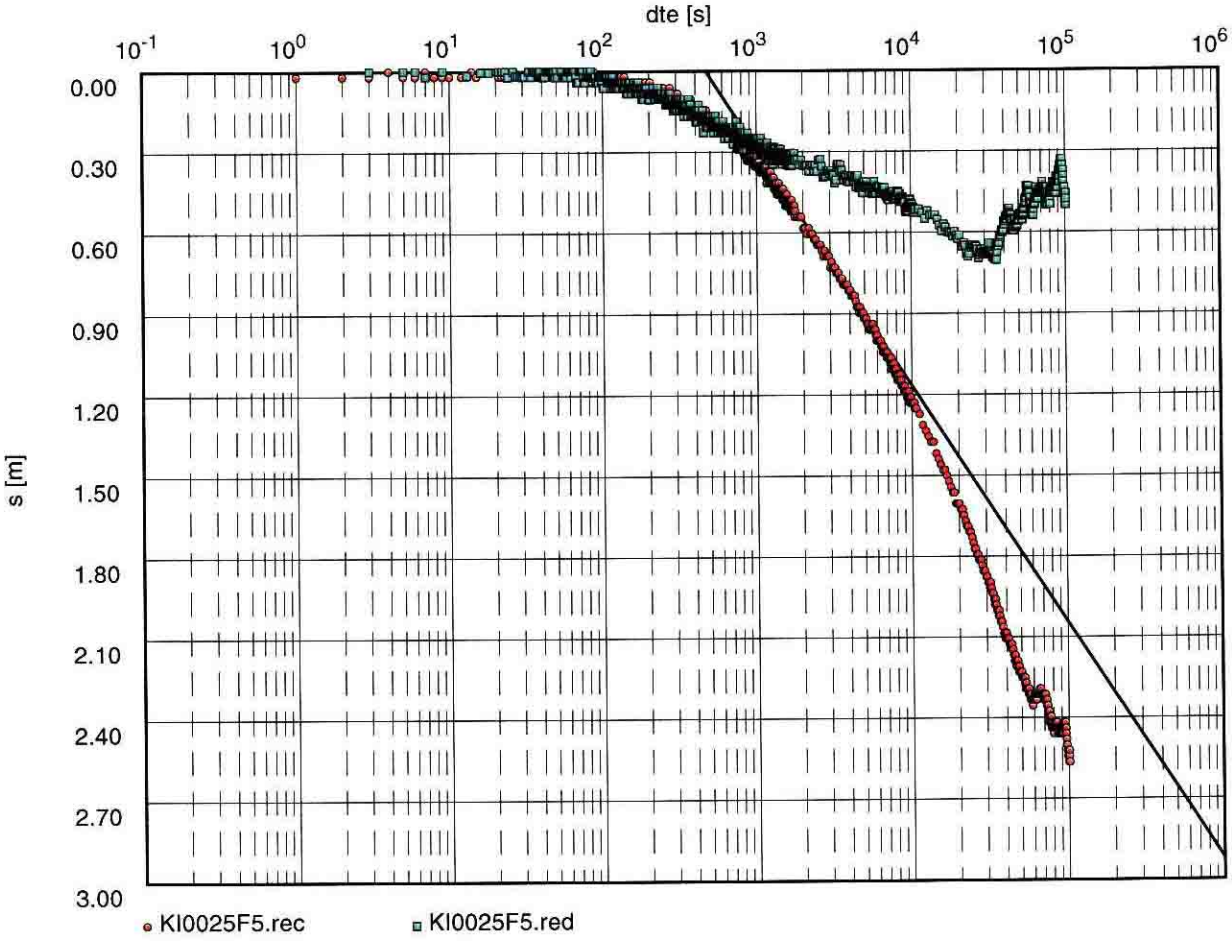
Effects of early fracyure flow.

Pseudo-radial flow at intermediate times.

Weak effects of apparent no-flow hydraulic boundary at late times followed by a slight leakance (support flow) by the end of test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0025F:R5	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 3.10×10^{-5}

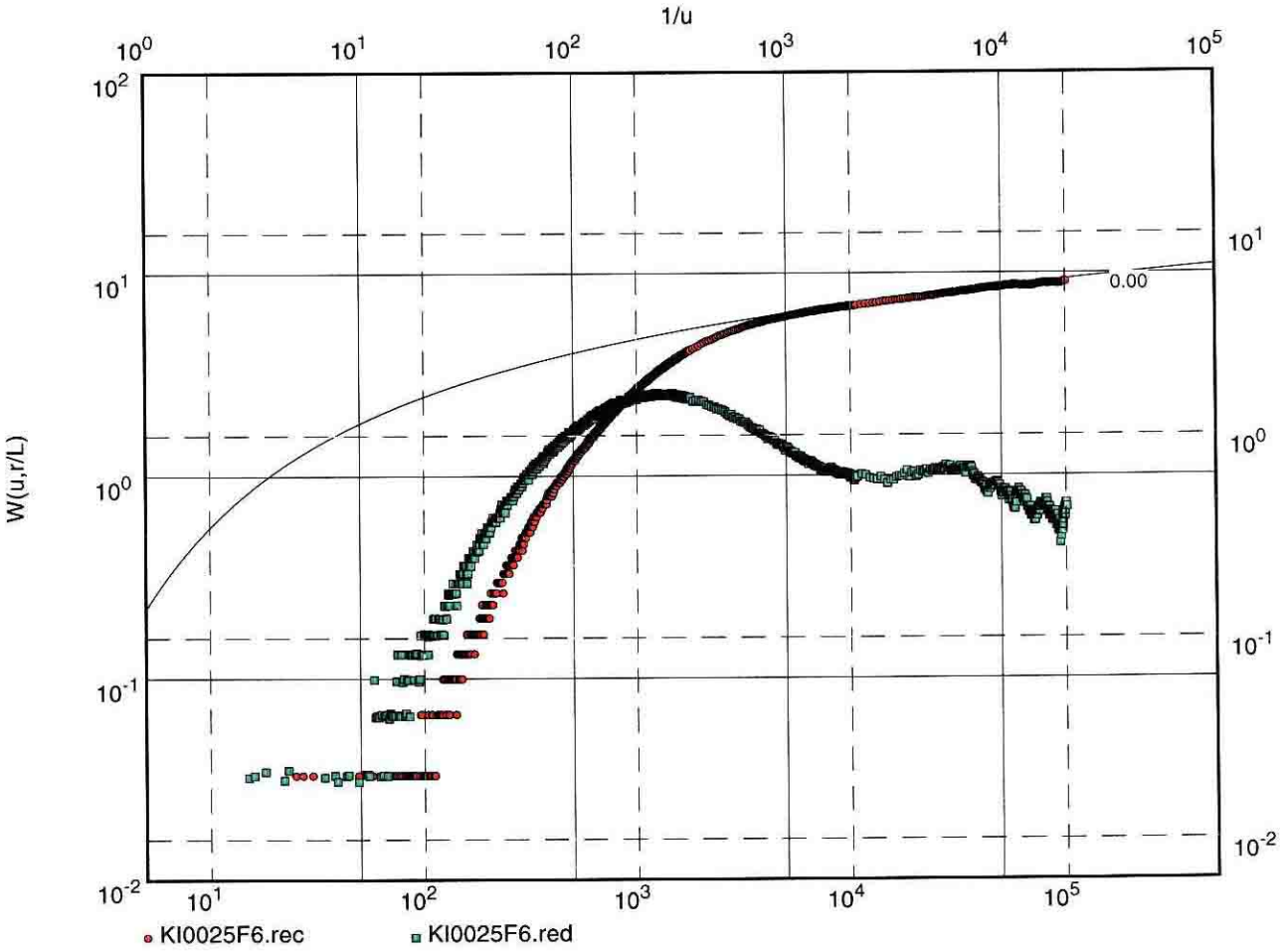
Storativity: 3.22×10^{-6}

Pseudo-radial flow at intermediate times.

Effects of apparent no-flow hydraulic boundary at late times followed by a slight leakance by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0025F:R6	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 1.87×10^{-5}

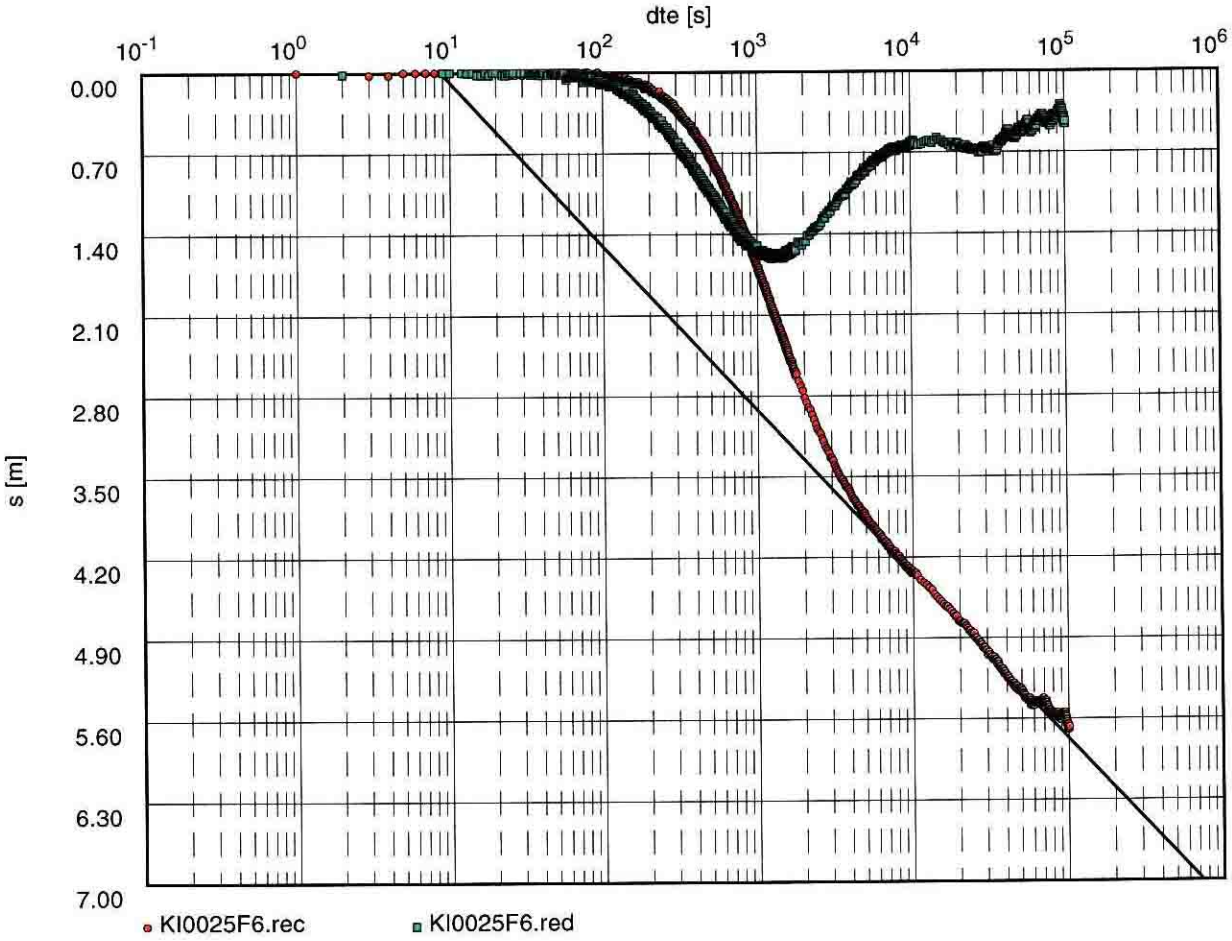
Storativity: 6.80×10^{-8}

Possibly effects of borehole storage and skin at early times.

Pseudo-radial flow at late times followed by a slight leakance (support flow) by the end of test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 5.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0025F:R6	
Discharge 0.15 l/s	



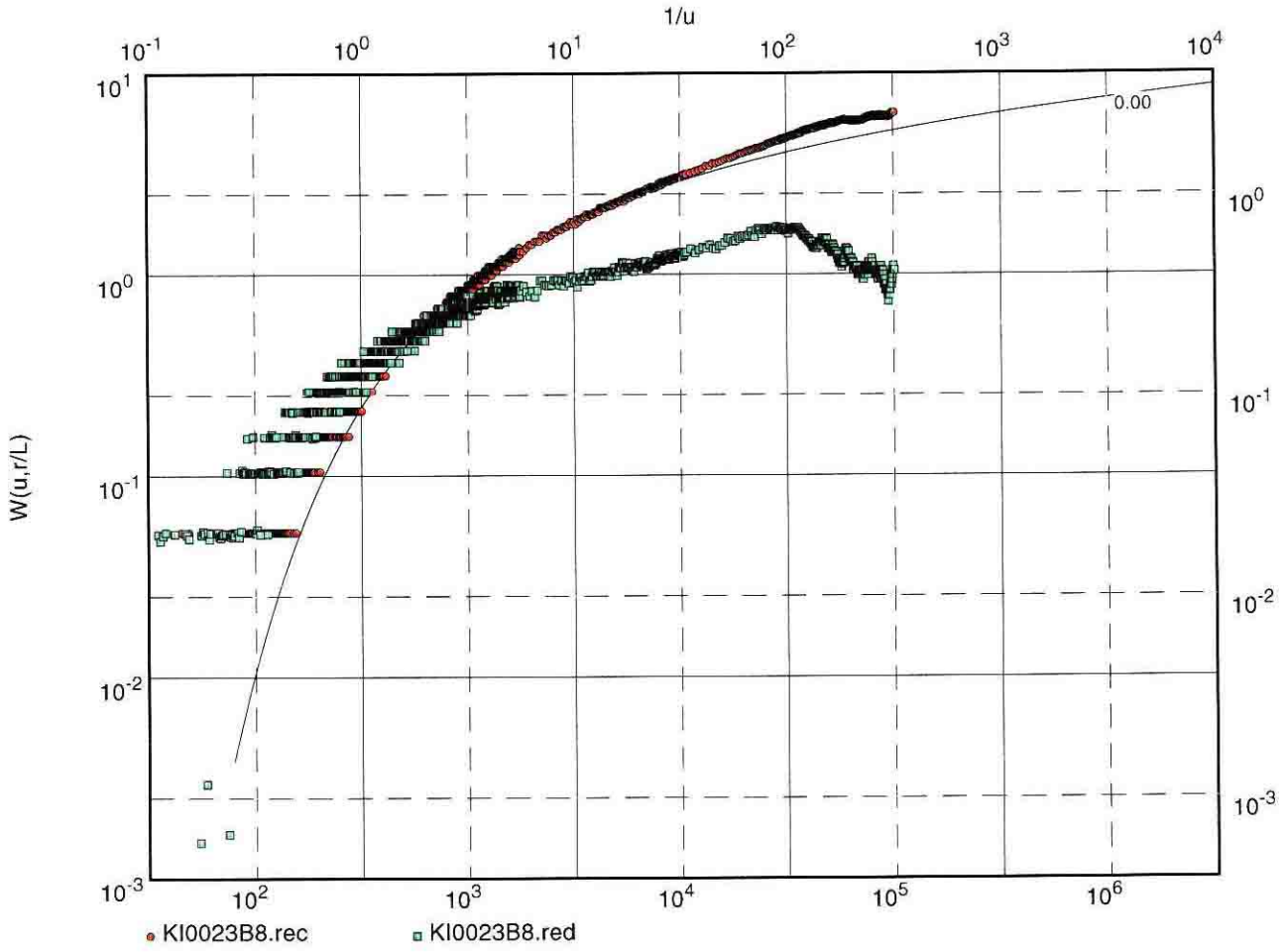
Transmissivity [m²/s]: 1.91×10^{-5}

Storativity: 6.83×10^{-8}

Pseudo-radial flow at late times followed by a slight leakance by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0023B:P8	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.97×10^{-5}

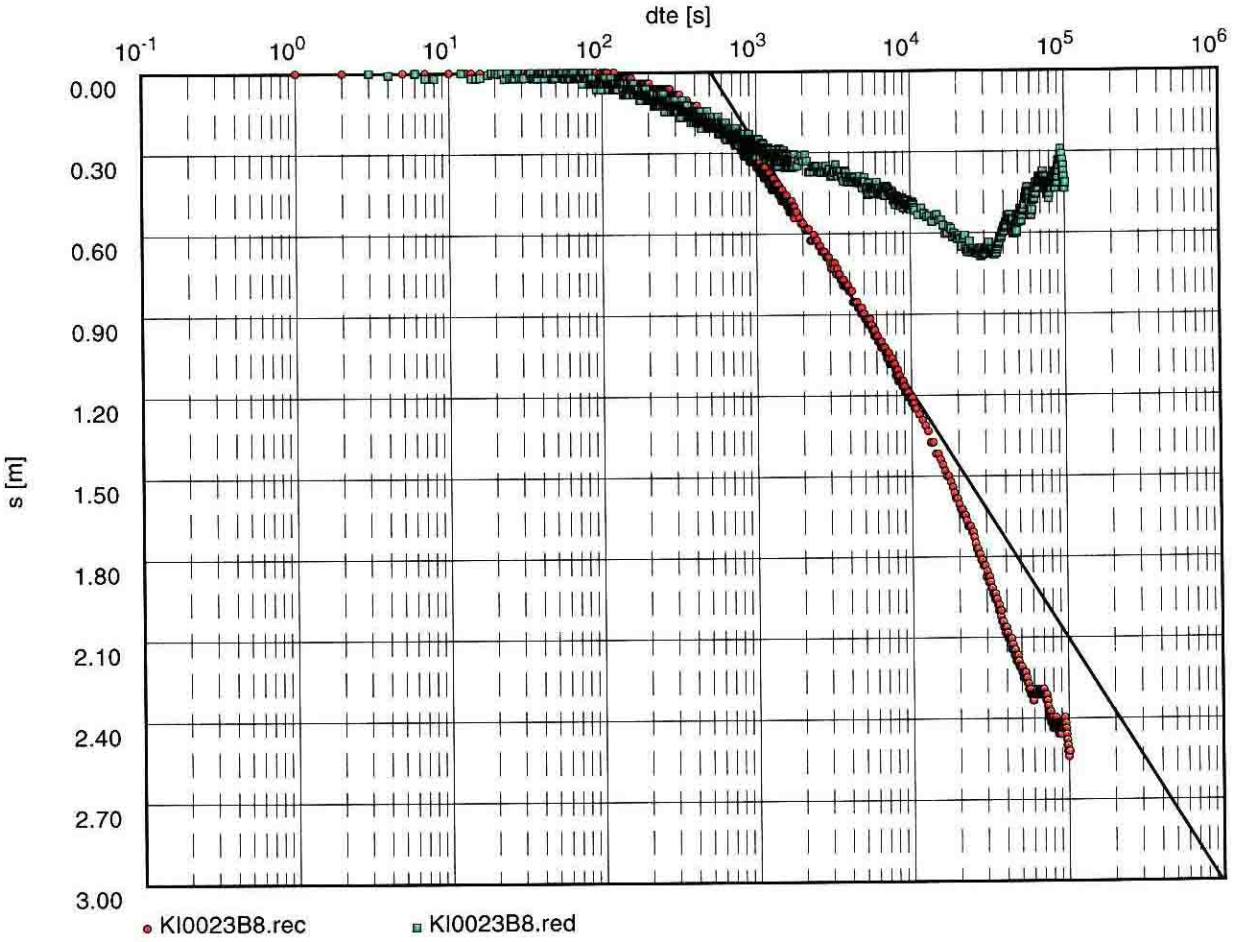
Storativity: 8.62×10^{-6}

Pseudo-radial flow at intermediate times.

Effects of apparent no-flow hydraulic boundary at late times followed by a slight leakance (support flow) by the end of test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 10 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0023B:P8	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.98×10^{-5}

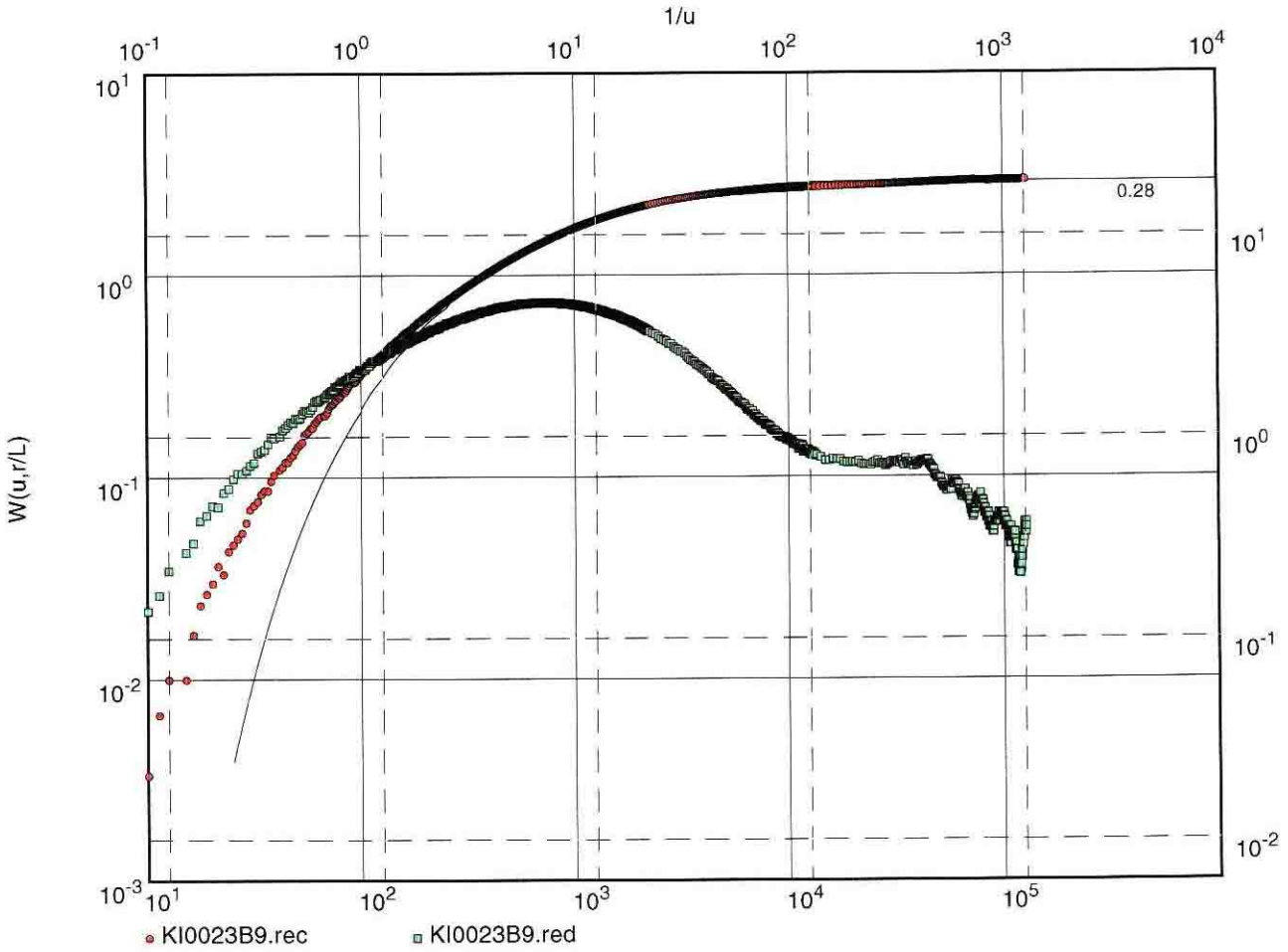
Storativity: 7.76×10^{-6}

Pseudo-radial flow during intermediate times.

Effects of apparent no-flow hydraulic boundary at late times followed by a slight leakance (support flow) by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KI0023B:P9	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 1.87×10^{-6}

Storativity: 1.59×10^{-7}

Hydraulic resistance (c) [s]: 2.54×10^{10}

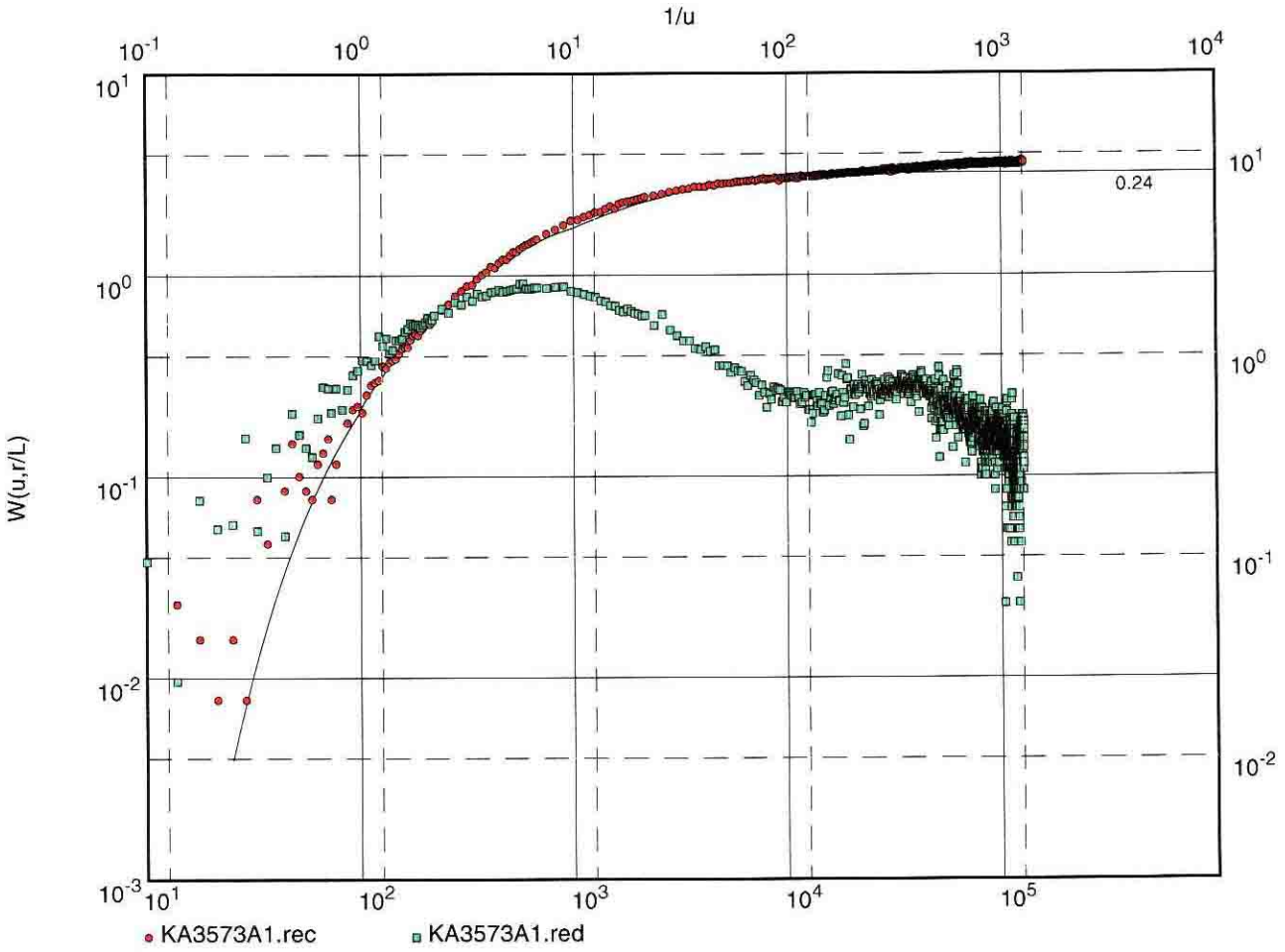
Borehole effects at early times?

Leaky flow at intermediate and late times.

Leakage coefficient K'/b'=3.94 E-11 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 12 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA3573A:P1	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 4.72×10^{-6}

Storativity: 4.47×10^{-6}

Hydraulic resistance (c) [s]: 1.23×10^{9}

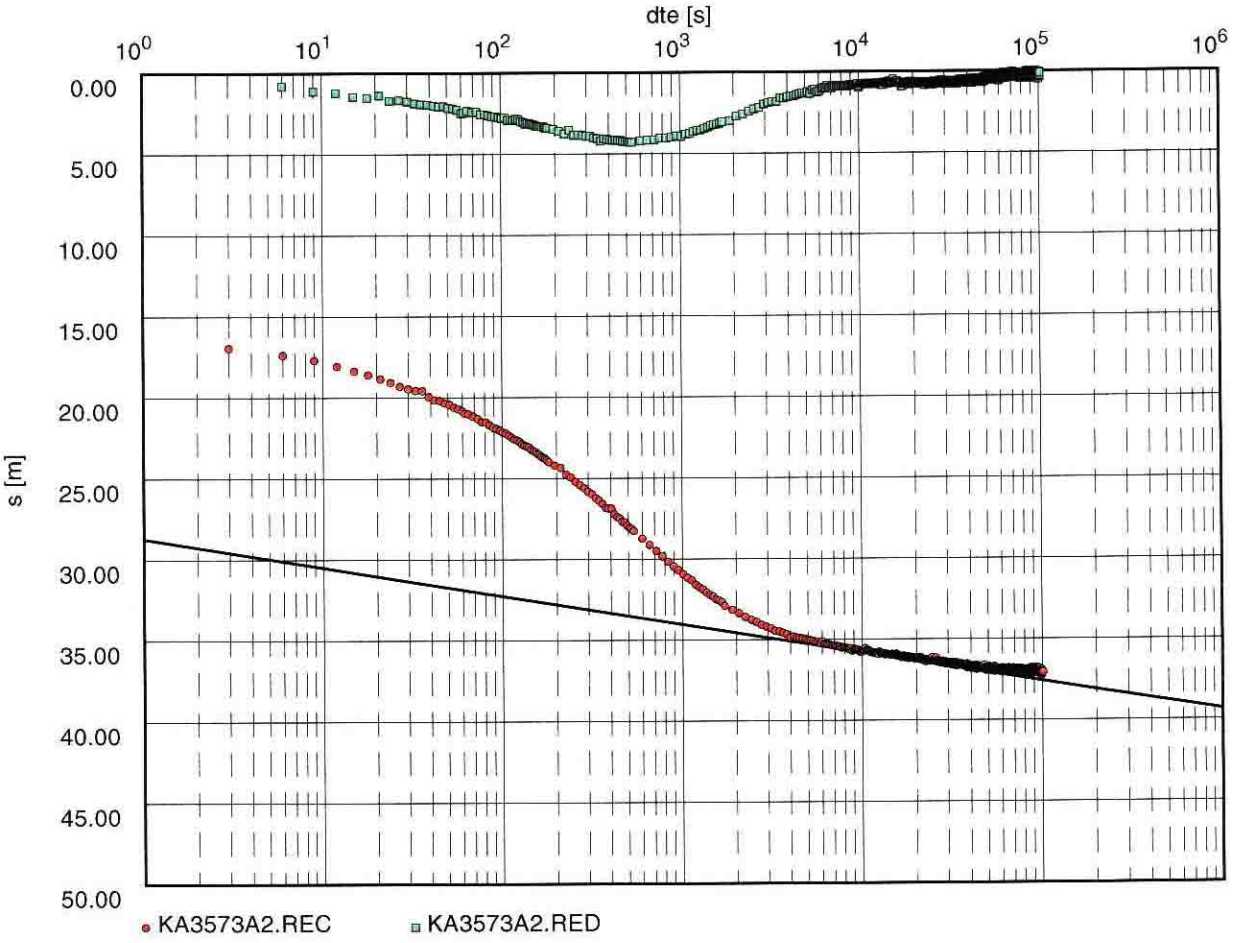
Section located close to the source section.

Predominantly leaky flow.

Apparent leakage coefficient K'/b'=8.13E-10 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 13 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.10.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA3573A:P2 (source)	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 1.54×10^{-5}

Storativity: 1.41×10^{-18}

Source section. Calculated storativity value is unrealistic. Indicates a high positive skin factor.

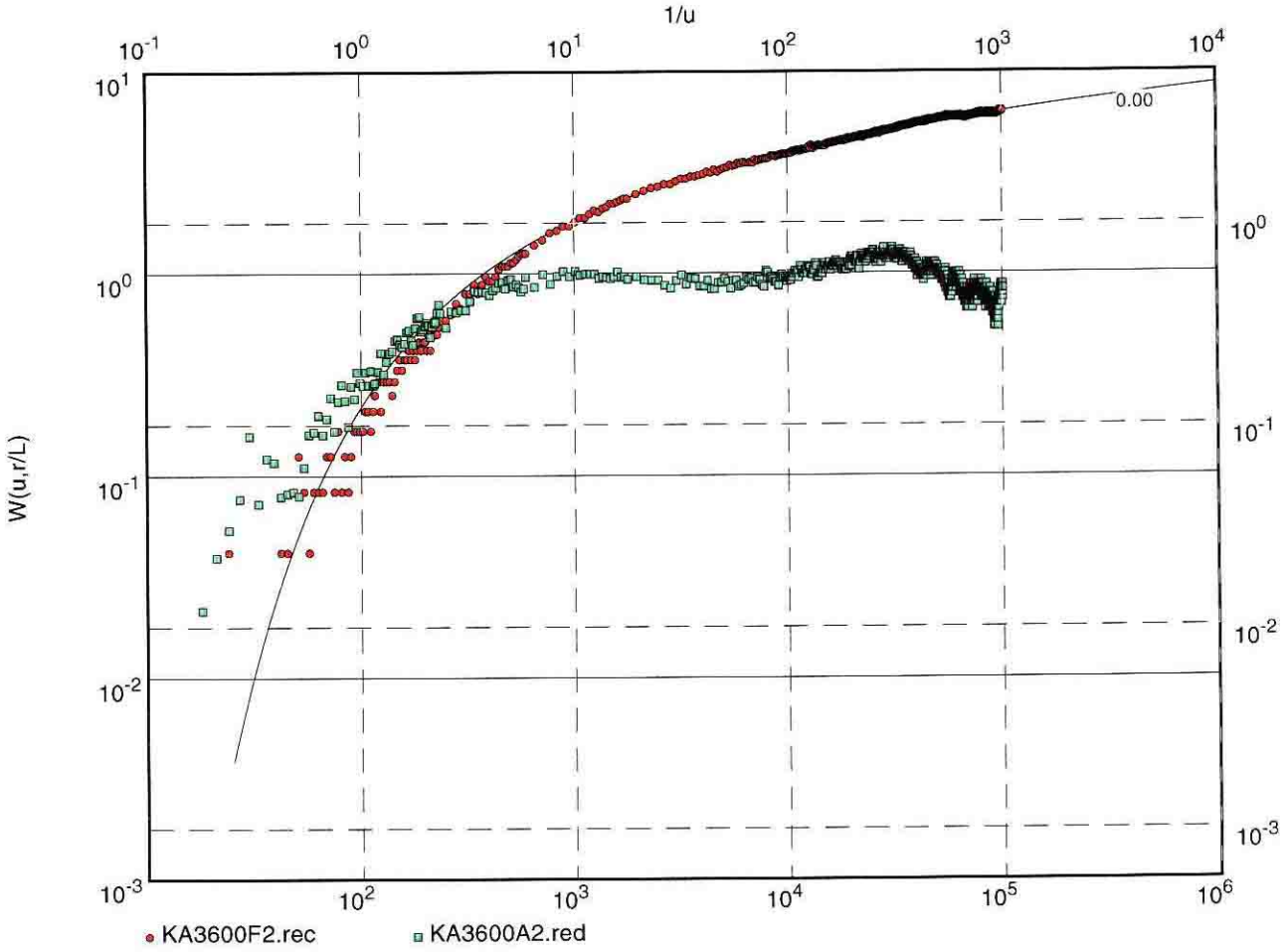
Positive skin at early times.

Pseudo-radial flow at intermediate times.

Leakance (support flow) at late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 14 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA3600F:P2	
Discharge 0.15 l/s	



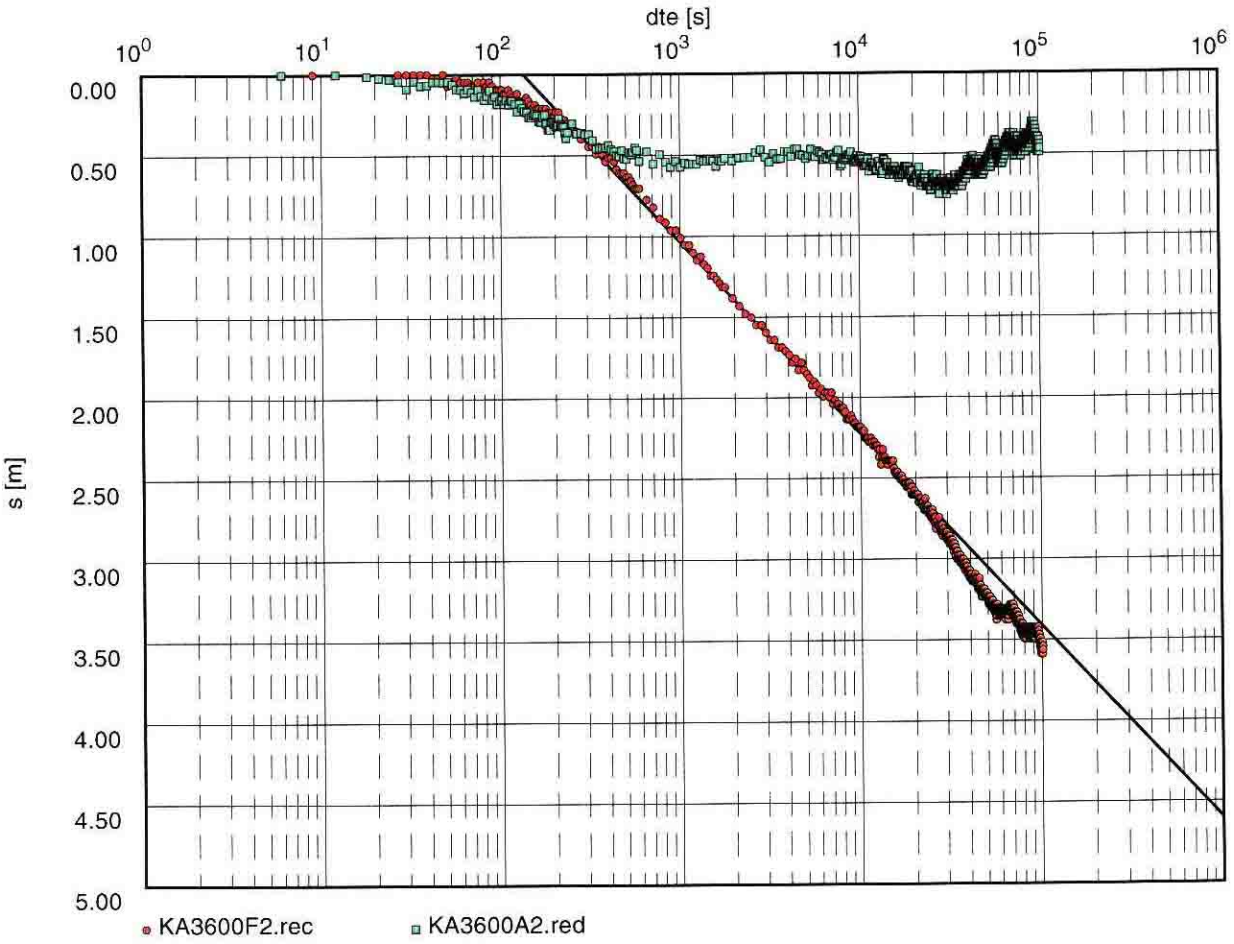
Transmissivity [m²/s]: 2.10×10^{-5}

Storativity: 5.54×10^{-6}

Dominating pseudo-radial flow.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 15 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA3600F:P2	
Discharge 0.15 l/s	



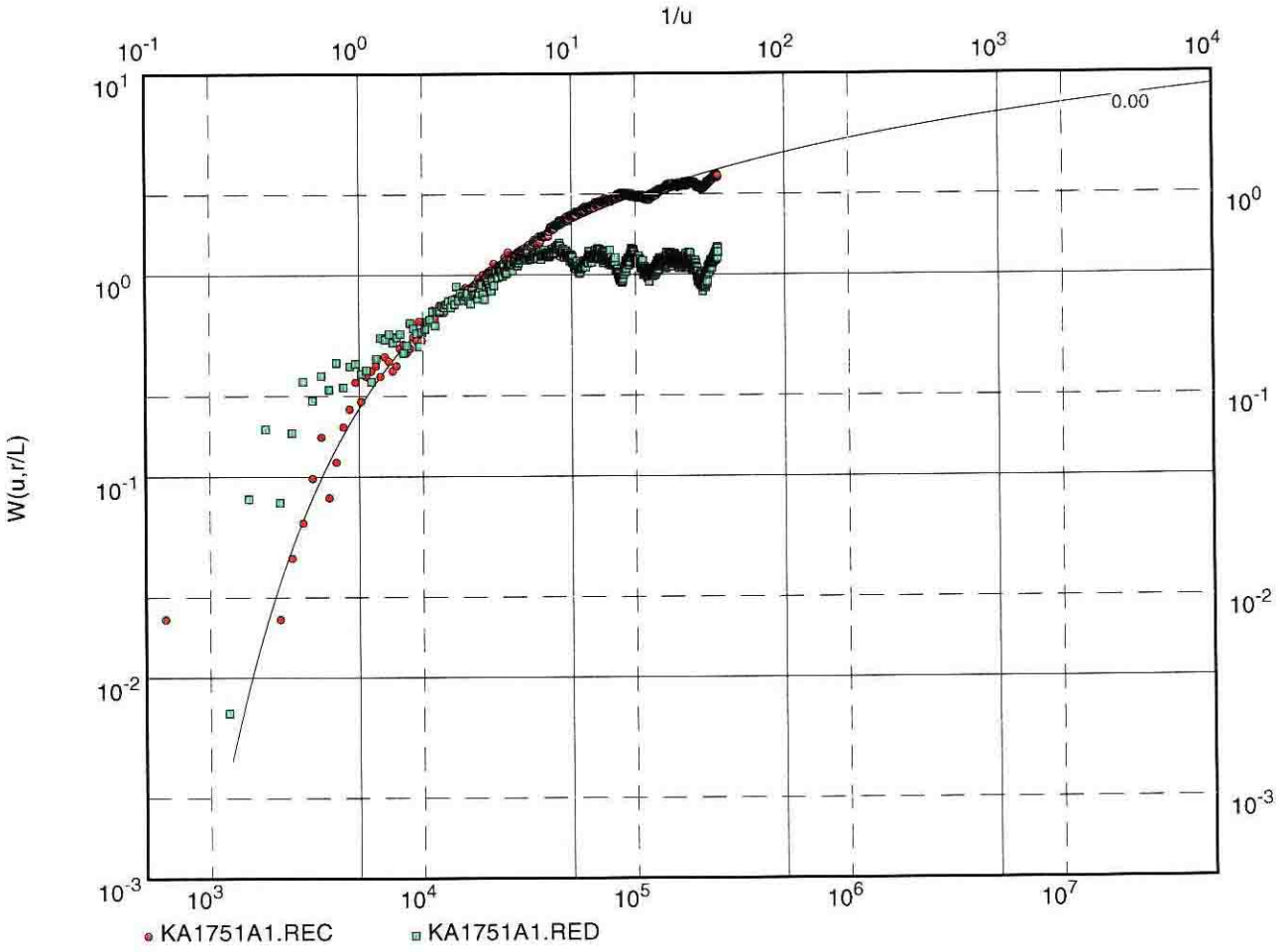
Transmissivity [m²/s]: 2.29×10^{-5}

Storativity: 4.56×10^{-6}

Dominating pseudo-radial flow.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 16 Project: TRUE Block Scale Evaluated by: JEL | Date: 26.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA1751A:P1	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.97×10^{-5}

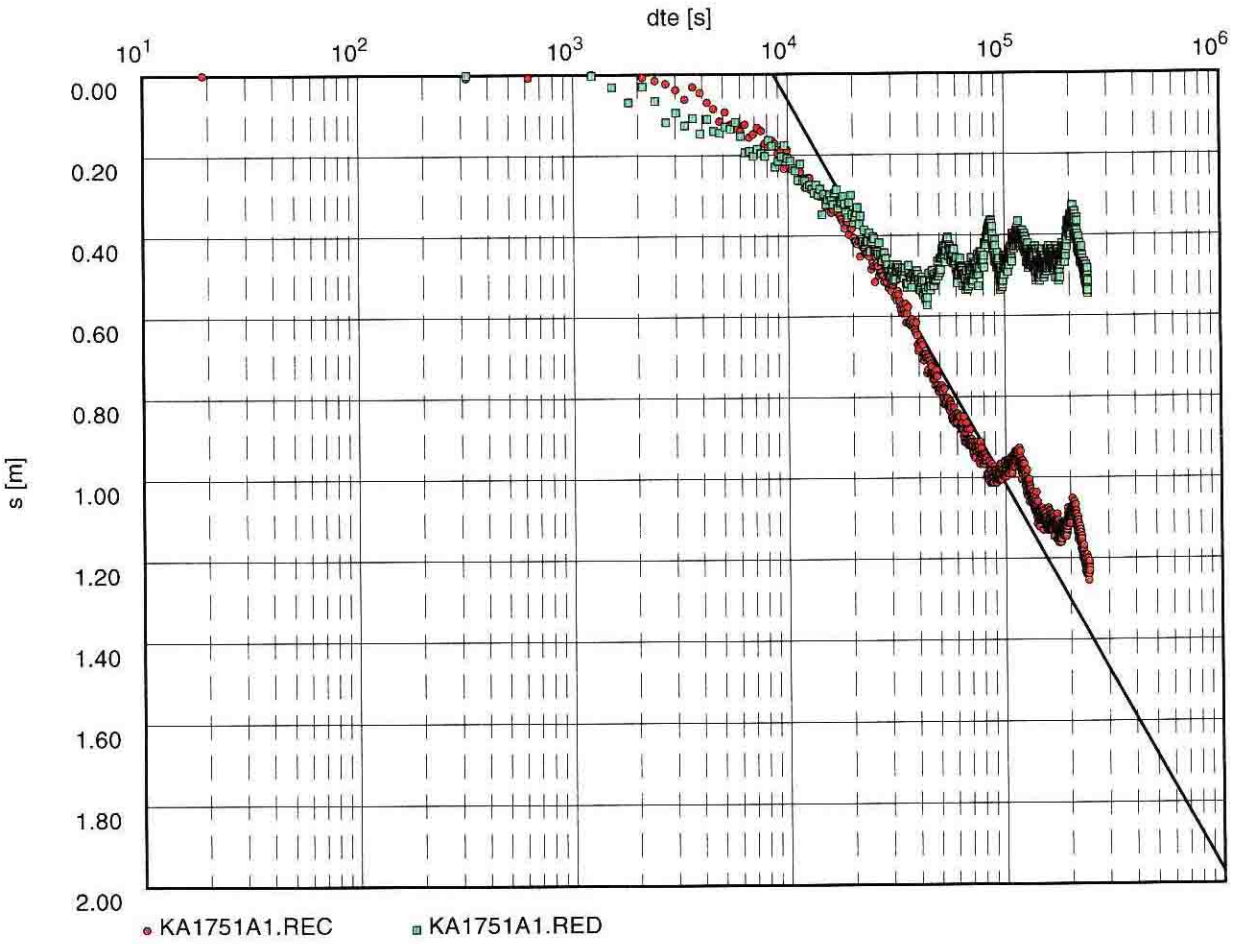
Storativity: 9.97×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 17 Project: TRUE Block Scale Evaluated by: JEL | Date: 26.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA1751A:P1	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 2.86×10^{-5}

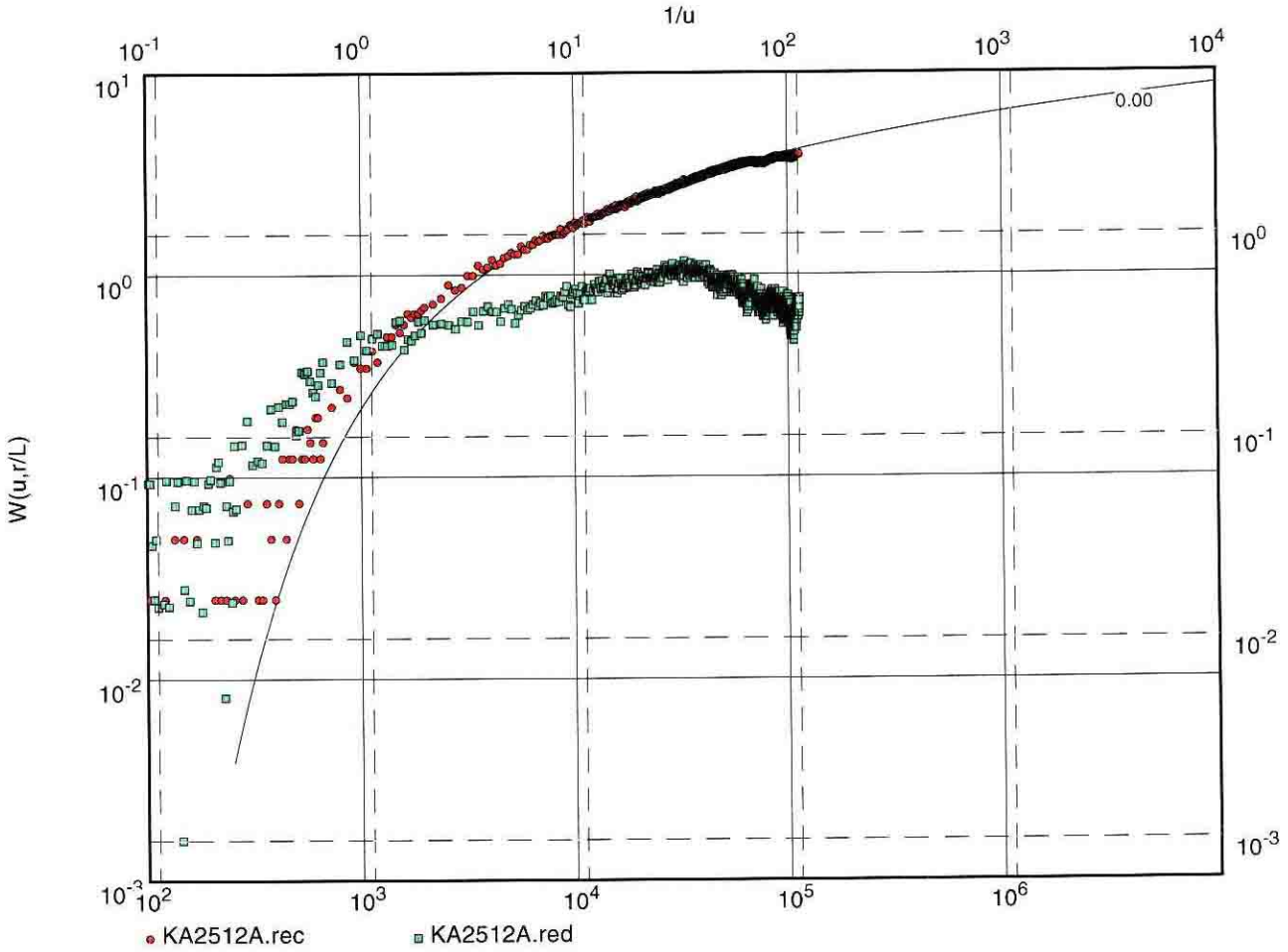
Storativity: 9.20×10^{-6}

Dominating pseudo-radial flow.

Tidal effects distort late-time data.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 2, Page 18 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2512A	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 1.87×10^{-5}

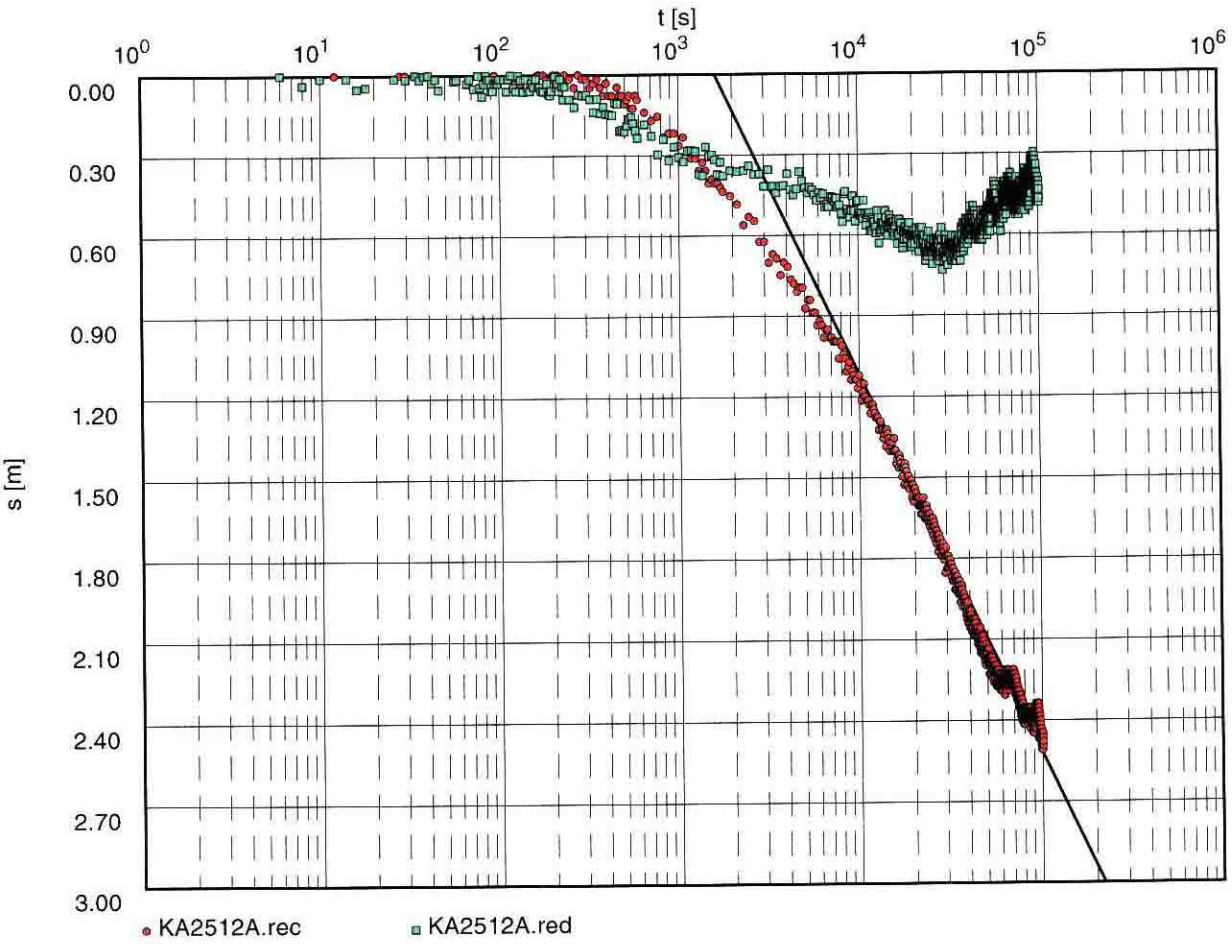
Storativity: 2.97×10^{-6}

Dominating pseudo-radial flow.

Tidal effects by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 2, Page 19 Project: TRUE Block Scale Evaluated by: JEL | Date: 6.08.1998

Pumping Test No. ENW-1	Test conducted on: 1998-03-18
KA2512A	
Discharge 0.15 l/s	



Transmissivity [m²/s]: 1.94×10^{-5}

Storativity: 3.10×10^{-6}

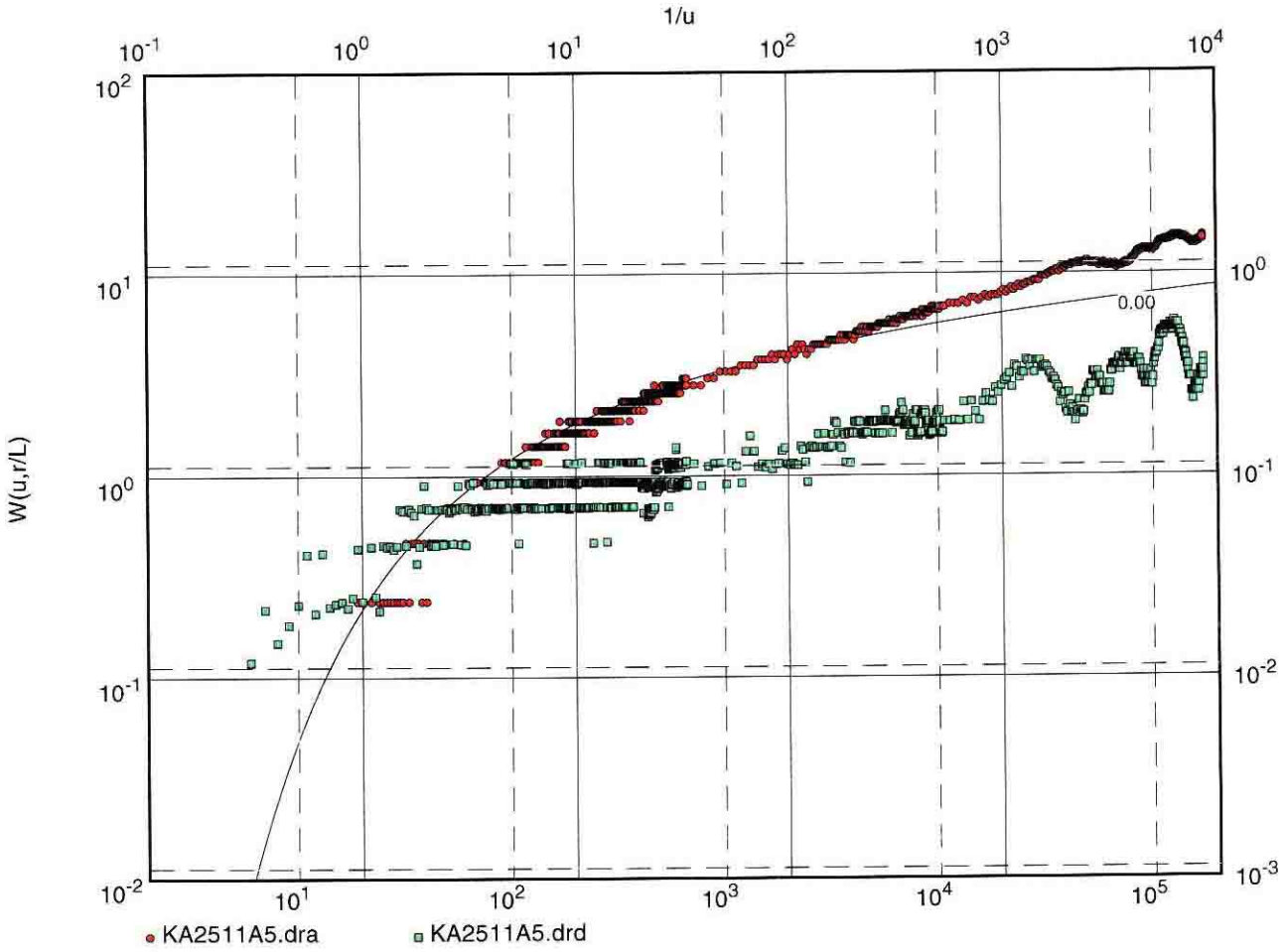
Dominating pseudo-radial flow.

Tidal effects by the end of the test

ENCLOSURE 3 – TEST ESV-2

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 1 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA2511A:S5	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 6.16×10^{-5}

Storativity: 3.78×10^{-7}

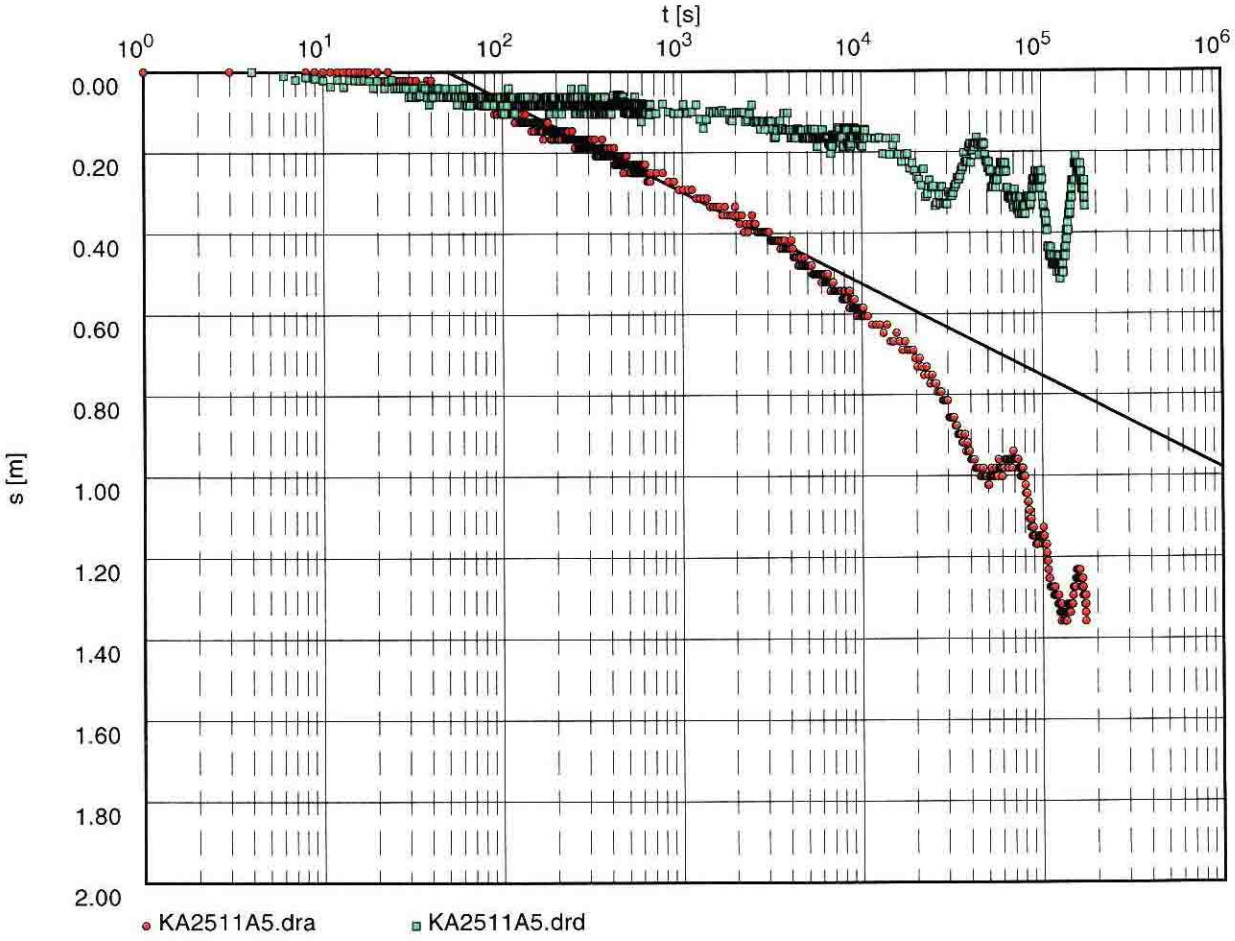
Early period of pseudo-radial flow.

Effects of no-flow hydraulic boundary at intermediate times.

Tidal effects and interference of external activities at late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 2 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA2511A:S5	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 5.54×10^{-5}

Storativity: 4.74×10^{-7}

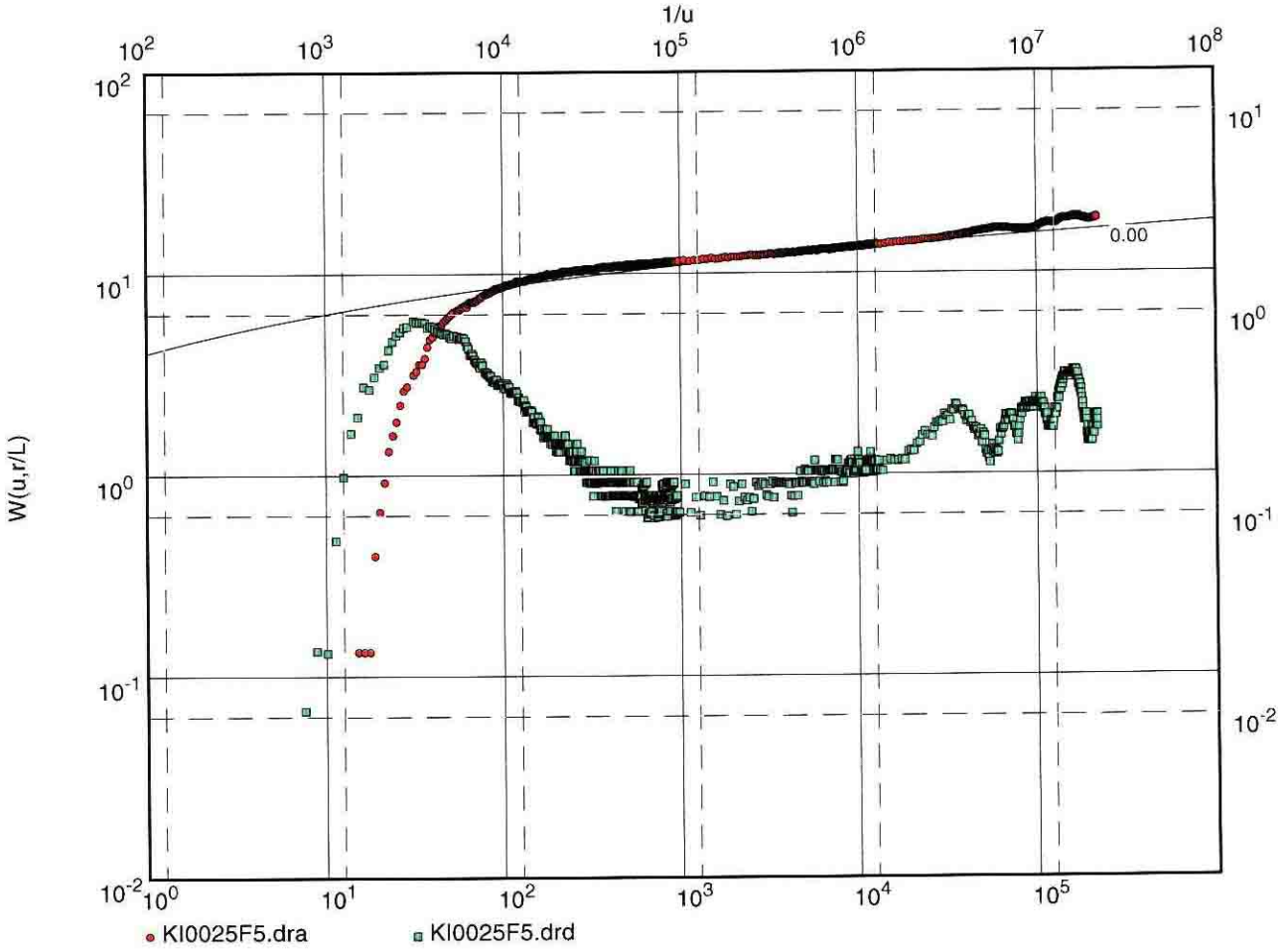
Pseudo-radial flow at early times.

Effects of no-flow hydraulic boundary at intermediate times.

Tidal effects and interferences of external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 3 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KI0025F:R5	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 3.46×10^{-5}

Storativity: 8.98×10^{-10}

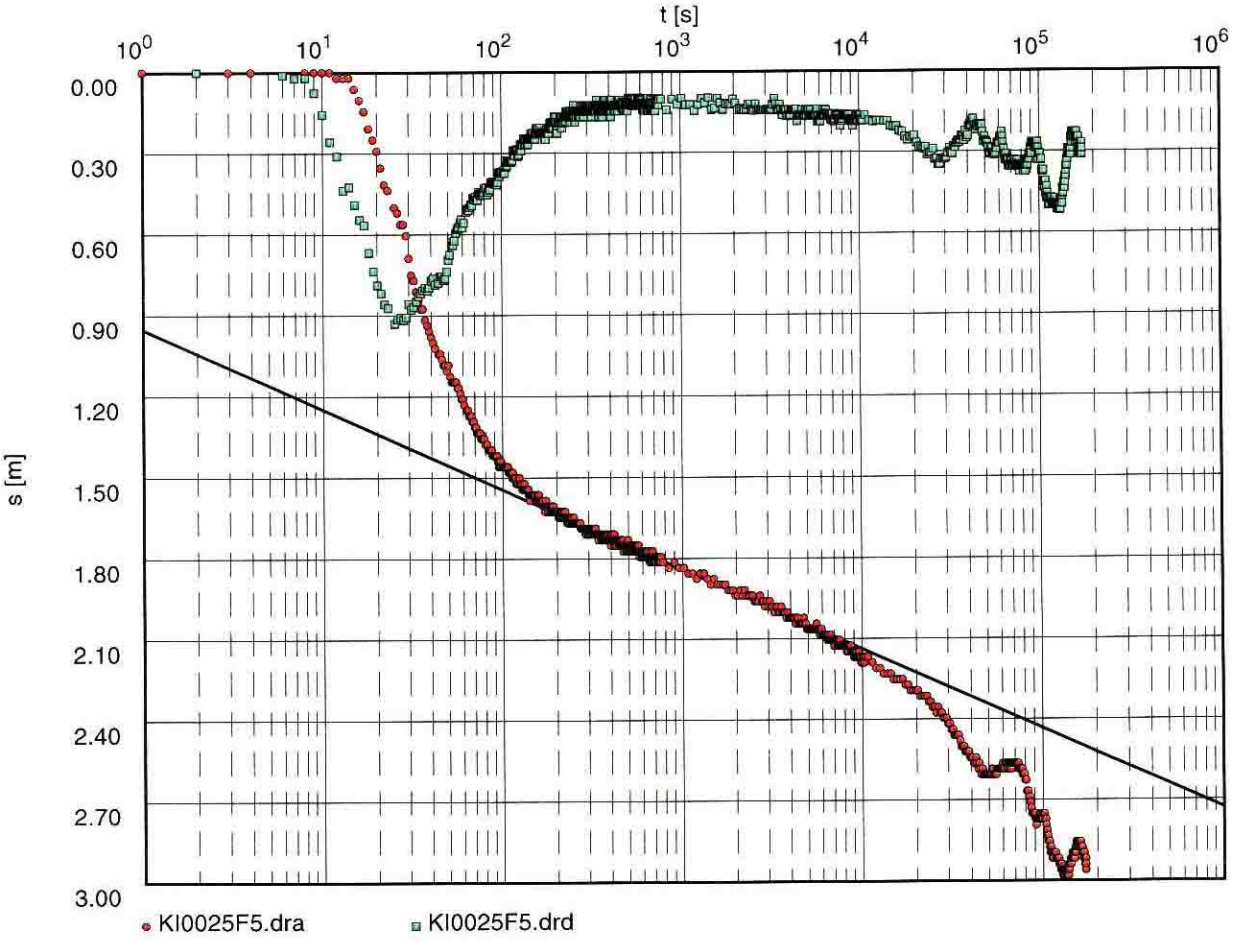
Early borehole effects?

Pseudo-radial flow at intermediate times followed by effects of no-flow hydraulic boundary.

Tidal effects and interference by external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 4 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KI0025F:R5	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 4.26×10^{-5}

Storativity: 4.73×10^{-11}

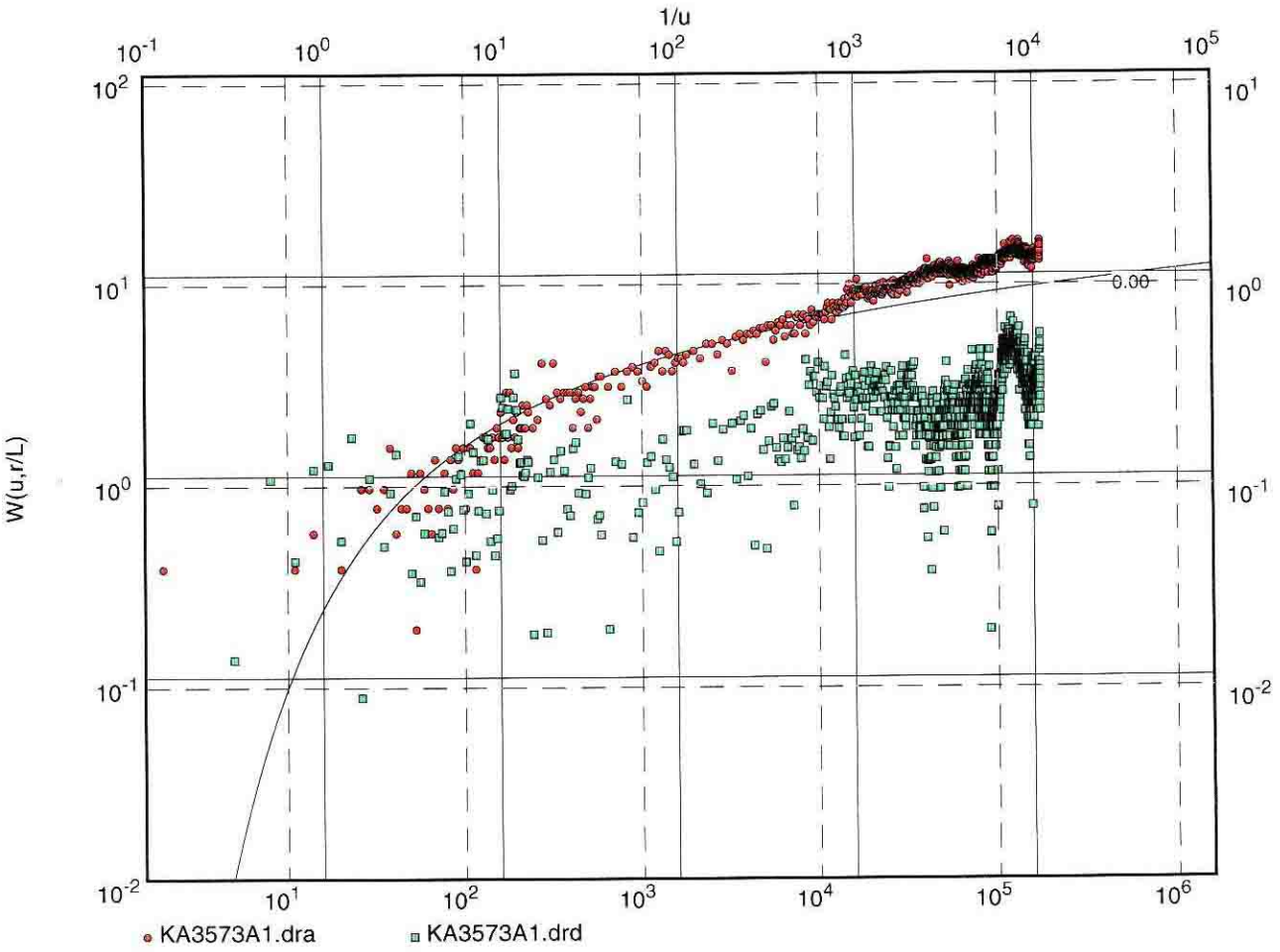
Early borehole effects? Calculated storativity value probably not representative.

Pseudo-radial flow at intermediate times followed by no-flow hydraulic boundary.

Tidal effects and interference by external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 5	
		Project: TRUE Block Scale	
		Evaluated by: JEL	Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3573A:P1	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 4.89×10^{-5}

Storativity: 1.02×10^{-6}

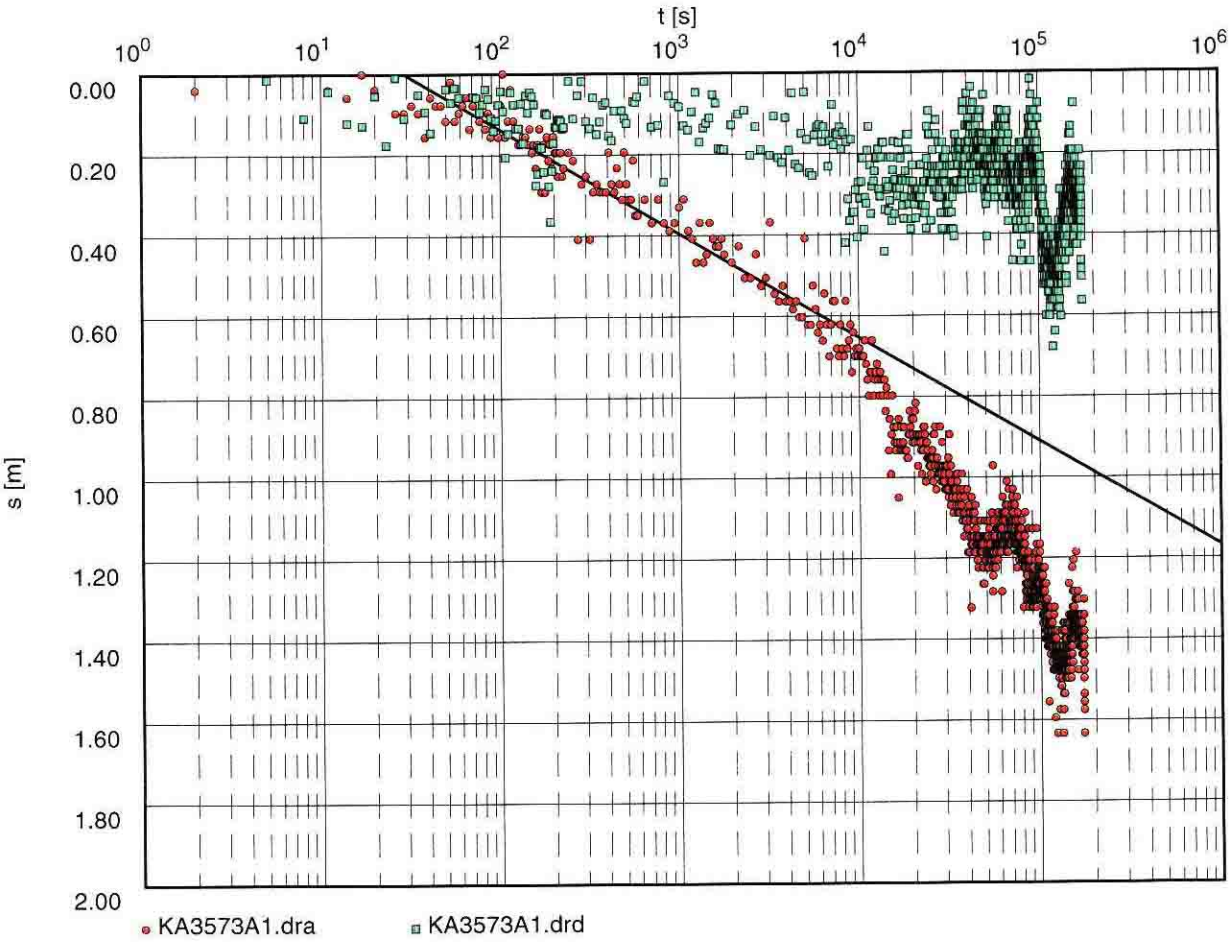
Pseudo-radial flow at early times.

Effects of no-flow hydraulic boundary at intermediate times.

Tidal effects and interference from external activities at late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3573A:P1	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 4.90×10^{-5}

Storativity: 1.06×10^{-6}

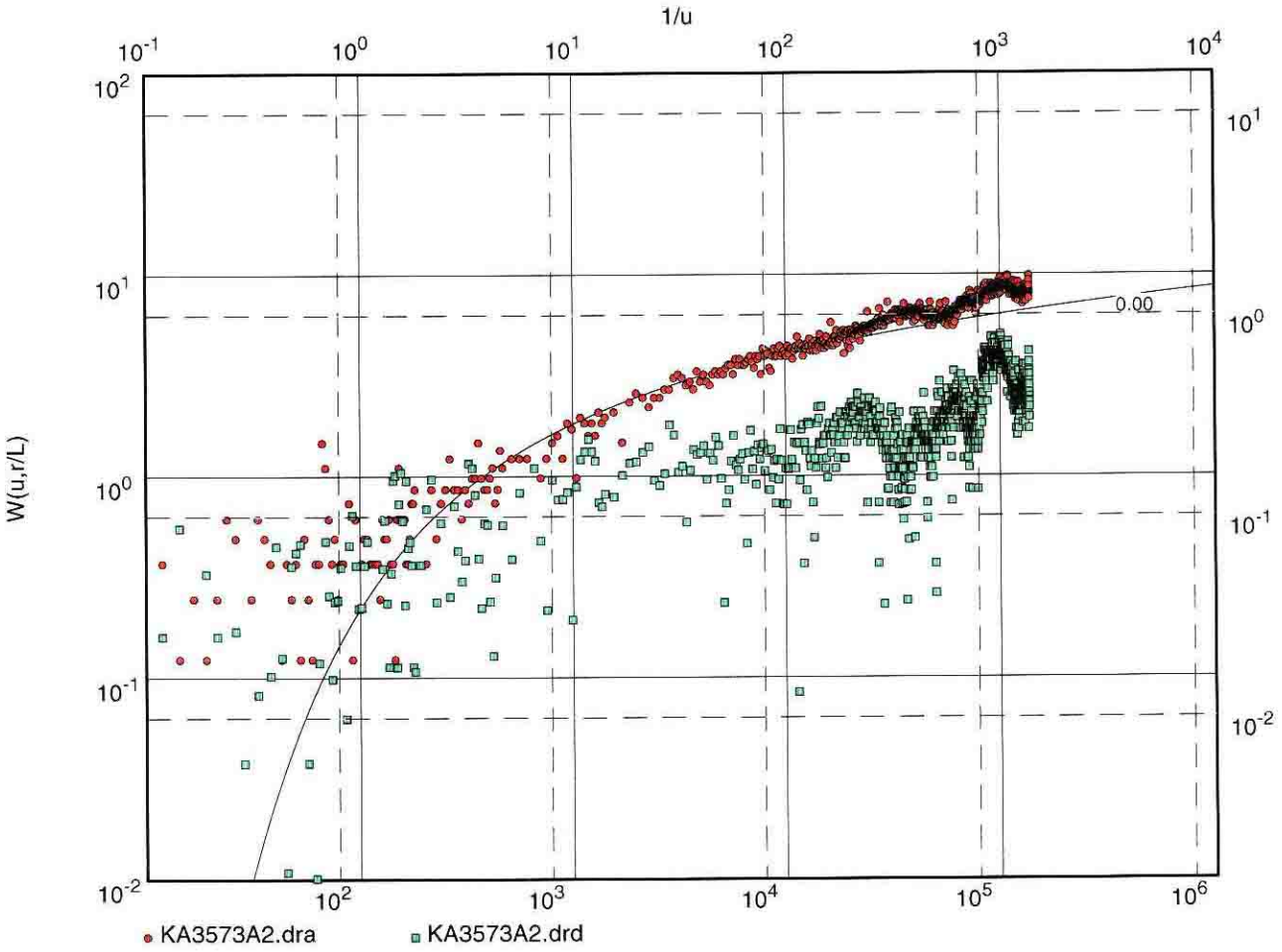
Pseudo-radial flow at early times.

Effects of no-flow hydraulic boundary at intermediate times.

Tidl effects and interference from external activities at late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3573A:P2	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 3.46×10^{-5}

Storativity: 3.99×10^{-6}

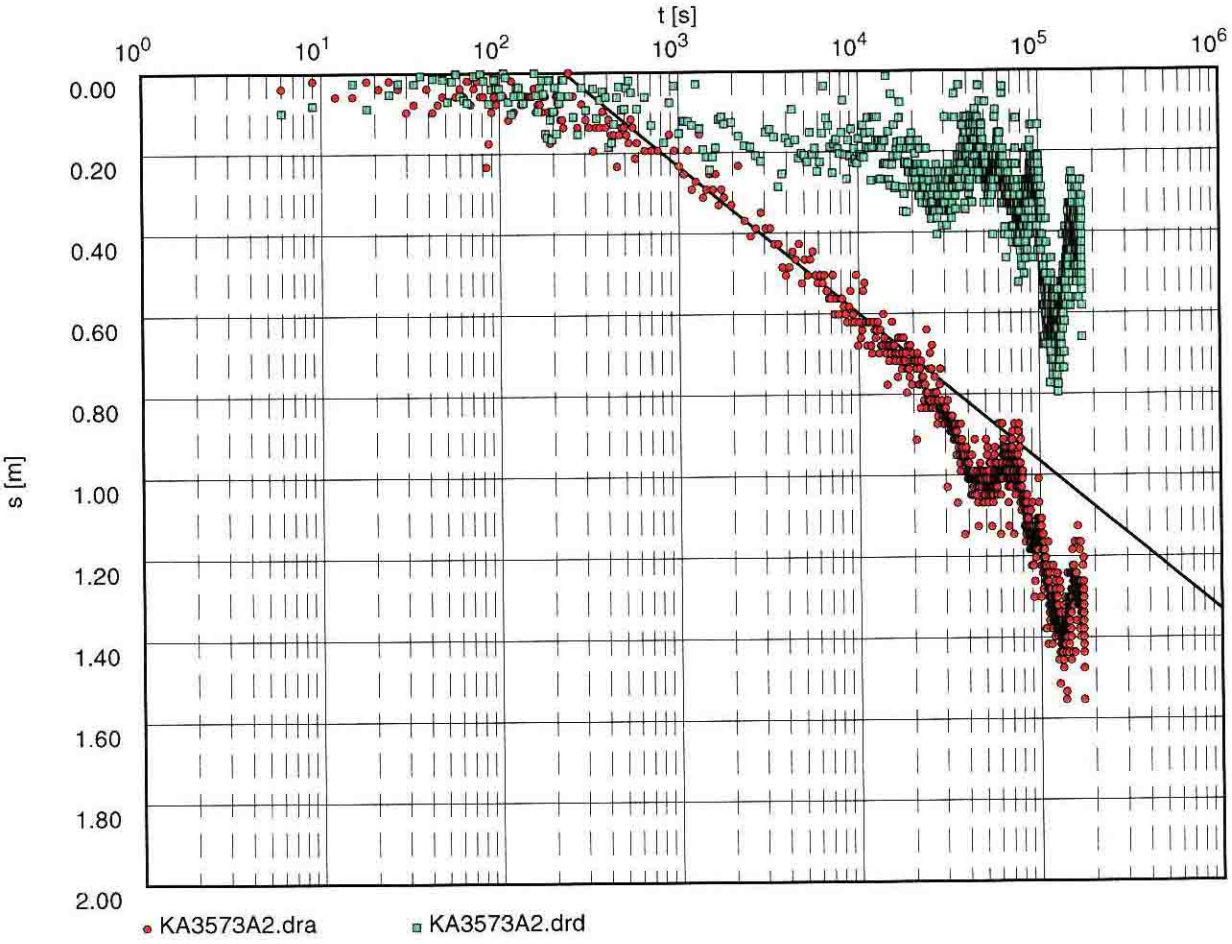
Pseudo-radial flow at early times.

Effects of No-flow hydraulic boundary at intermediate times.

Tidal effects and interference from external activities at late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3573A:P2	
Discharge 0.07 l/s	



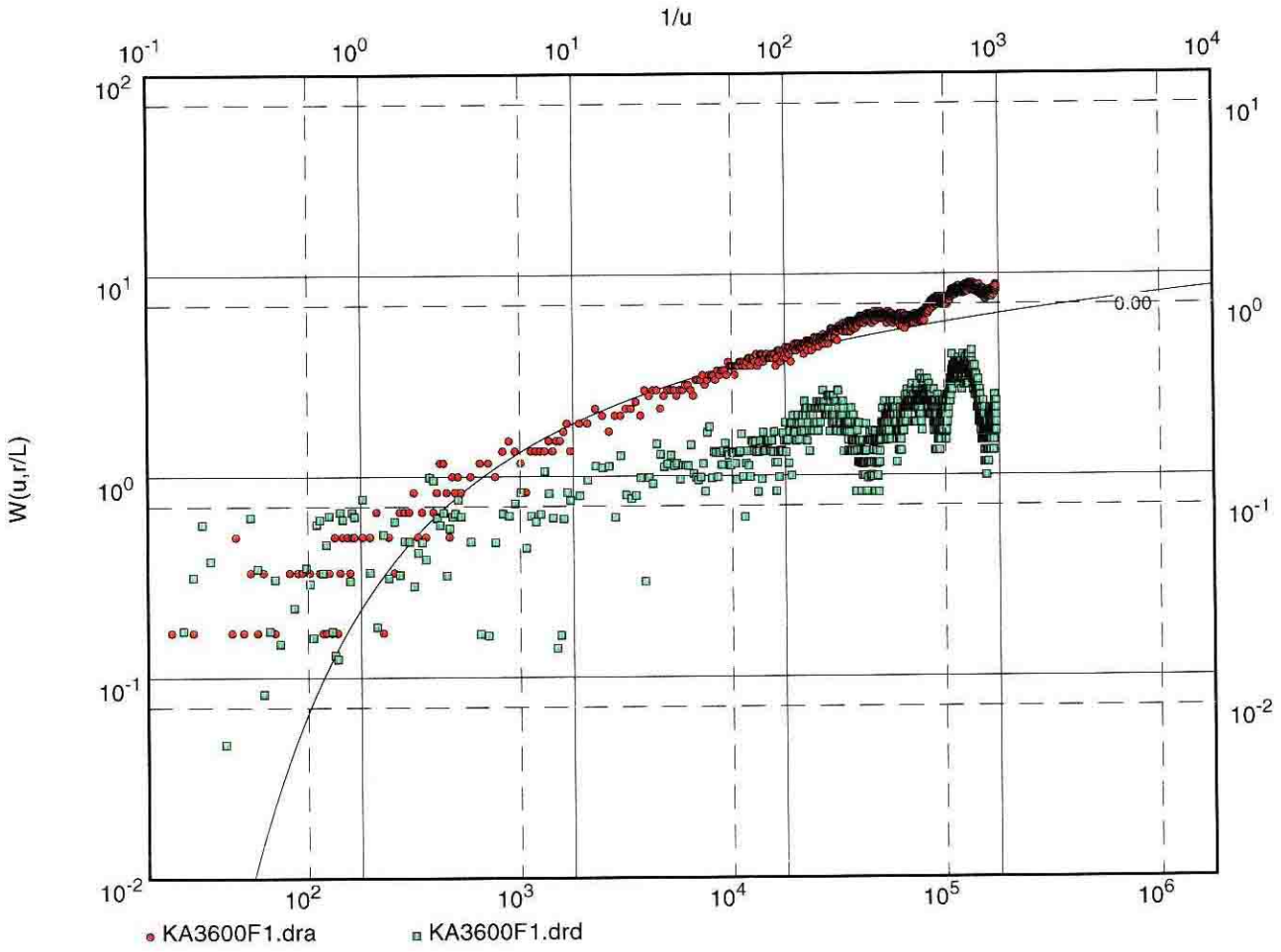
Transmissivity [m²/s]: 3.45×10^{-5}

Storativity: 4.08×10^{-6}

Pseudo-radial flow at early times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3600F:P1	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 3.88×10^{-5}

Storativity: 2.20×10^{-6}

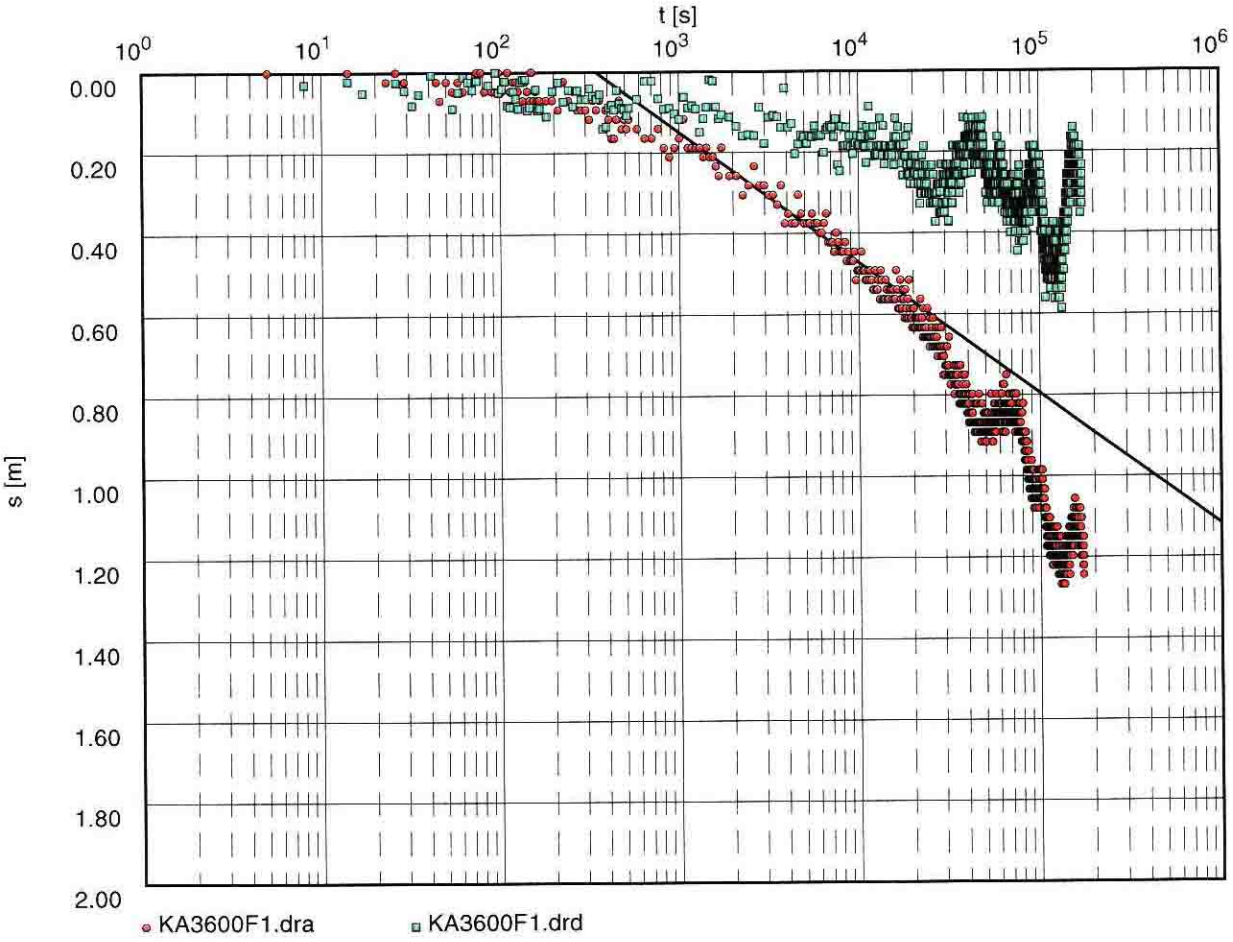
Pseudo-radial flow at early times.

Effects of No-flow hydraulic boundary at intermediate times.

Tidal effects and interference from external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 10 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3600F:P1	
Discharge 0.07 l/s	



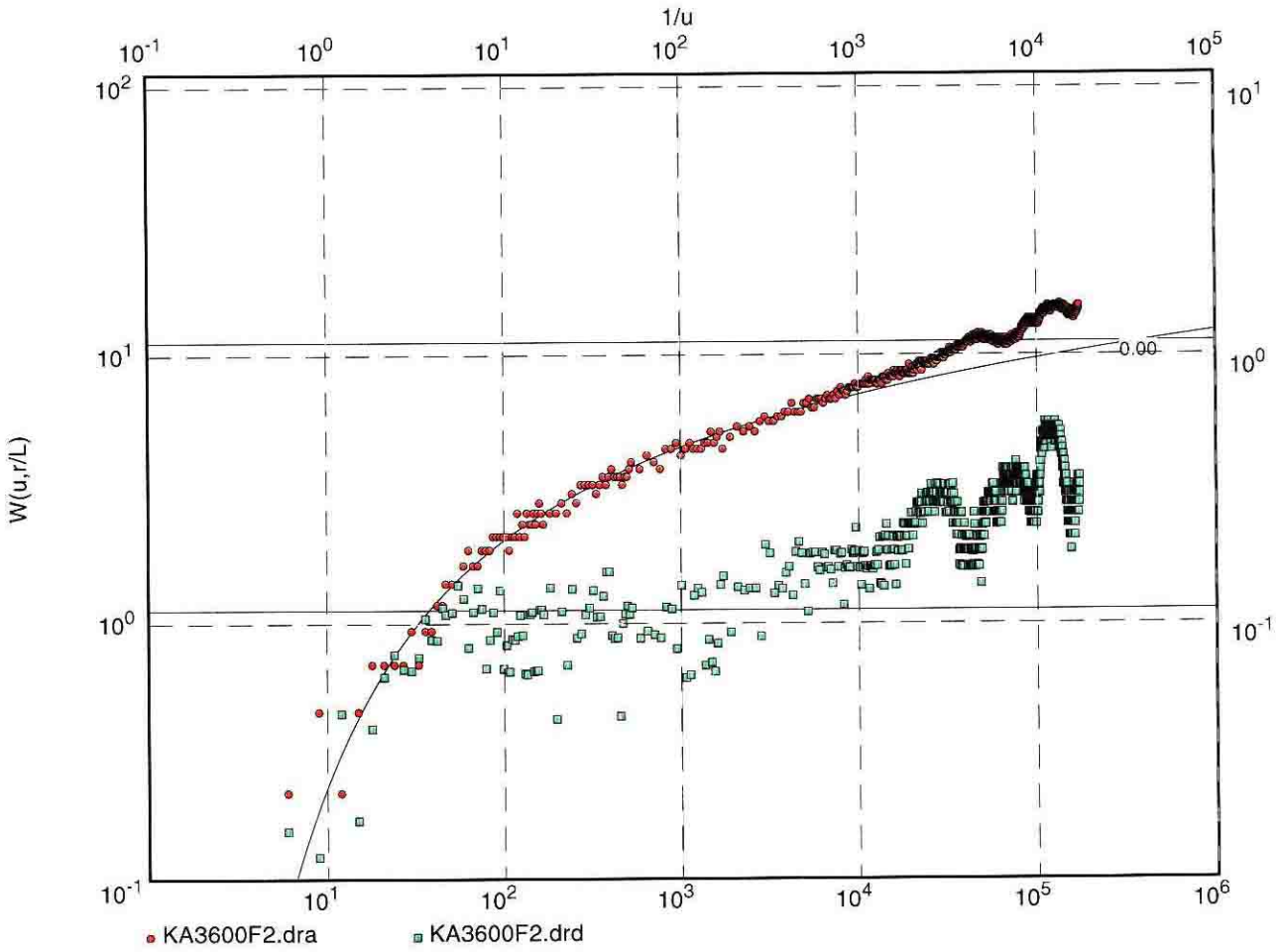
Transmissivity [m²/s]: 3.91×10^{-5}

Storativity: 2.41×10^{-6}

Pseudo-radial flow at early times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3600F:P2	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 4.89×10^{-5}

Storativity: 1.98×10^{-7}

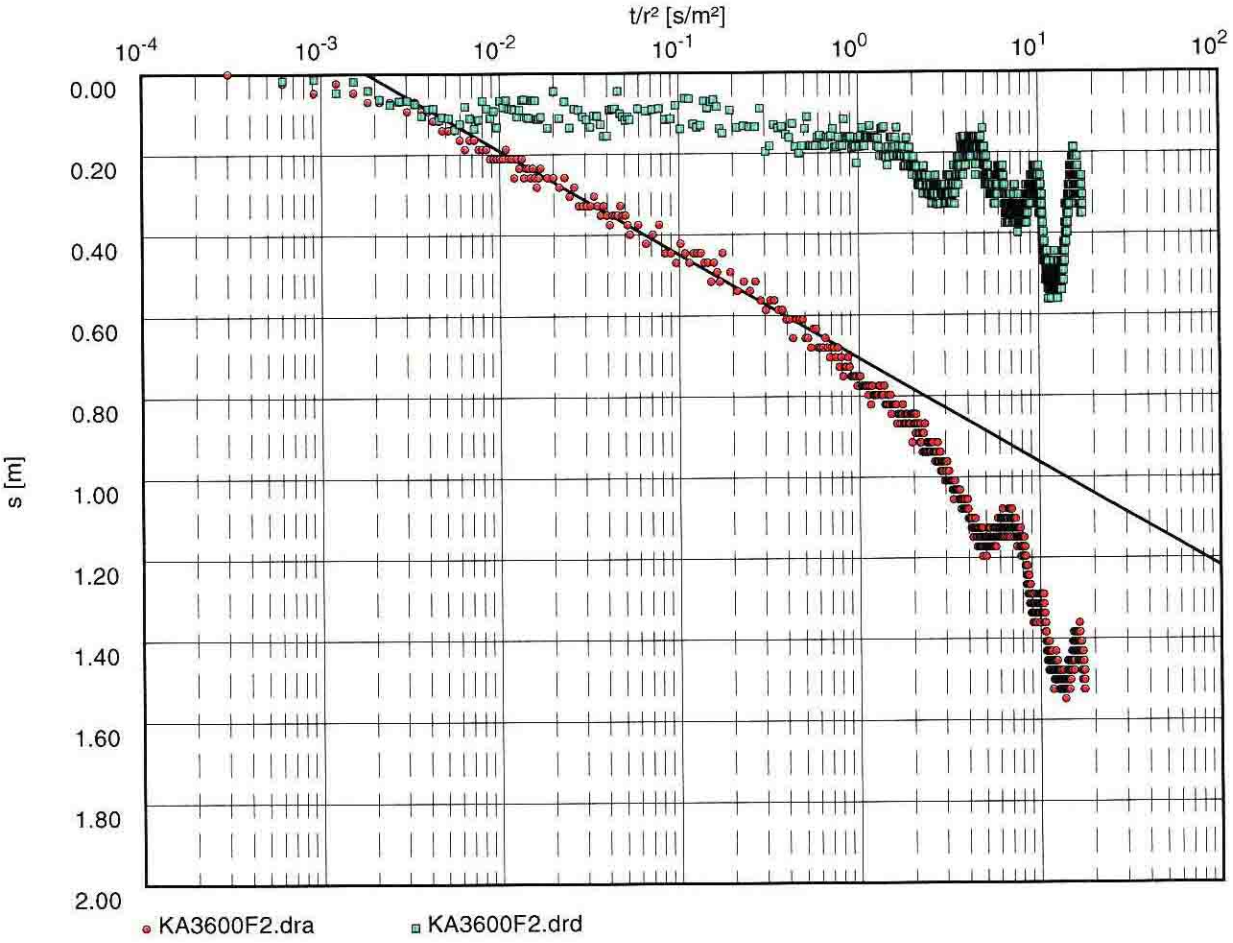
Pseudo-radial flow at early times.

Effwcts of No-flow hydraulic boundary at intermediate times.

Tidal effects and intereference from external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Distance-Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 12 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA3600F:P2	
Discharge 0.07 l/s	



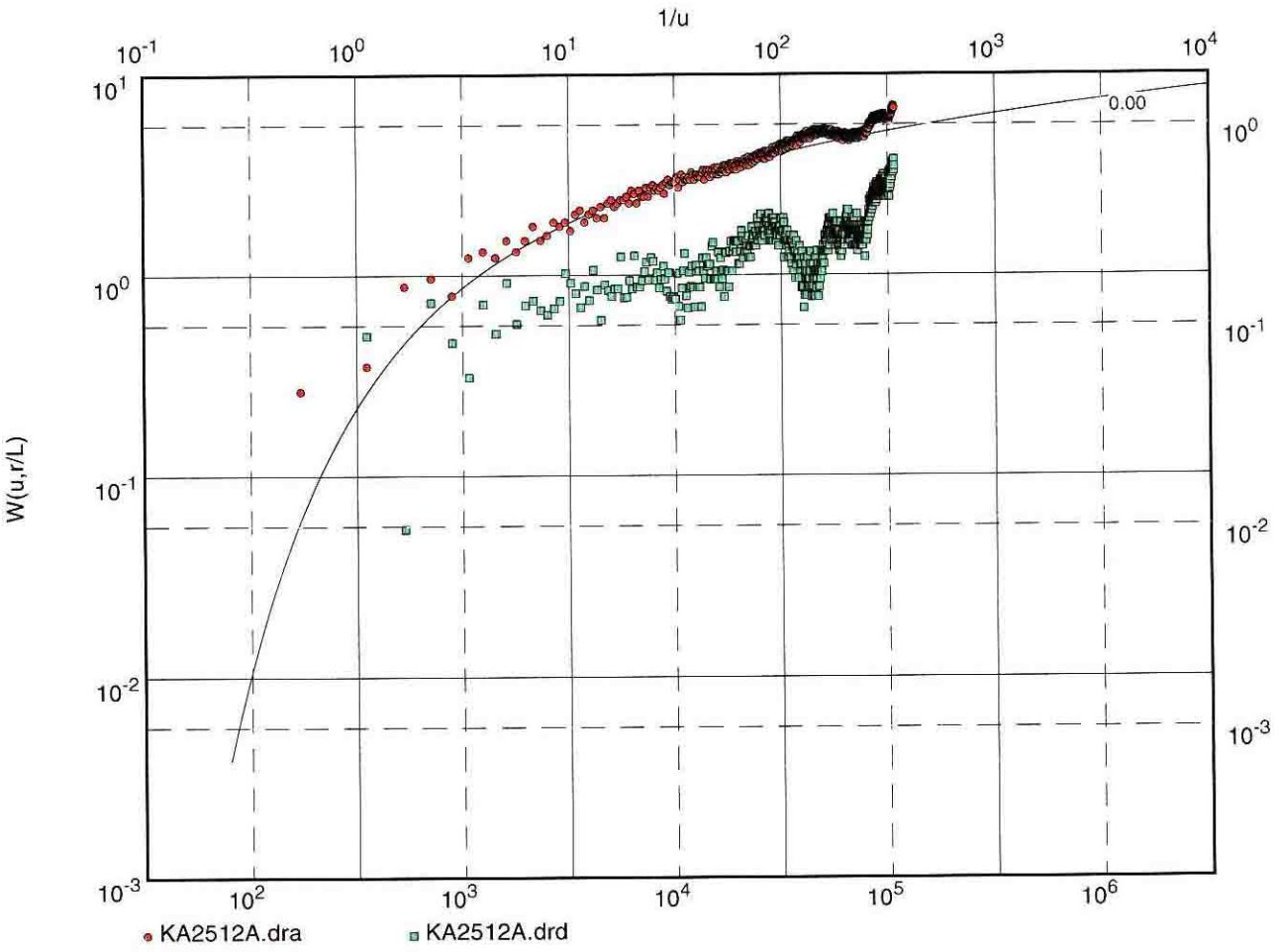
Transmissivity [m²/s]: 4.91×10^{-5}

Storativity: 1.98×10^{-7}

Pseudo-radial flow at early times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 3, Page 13 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA2512A	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 3.08×10^{-5}

Storativity: 1.73×10^{-6}

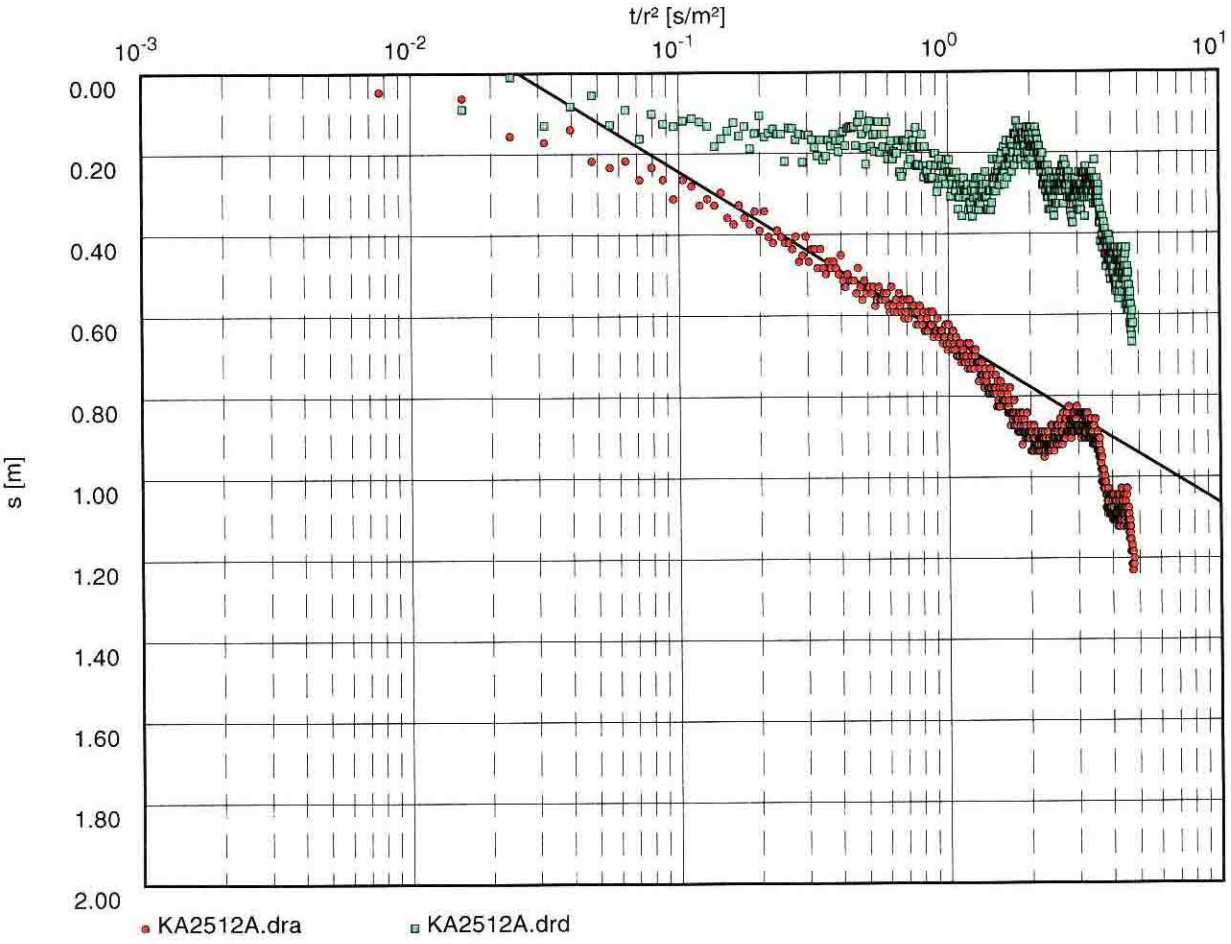
Pseudo-radial flow at early times.

Effects of No-flow hydraulic boundary at intermediate times.

Tidal effects and interferences from external activities by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Distance-Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 14 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KA2512A	
Discharge 0.07 l/s	



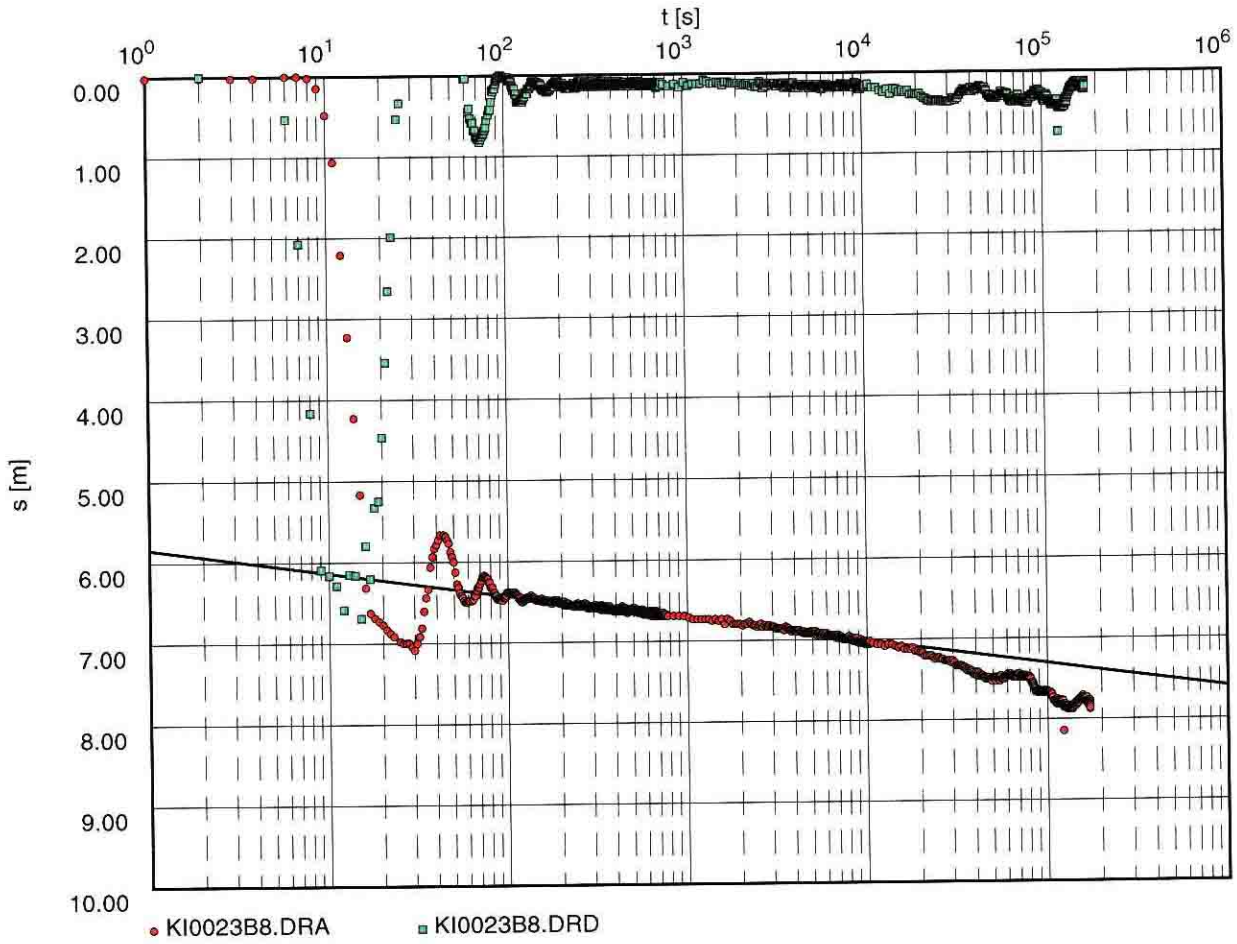
Transmissivity [m²/s]: 3.07×10^{-5}

Storativity: 1.75×10^{-6}

Pseudo-radial flow at early times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 3, Page 15 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.10.1998

Pumping Test No. ESV-2	Test conducted on: 1998-03-25
KI0023B:P8 (Source)	
Discharge 0.07 l/s	



Transmissivity [m²/s]: 4.32×10^{-5}

Storativity: 6.63×10^{-22}

Source section.
Drawdown data indicate a high positive skin factor at early times. Thus the calculated storativity (based on zero skin) is not representative.

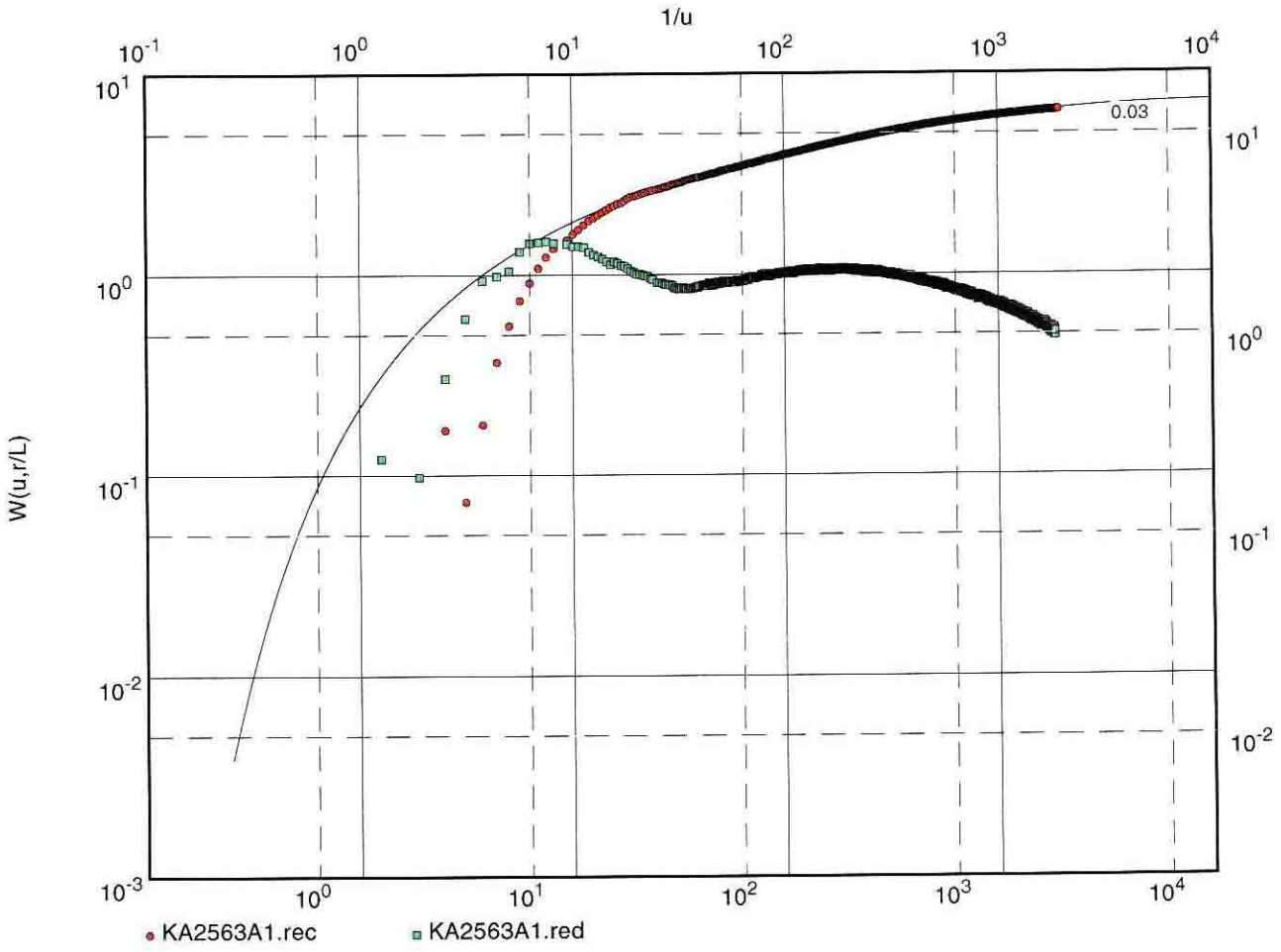
Pseudo-radial flow at early to intermediate times.

Influence of apparent no-flow hydraulic boundary at intermediate times. Interference by other activities in the tunnel together with tidal effects at late times.

ENCLOSURE 4 – TEST ESV-1a

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 4, Page 1	
		Project: TRUE Block Scale	
		Evaluated by: JEL	Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KA2563A:R1	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 1.02×10^{-6}

Storativity: 4.24×10^{-10}

Hydraulic resistance (c) [s]: 1.66×10^{13}

Early borehole effect? Section located in source bh.

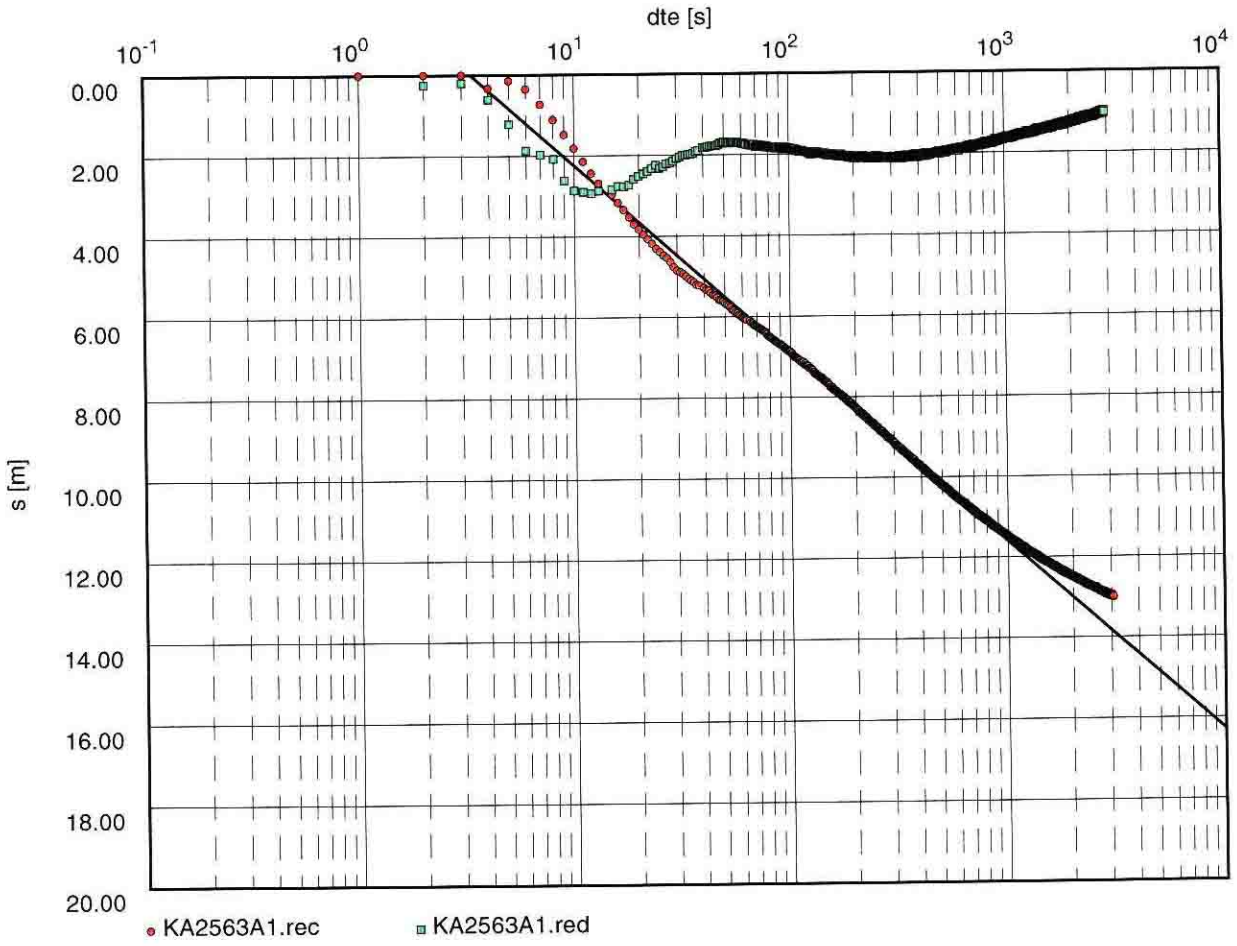
Calculated storativity value probably not representative due to uncertain actual distance to the source section (long observation section).

Dominating pseudo-radial flow. Slightly leaky (pseudo-spherical) flow by the end of test.

Apparent leakage coefficient K'/b'=6.0E-14 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 2 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KA2563A:R1	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 1.00×10^{-6}

Storativity: 4.90×10^{-10}

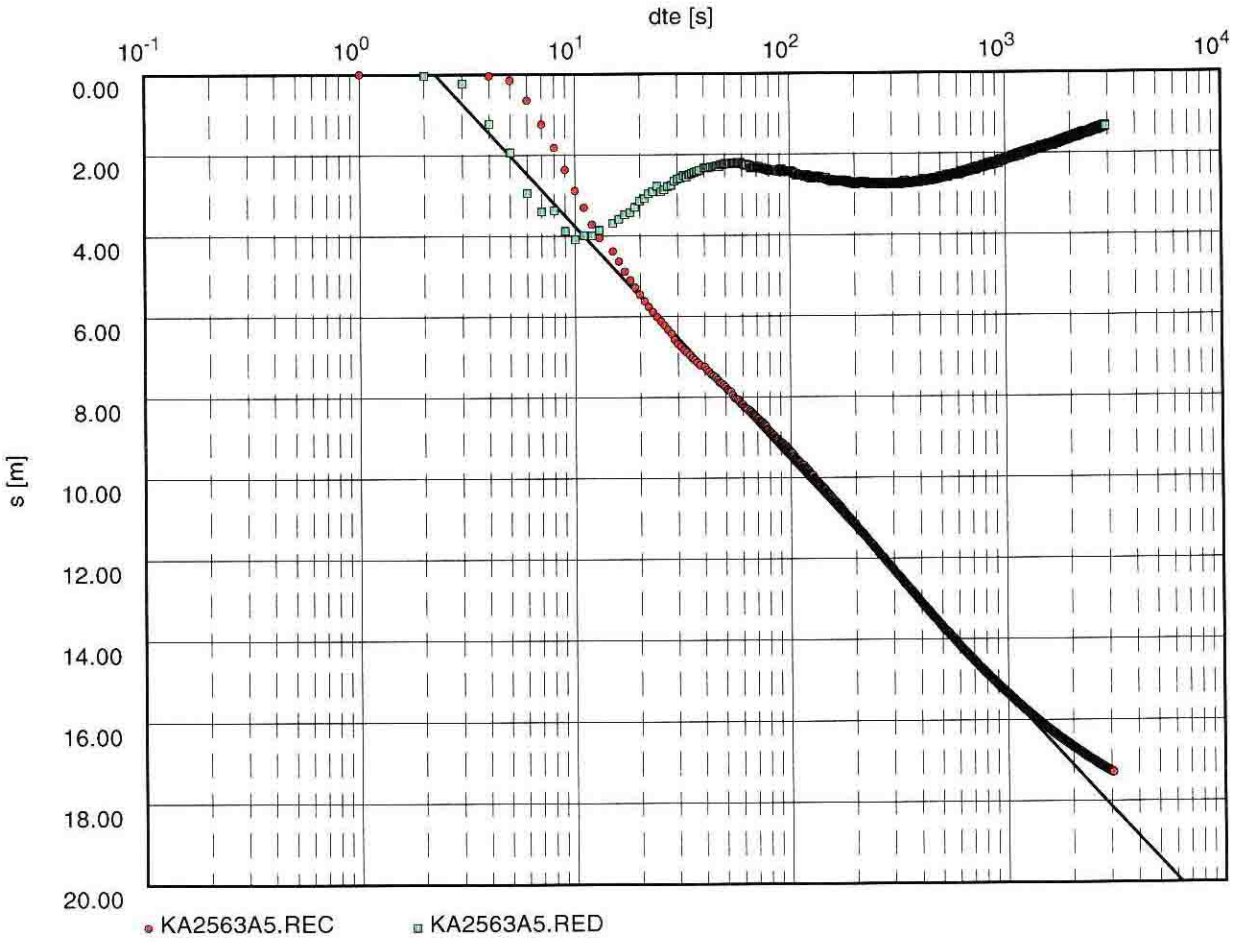
Dominating pseudo-radial flow.

Calculated storativity value probably not representative due to uncertain actual distance to the source section (long observation section).

Slight leakance by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 3 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.10.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KA2563A:R5 (Source)	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 8.13×10^{-7}

Storativity: 5.24×10^{-3}

Source section.

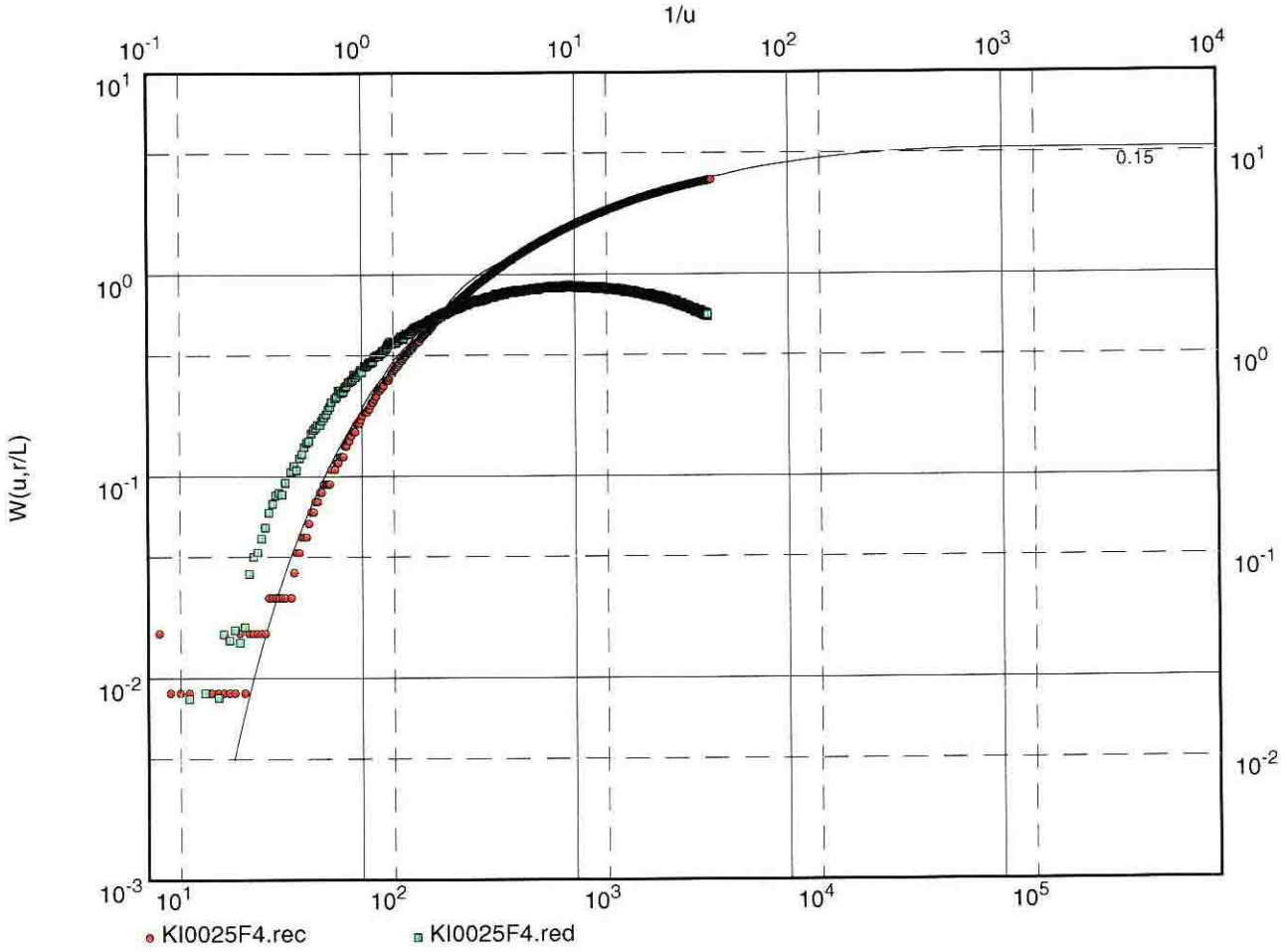
Indications of negative skin factor during early times. Thus, the calculated storativity value (assuming zero skin) is probably overestimated.

Pseudo-radial flow during intermediate times.

Slight leakance (support flow) at late times

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 4, Page 4 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0025F:R4	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 8.17×10^{-7}

Storativity: 7.02×10^{-8}

Hydraulic resistance (c) [s]: 1.79×10^{11}

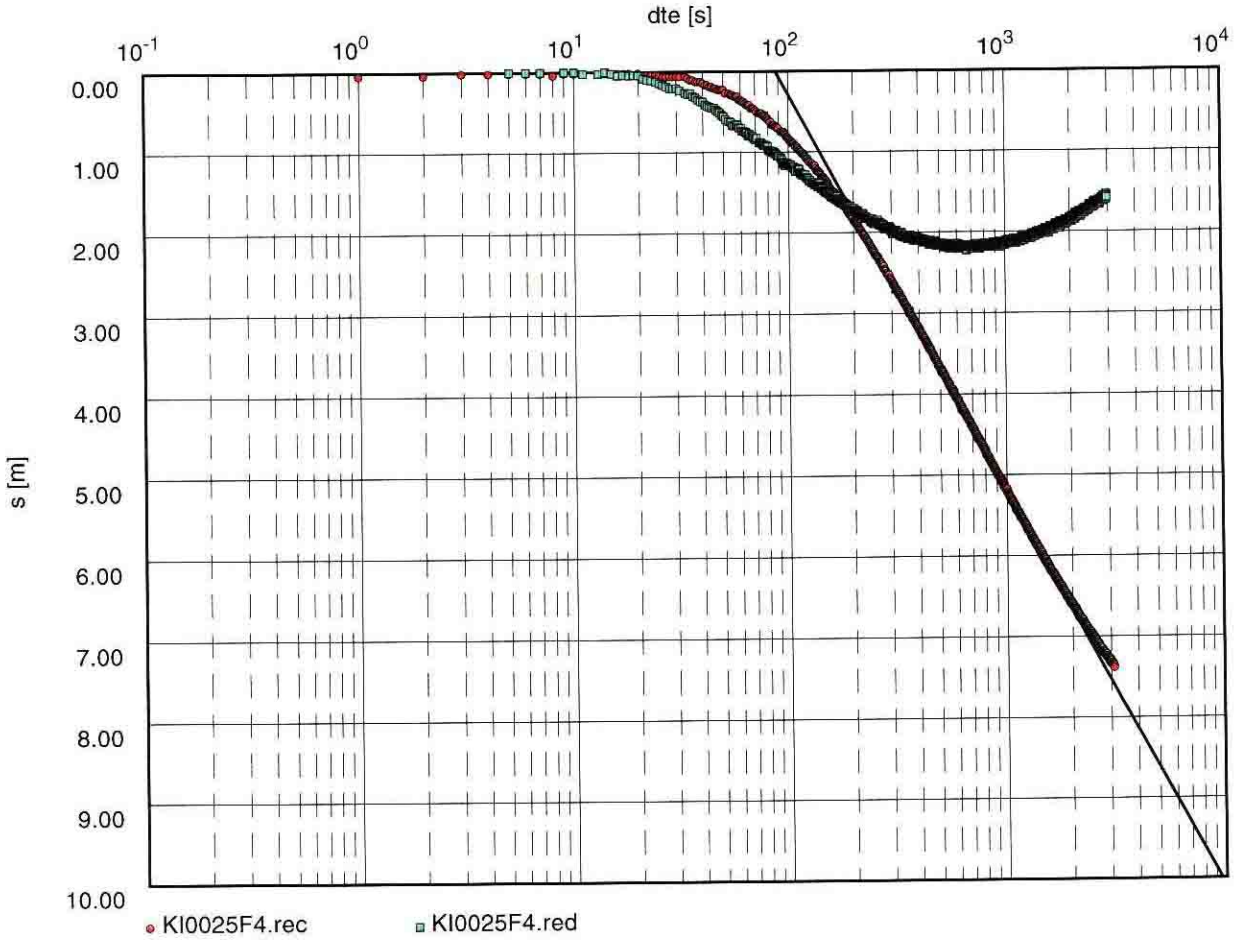
Dominating Pseudo-radial flow.

Slightly leaky (pseudo-spherical) flow by the end.

Leakage coefficient K'/b'=5.6E-12 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 5 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0025F:R4	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 9.63×10^{-7}

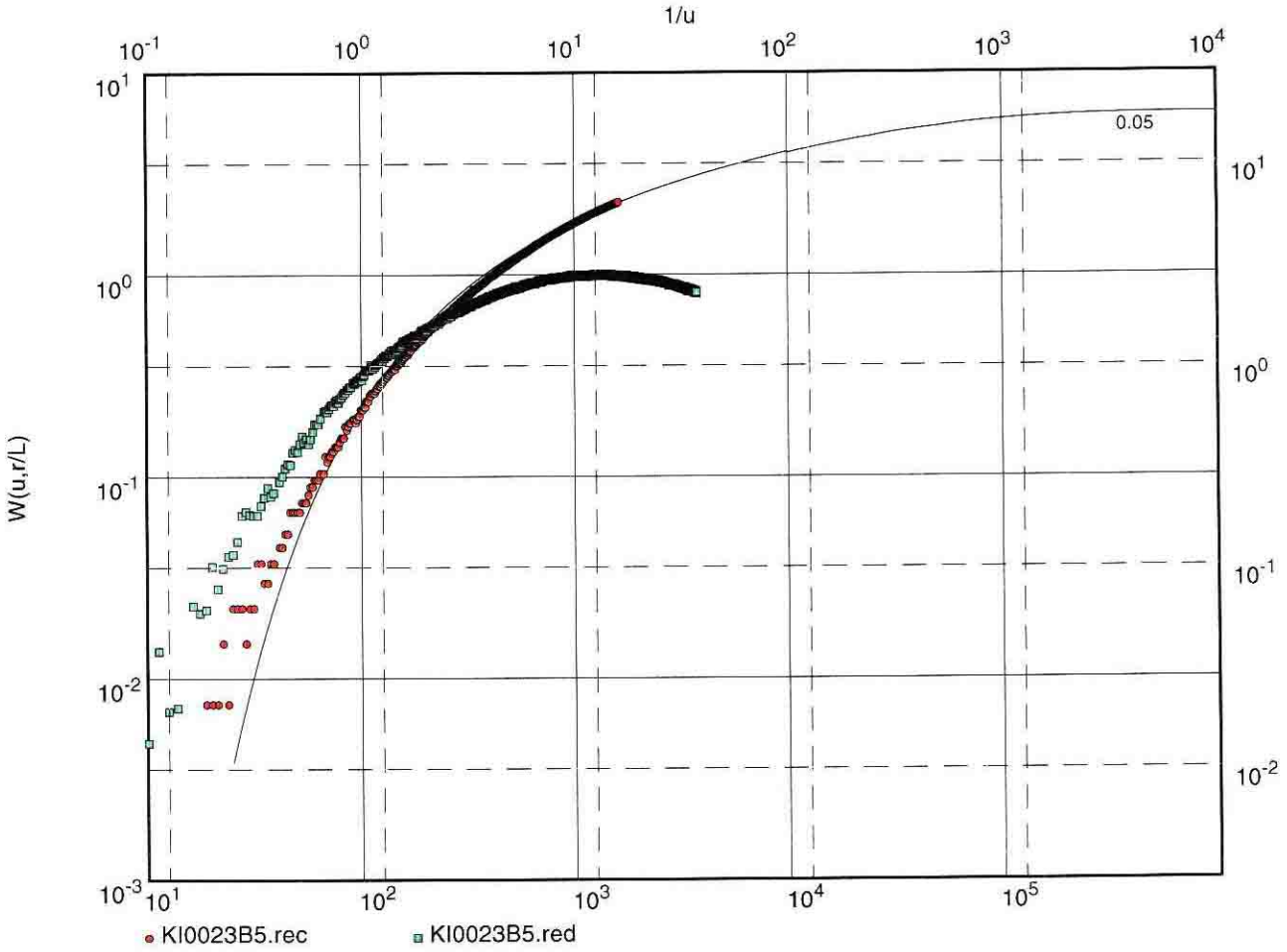
Storativity: 5.73×10^{-8}

Dominating pseudo-radial flow.

Slight leakance by the end of the test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 4, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P5	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 7.28×10^{-7}

Storativity: 5.72×10^{-7}

Hydraulic resistance (c) [s]: 2.21×10^{11}

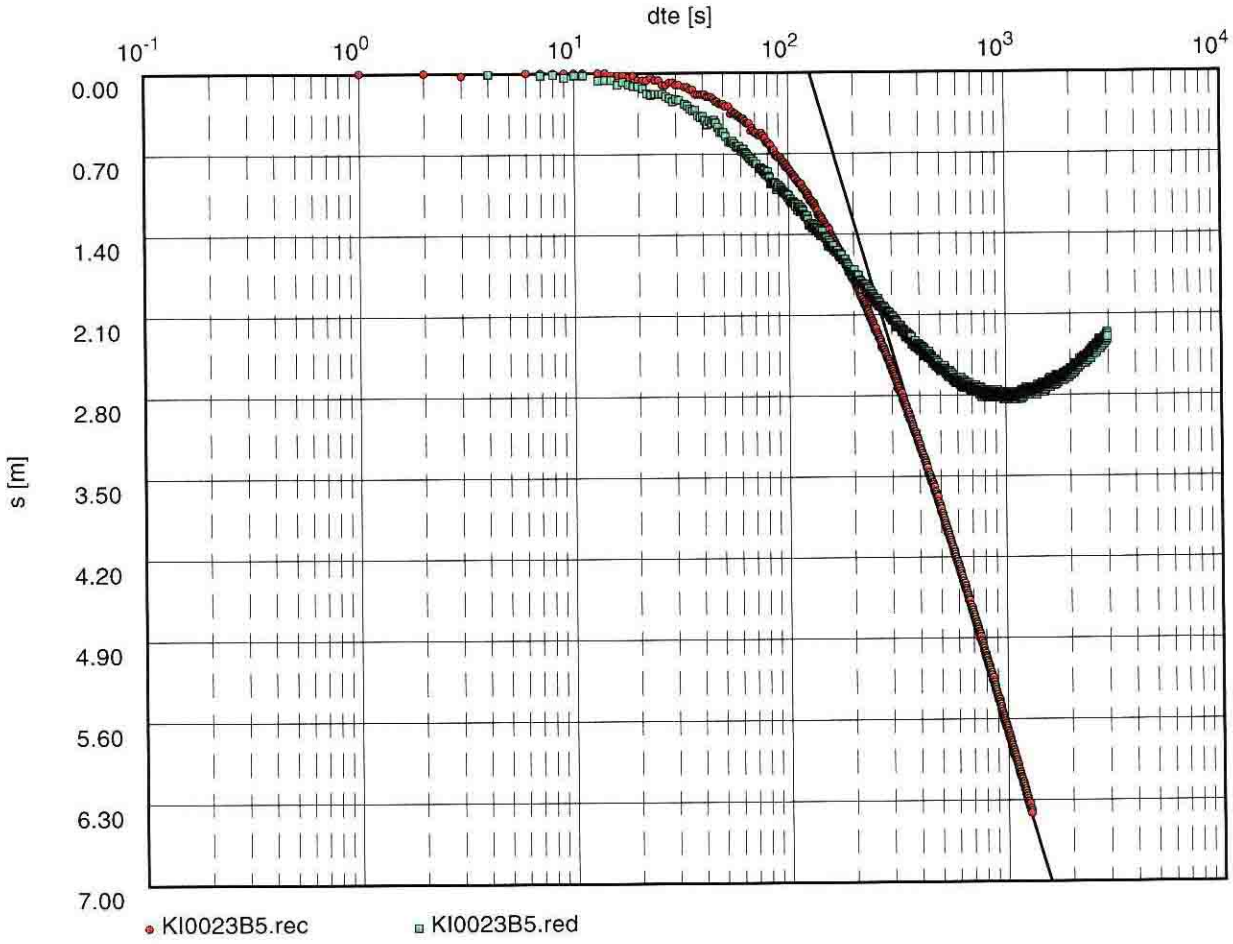
Predominantly pseudo-radial flow.

Slightly leaky flow by the end of test.

Leakage coefficient K'/b'=4.5E-12 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P5	
Discharge 0.03 l/s	



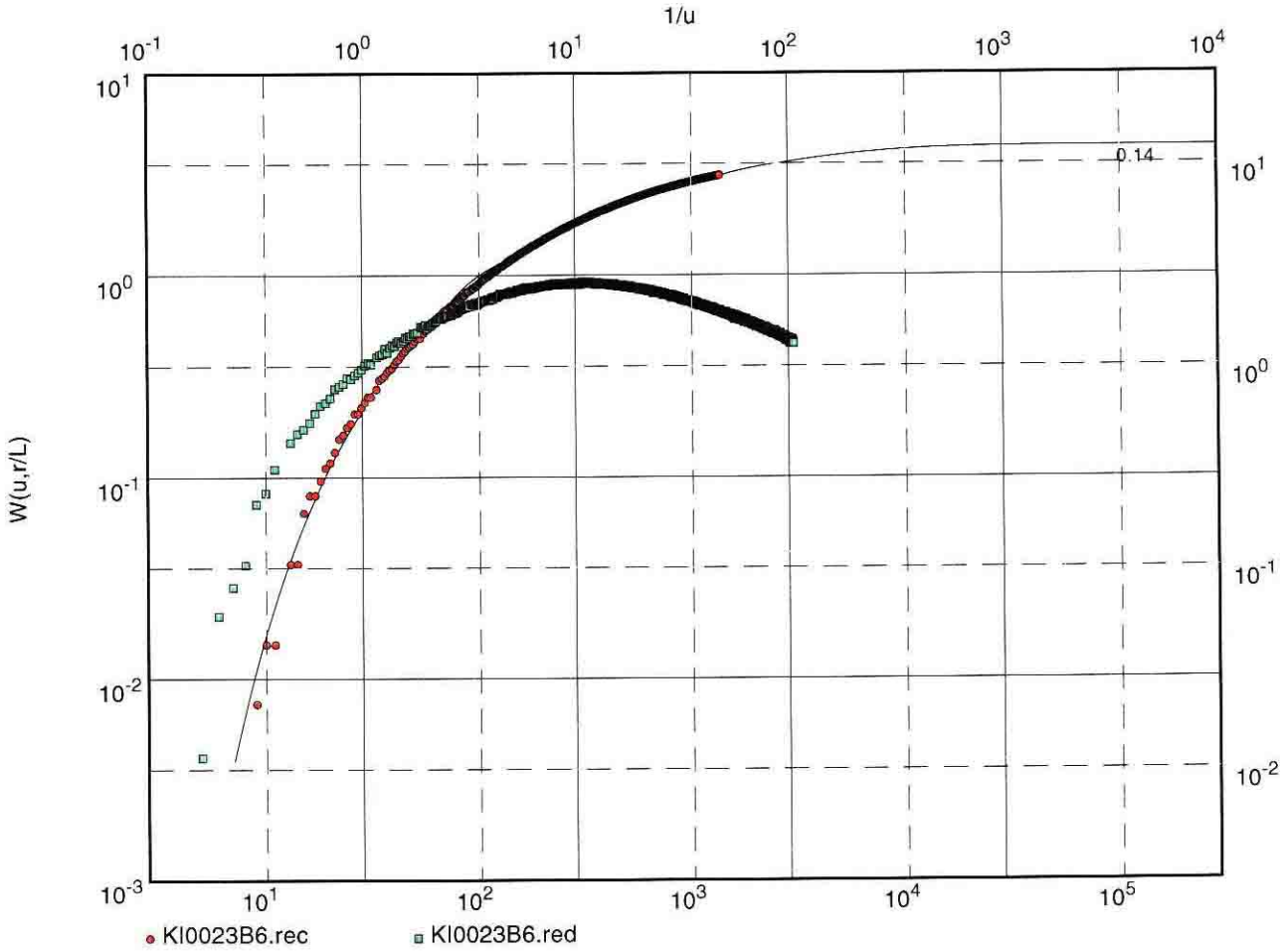
Transmissivity [m²/s]: 7.39×10^{-7}

Storativity: 5.17×10^{-7}

Dominating pseudo-radial flow.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 4, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P6	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 7.28×10^{-7}

Storativity: 3.24×10^{-7}

Hydraulic resistance (c) [s]: 1.77×10^{10}

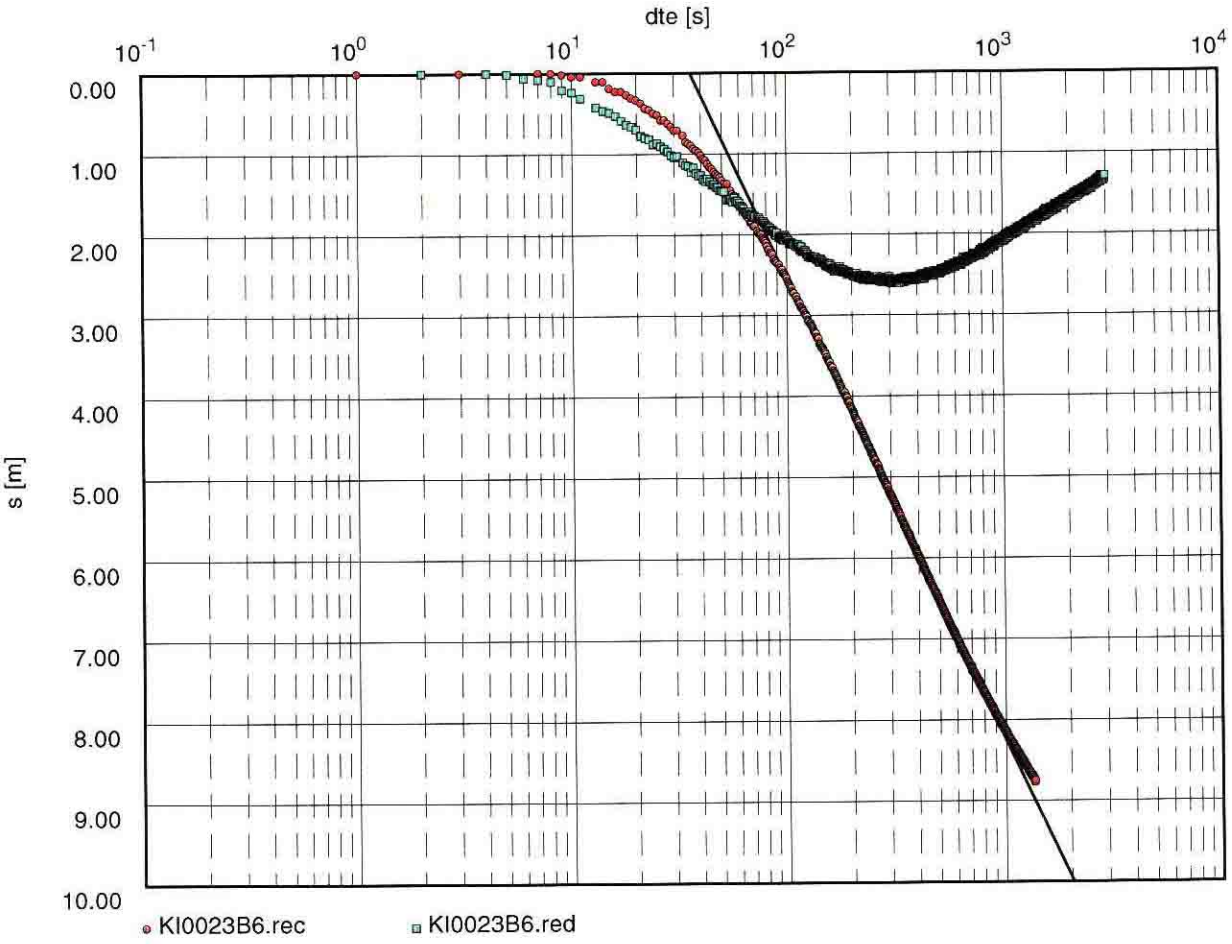
Predominantly pseudo-radial flow.

Slightly leaky (pseudo-spherical) flow by the end.

Leakage coefficient K'/b'=5.6E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P6	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 8.28×10^{-7}

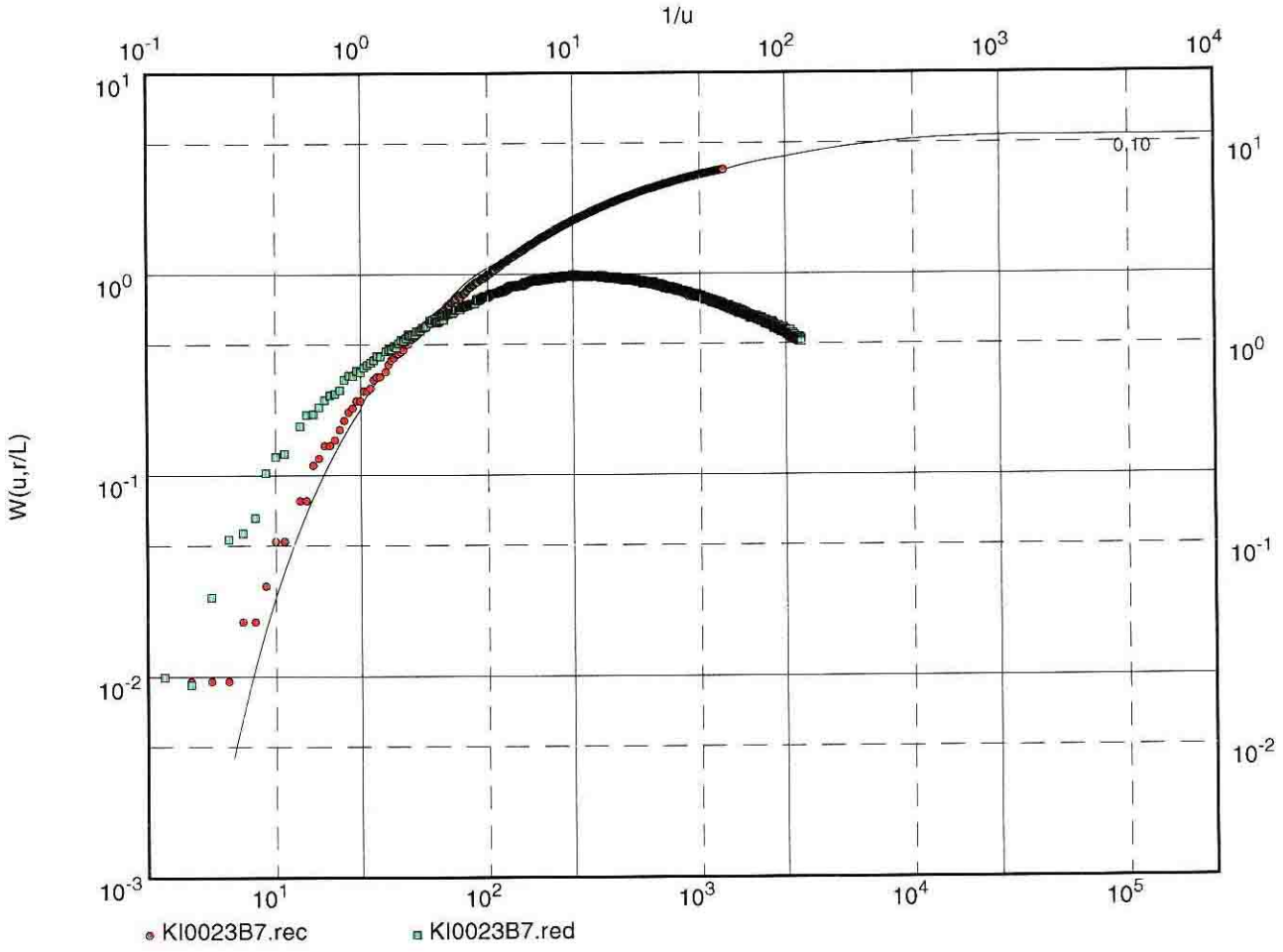
Storativity: 2.63×10^{-7}

Dominating pseudo-radial flow.

Slight leakance by the end of test.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 4, Page 10 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P7	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 9.17×10^{-7}

Storativity: 3.42×10^{-7}

Hydraulic resistance (c) [s]: 2.93×10^{10}

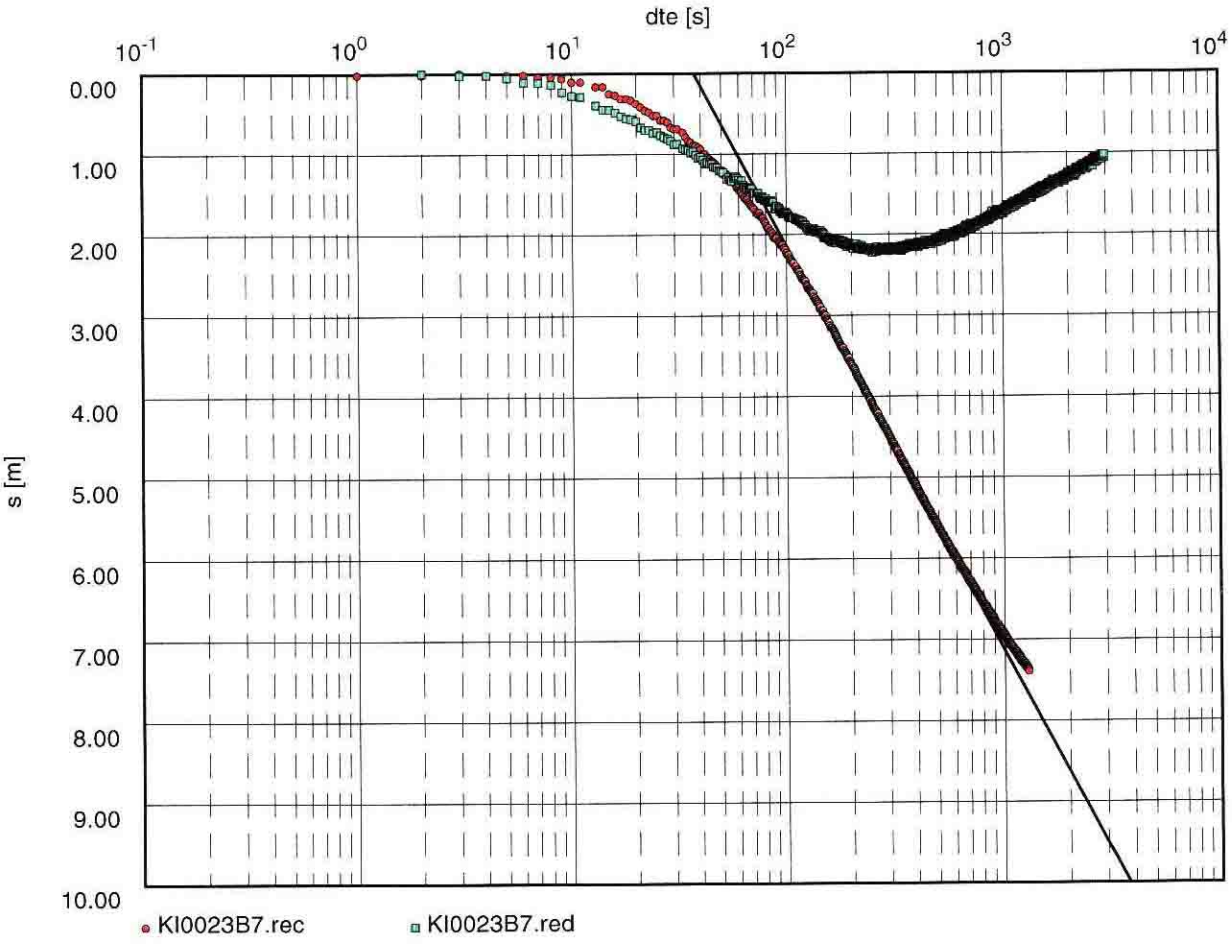
Dominantly pseudo-radial flow.

Slightly leaky flow byn the end of the test

Leakage coefficient K'/b'=3.4E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 4, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.08.1998

Pumping Test No. ESV-1a	Test conducted on: 1998-03-31
KI0023B:P7	
Discharge 0.03 l/s	



Transmissivity [m²/s]: 9.45×10^{-7}

Storativity: 2.94×10^{-7}

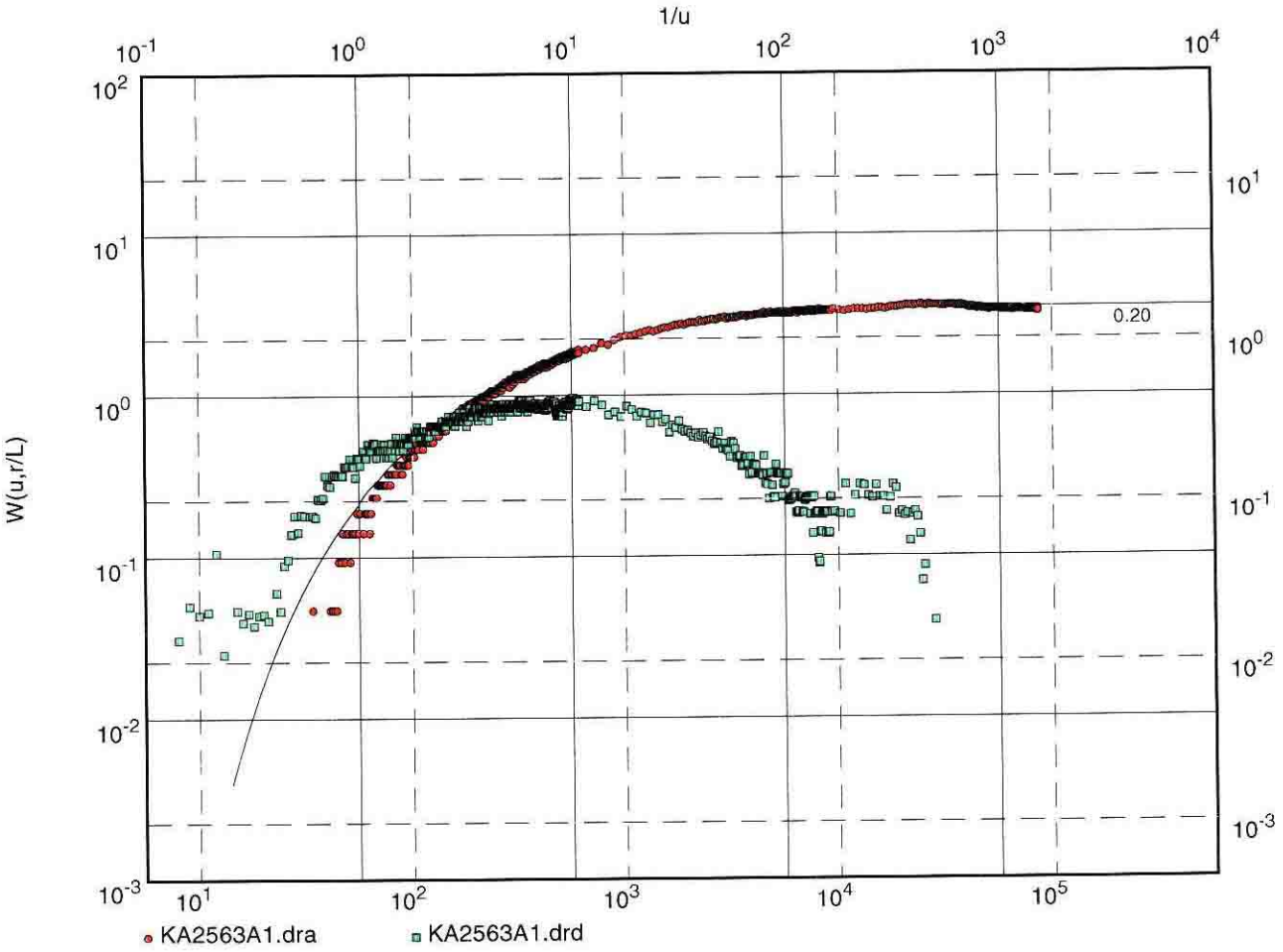
Dominating pseudo-radial flow.

Slight leakance by the end of the test.

ENCLOSURE 5 – TEST ESV-1b

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 5, Page 1 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KA2563A:R1	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 1.02×10^{-6}

Storativity: 1.18×10^{-8}

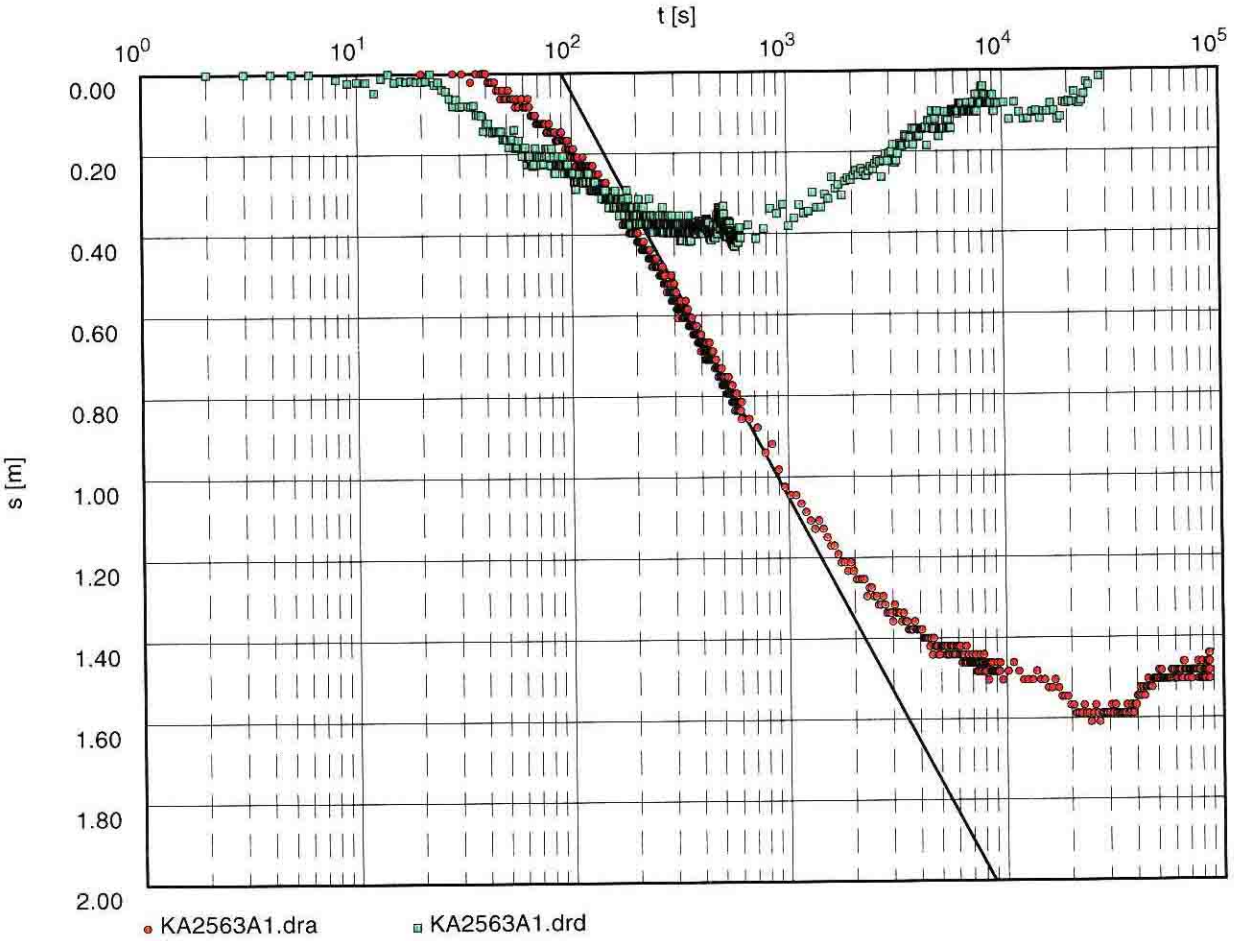
Hydraulic resistance (c) [s]: 4.74×10^{11}

Pseudo-radial flow at early times converging to leaky (pseudo-spherical) flow.

K'/b'=2.1E-12 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 2 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KA2563A:R1	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 1.04×10^{-6}

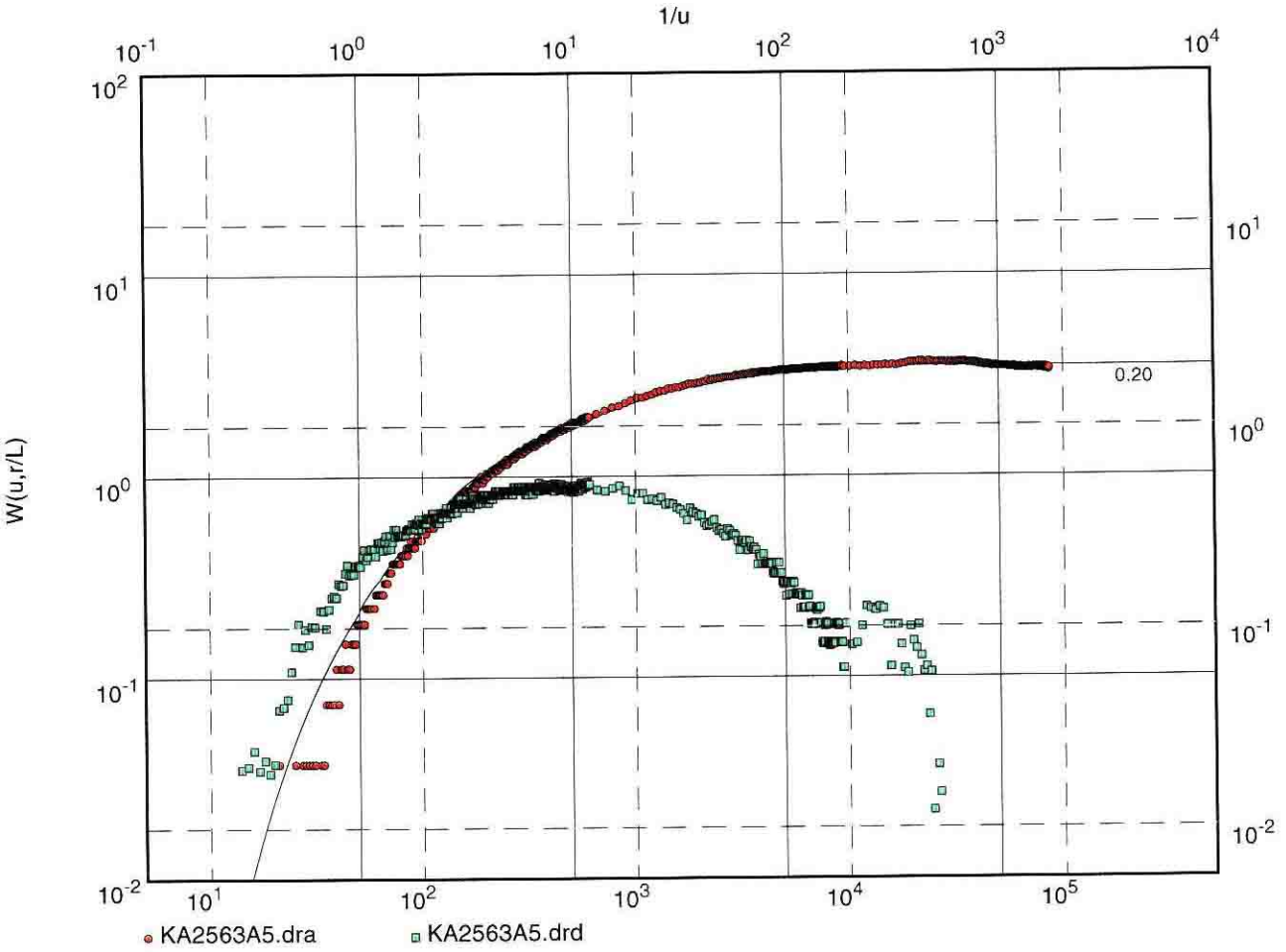
Storativity: 1.09×10^{-8}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 5, Page 3 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KA2563A:R5	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 8.13×10^{-7}

Storativity: 4.95×10^{-8}

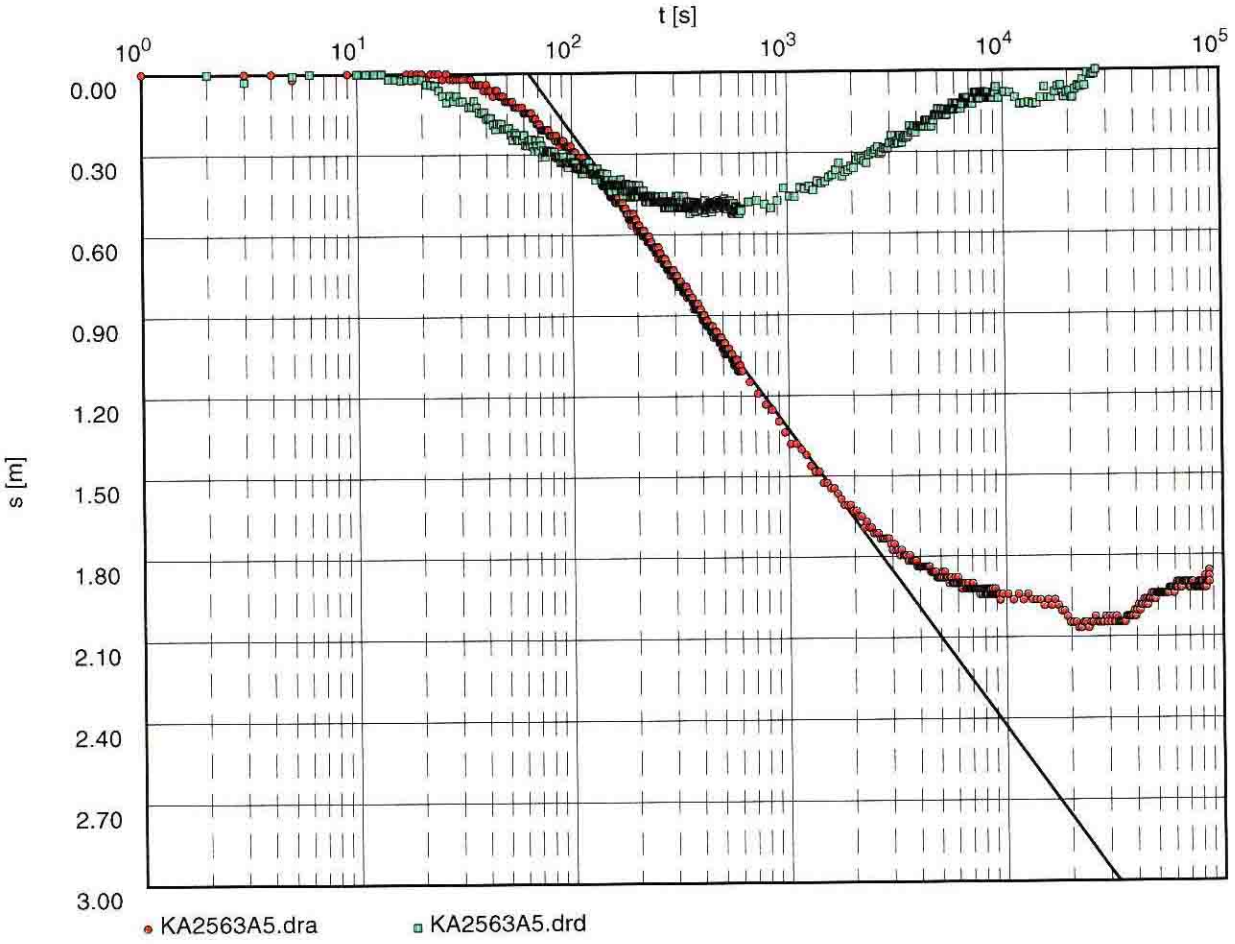
Hydraulic resistance (c) [s]: 1.01×10^{11}

Pseudo-radial flow at early times converging to leaky (pseudo-spherical) flow.

K'/b'=9.9E-12 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 4	
		Project: TRUE Block Scale	
		Evaluated by: JEL	Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KA2563A:R5	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 9.52×10^{-7}

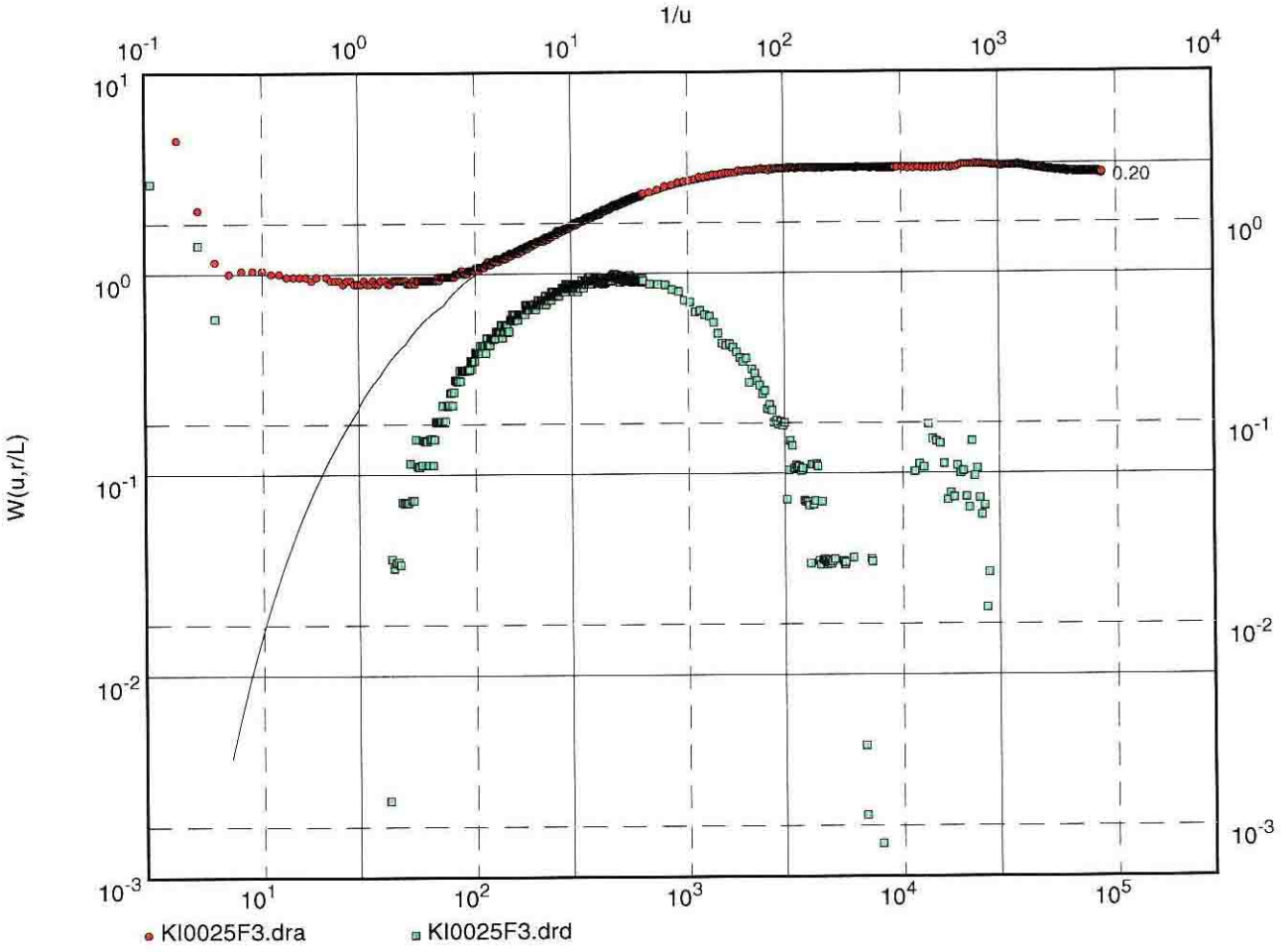
Storativity: 4.09×10^{-8}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 5, Page 5 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0025F:R3	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 8.13×10^{-7}

Storativity: 6.03×10^{-8}

Hydraulic resistance (c) [s]: 4.67×10^{10}

In the source borehole, next to the source section.

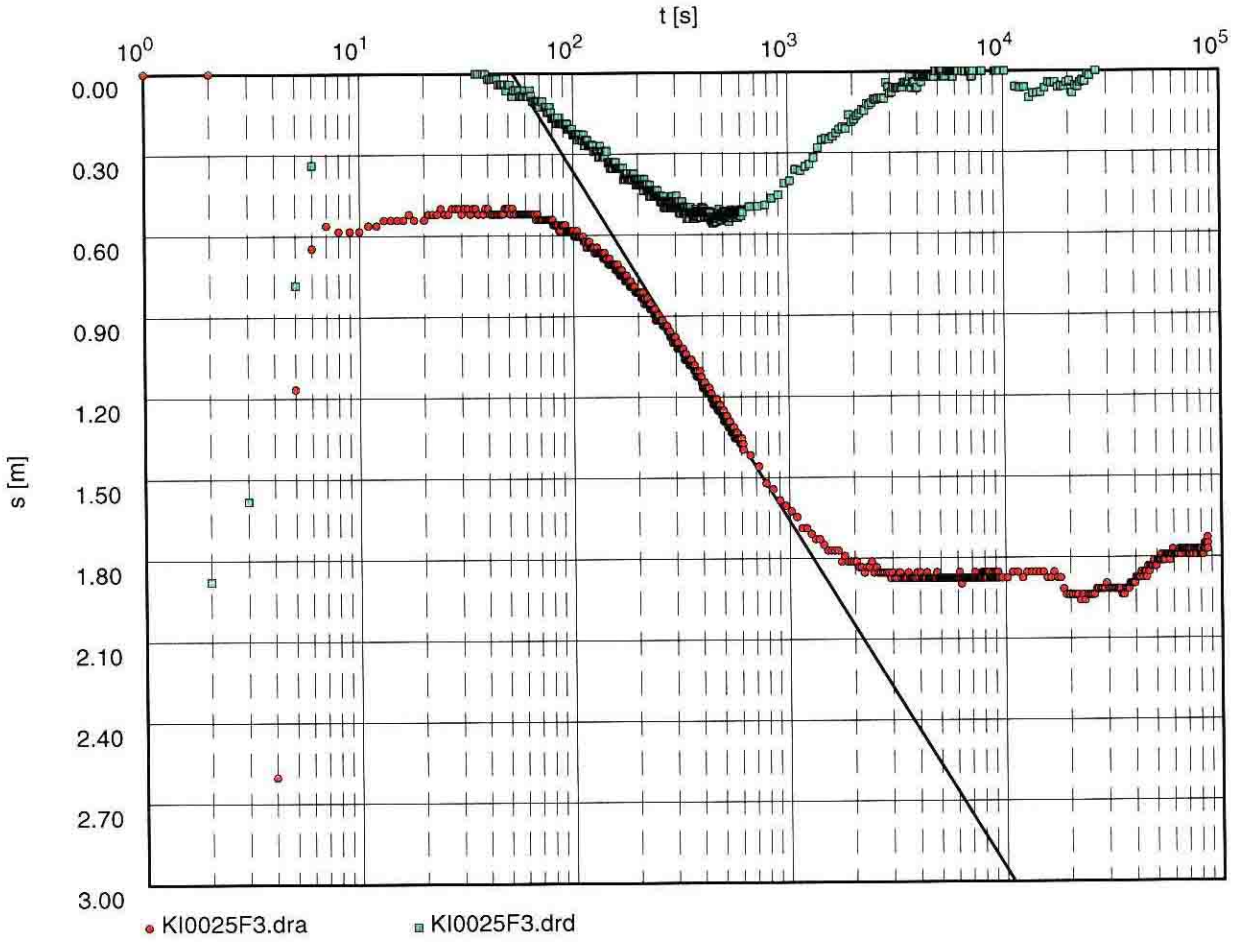
Early borehole (source) effect, possibly wave effect.

Leaky (pseudo-spherical) flow.

K'/b'=2.1E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0025F:R3	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 8.11×10^{-7}

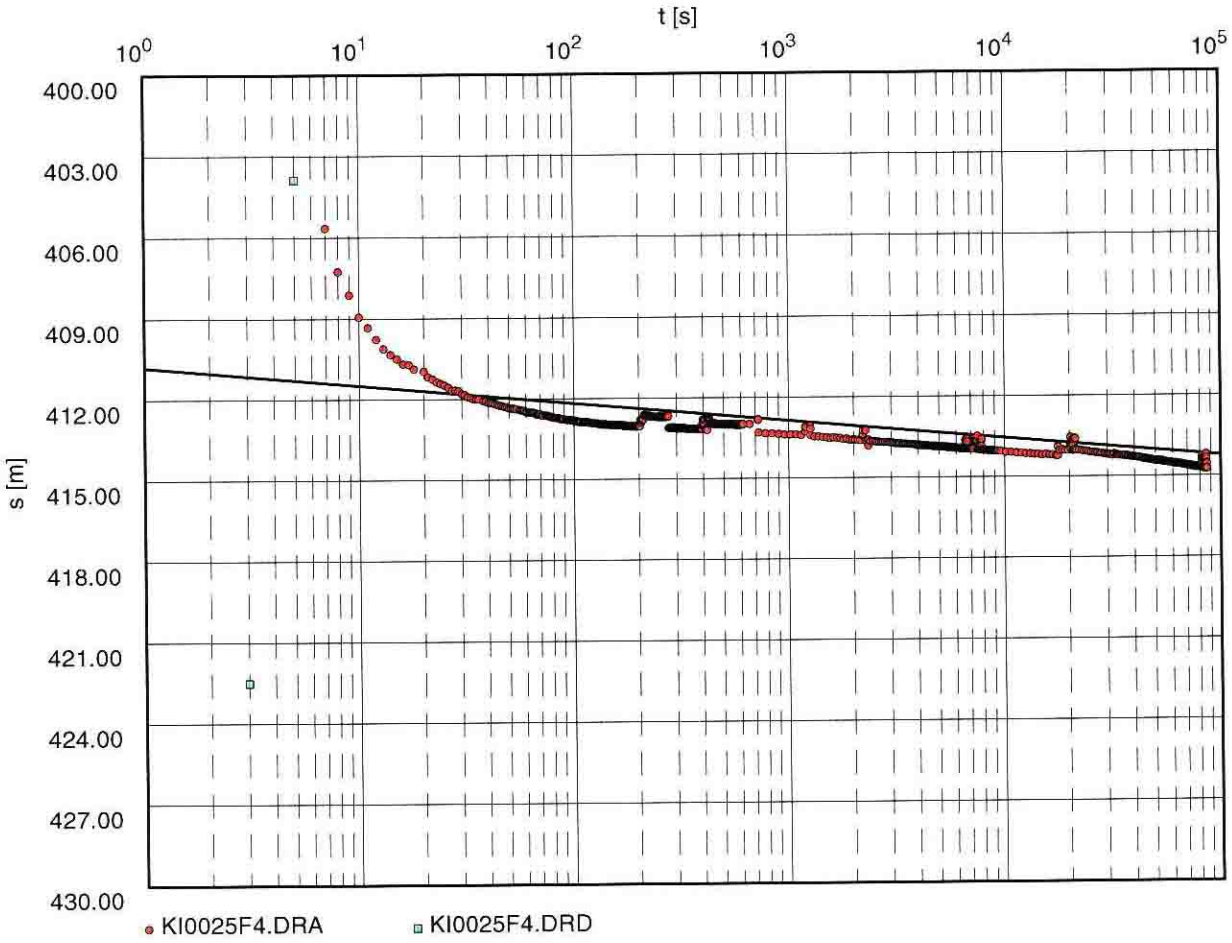
Storativity: 6.30×10^{-8}

Early pseudo-radial flow.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.10.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0025F:R4 (Source)	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 1.54×10^{-6}

Storativity: 0.00×10^{0}

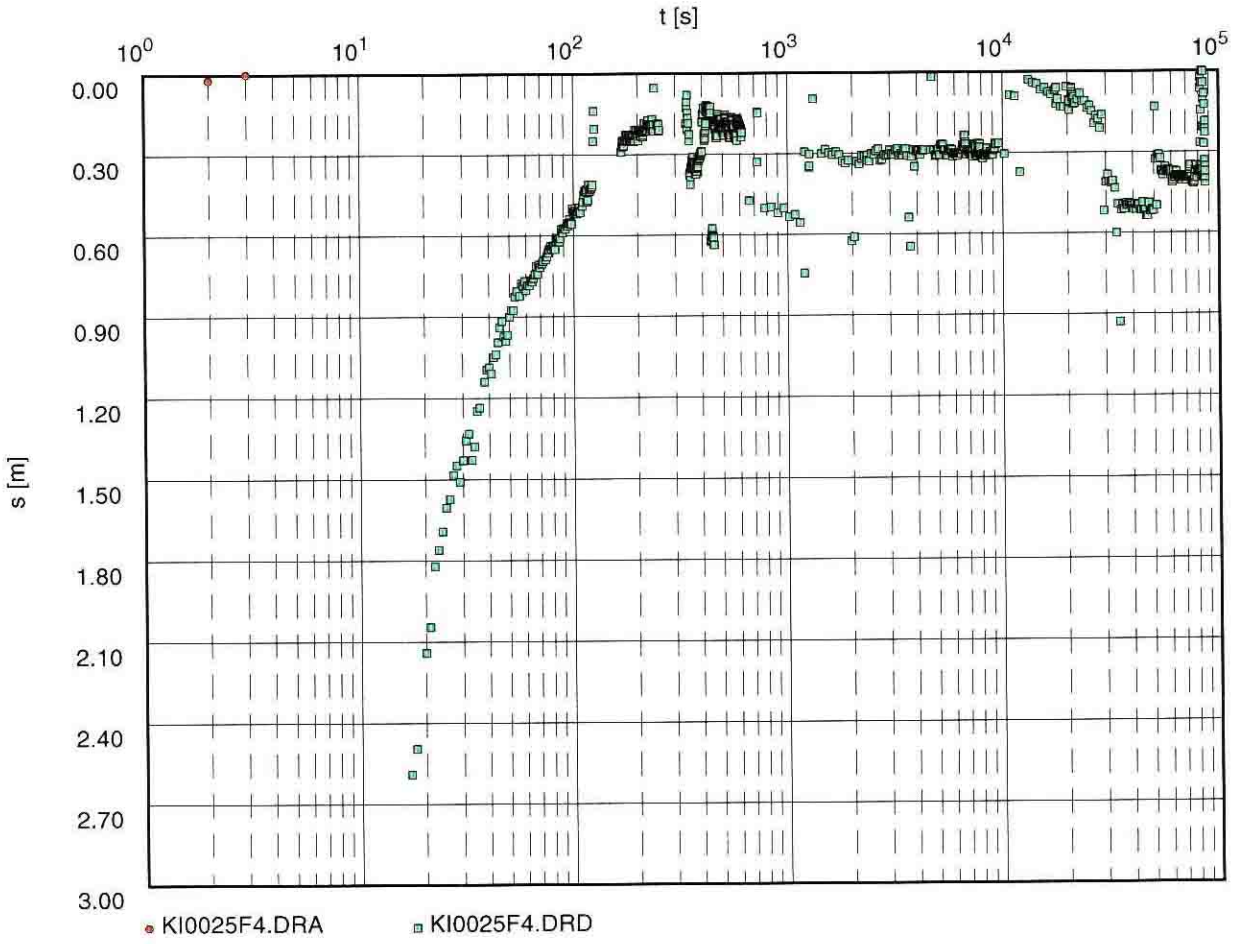
Source section. Drawdown zoomed in (400-430 m).

Drawdown curve indicate high positive skin at early times.
No representative value on the storativity could be calculated.

Dominating pseudo-radial flow.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 27.10.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0025F:R4 (Source)	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 1.54×10^{-6}

Storativity: 0.00×10^{0}

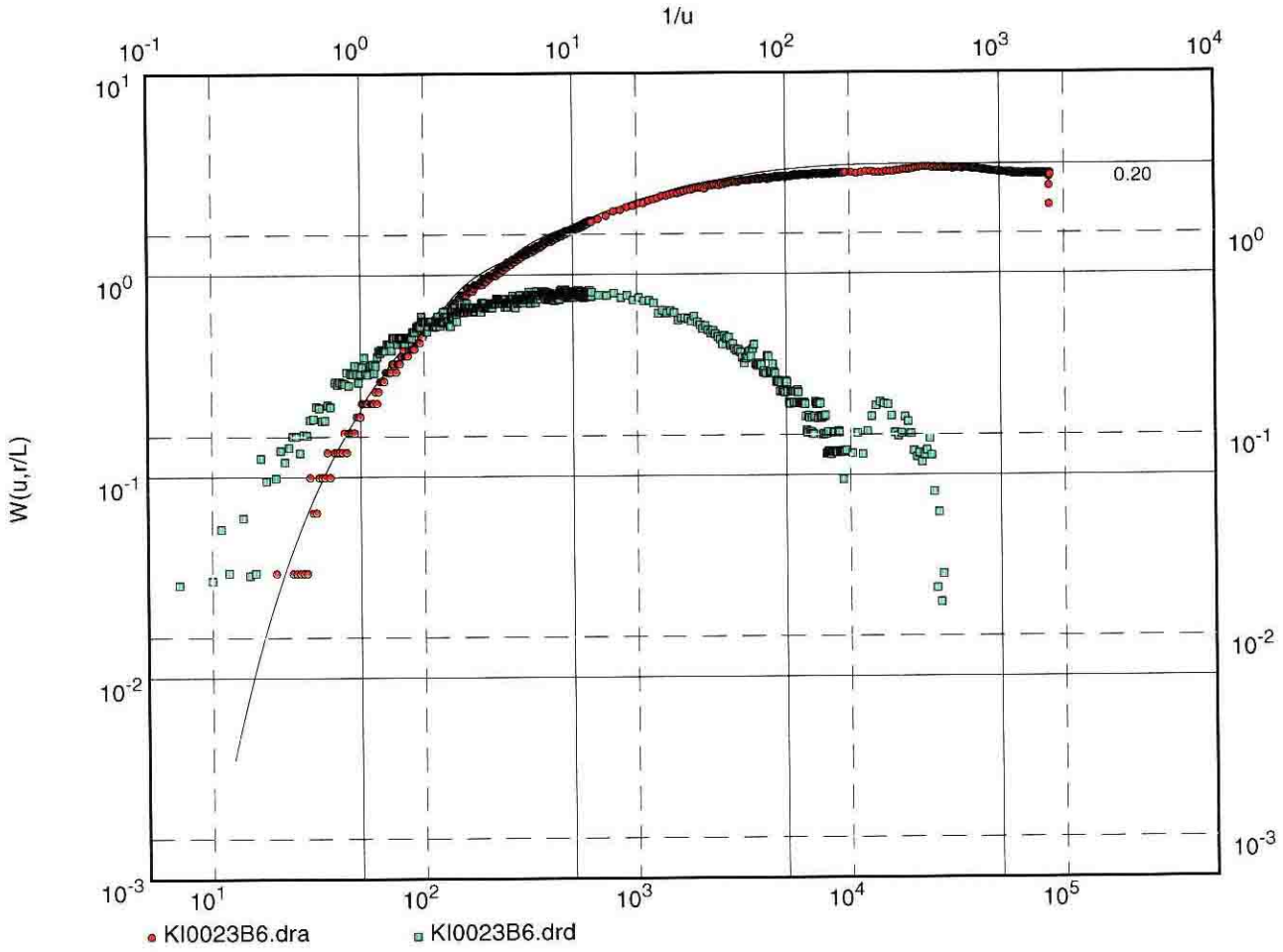
Source section.

Drawdown derivative zoomed in (0-3 m).

Dominating pseudo-radial flow.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 5, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0023B:P6	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 7.25×10^{-7}

Storativity: 8.20×10^{-8}

Hydraulic resistance (c) [s]: 6.11×10^{10}

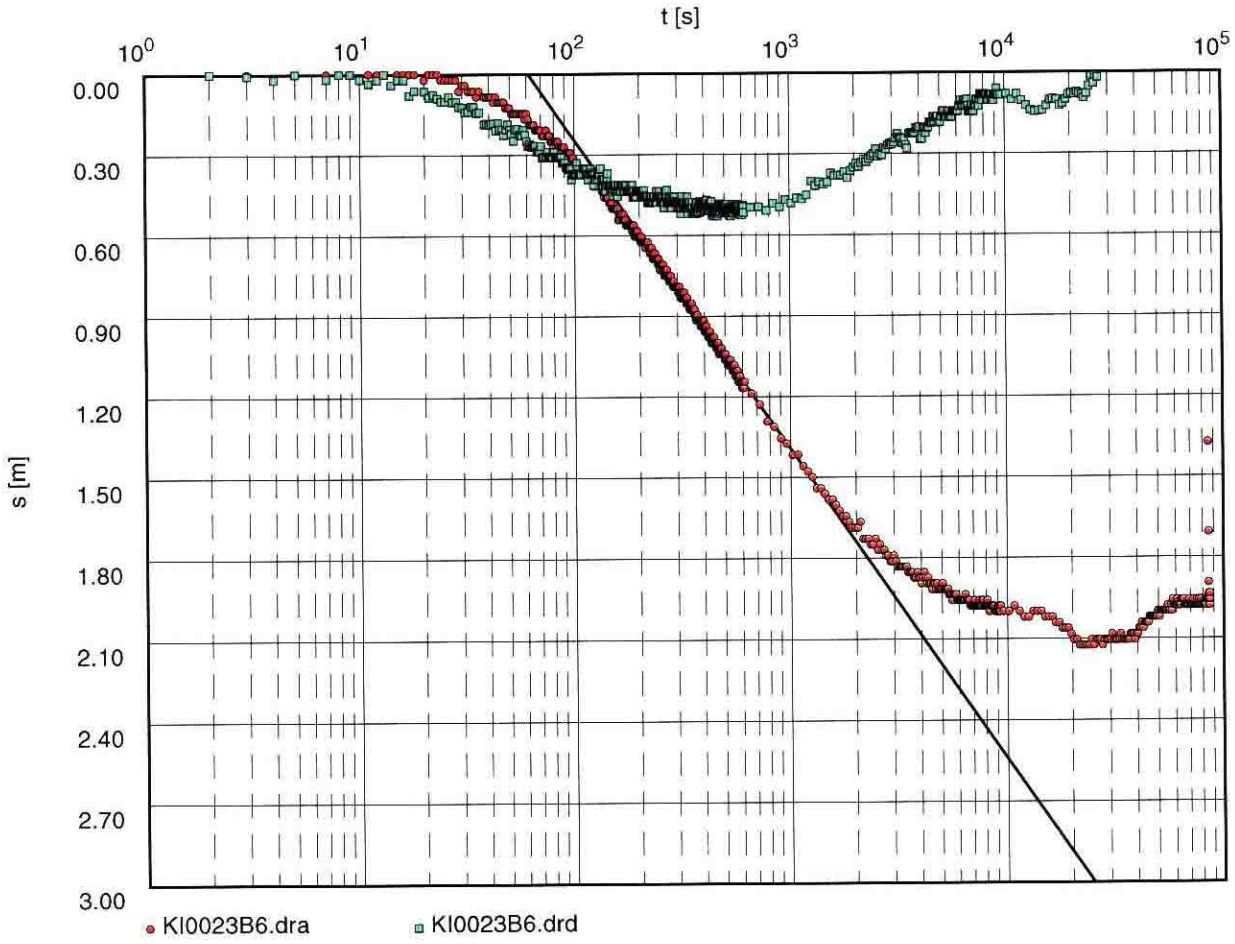
Early pseudo.spherical flow.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/b'=1.6E-11 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 10 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0023B:P6	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 9.16×10^{-7}

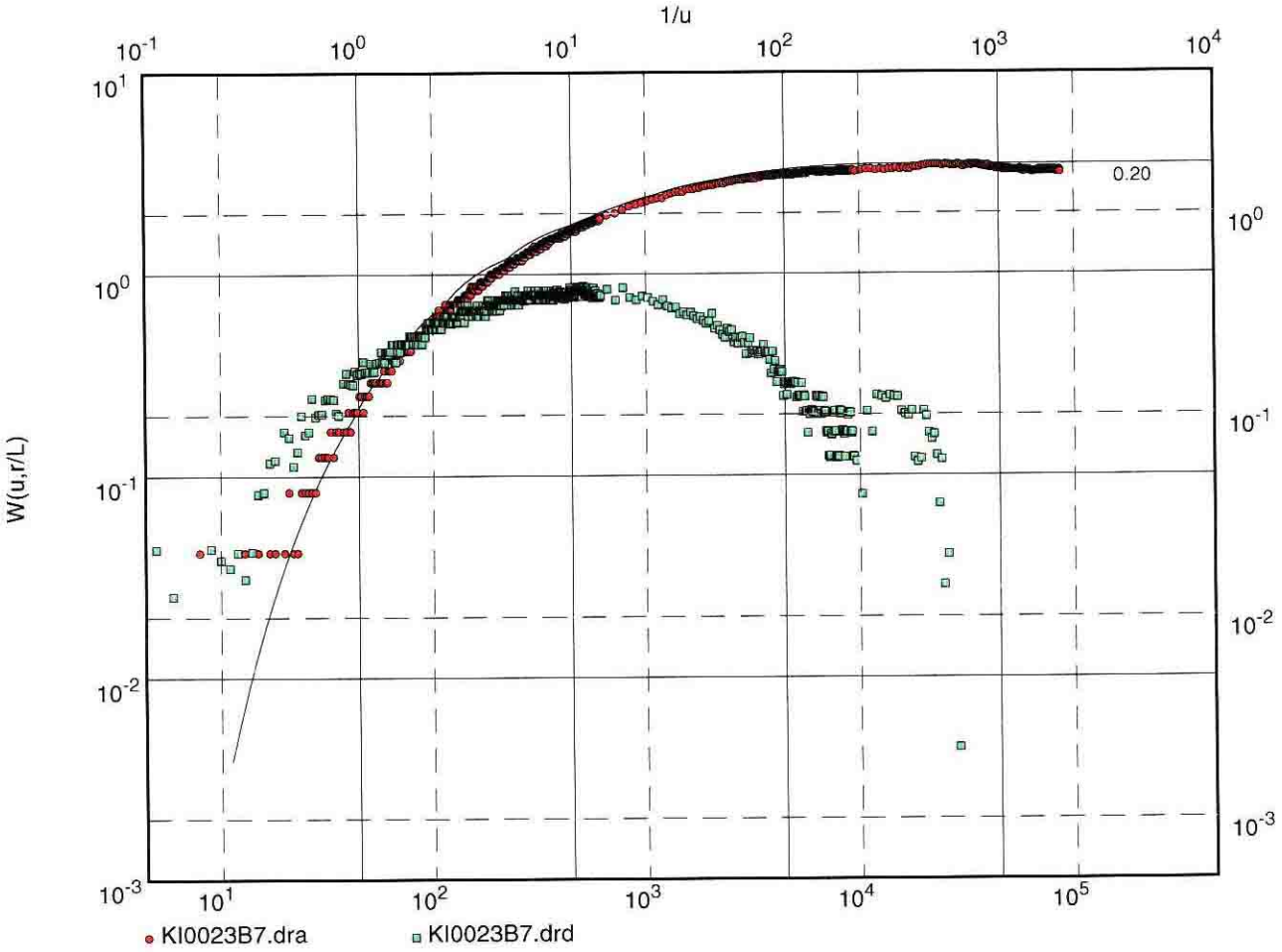
Storativity: 7.10×10^{-8}

Early pseudo-radial flow.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 5, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0023B:P7	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 9.12×10^{-7}

Storativity: 7.26×10^{-8}

Hydraulic resistance (c) [s]: 6.15×10^{10}

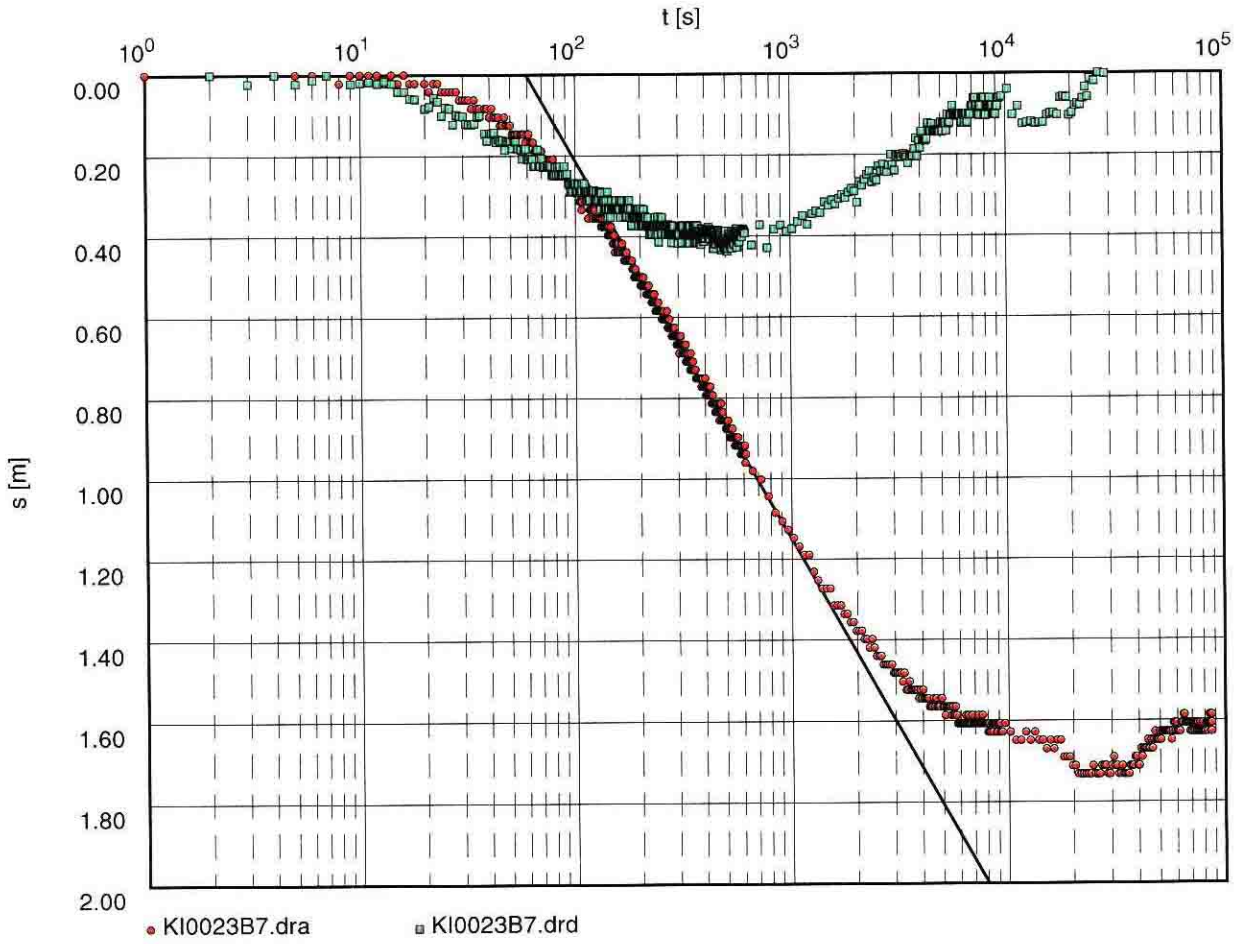
Early pseudo-radial flow.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/b'=1.6E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 5, Page 12 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1b	Test conducted on: 1998-04-02
KI0023B:P7	
Discharge 0.01 l/s	



Transmissivity [m²/s]: 1.12×10^{-6}

Storativity: 6.66×10^{-8}

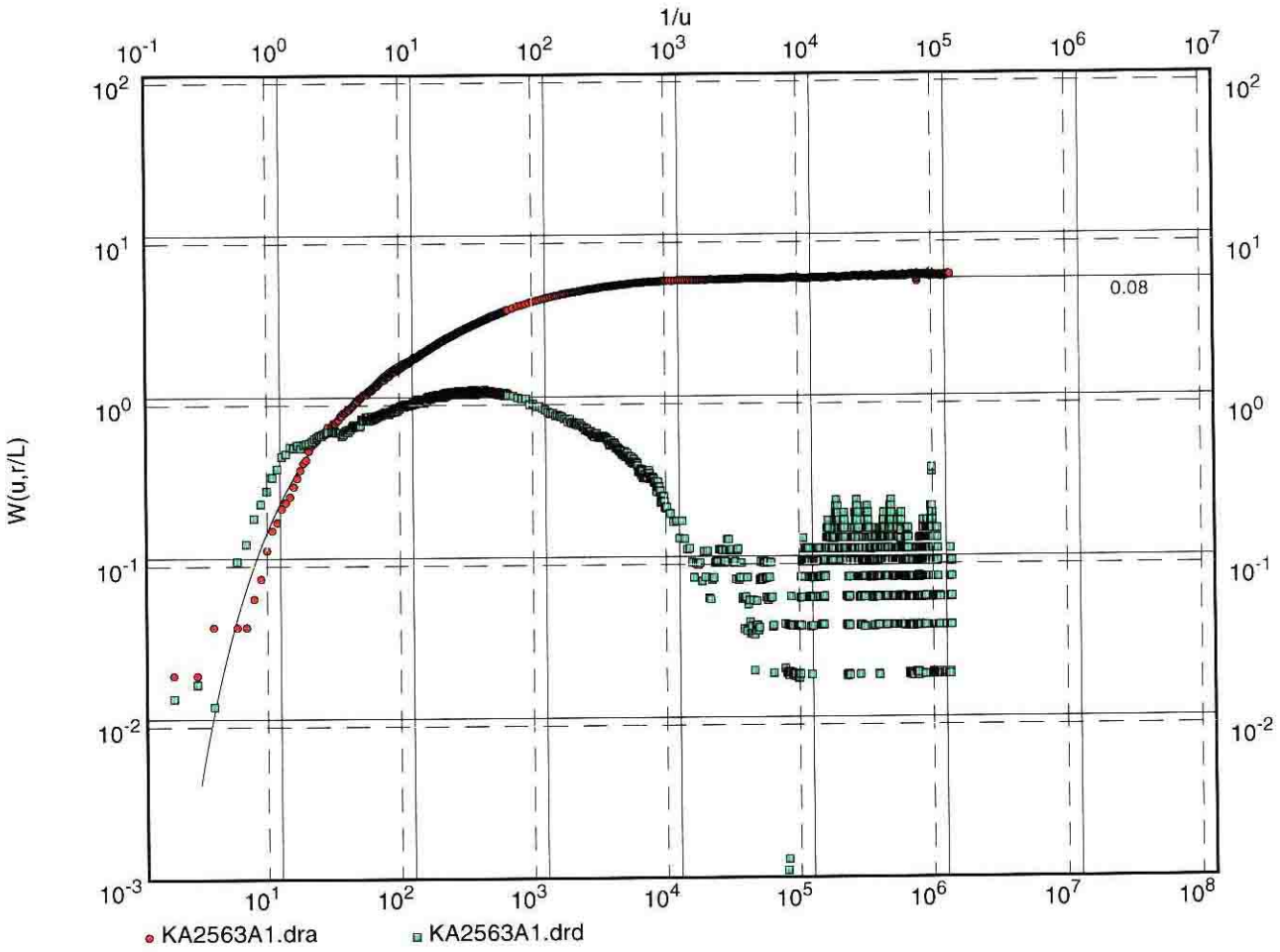
Early pseudo-radial flow.

Leaky flow at intermediate and late times.

ENCLOSURE 6 – TEST ESV-1c

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 6, Page 1 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0025F:R4	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 1.22×10^{-6}

Storativity: 4.15×10^{-9}

Hydraulic resistance (c) [s]: 1.89×10^{12}

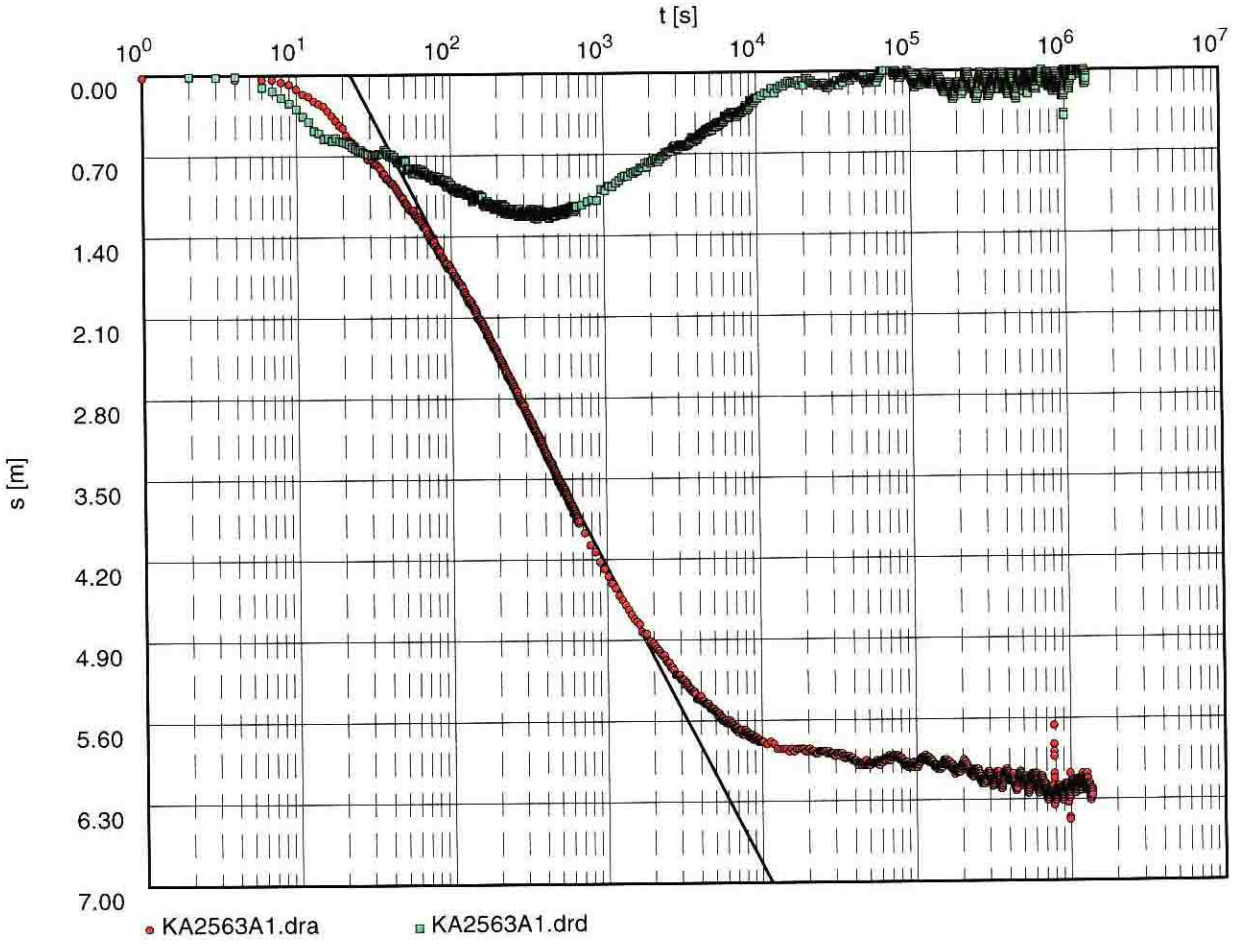
Early pseudo-radial flow.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/b'=5.3E-13 (1/s).

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 2 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0025F:R4	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 1.22×10^{-6}

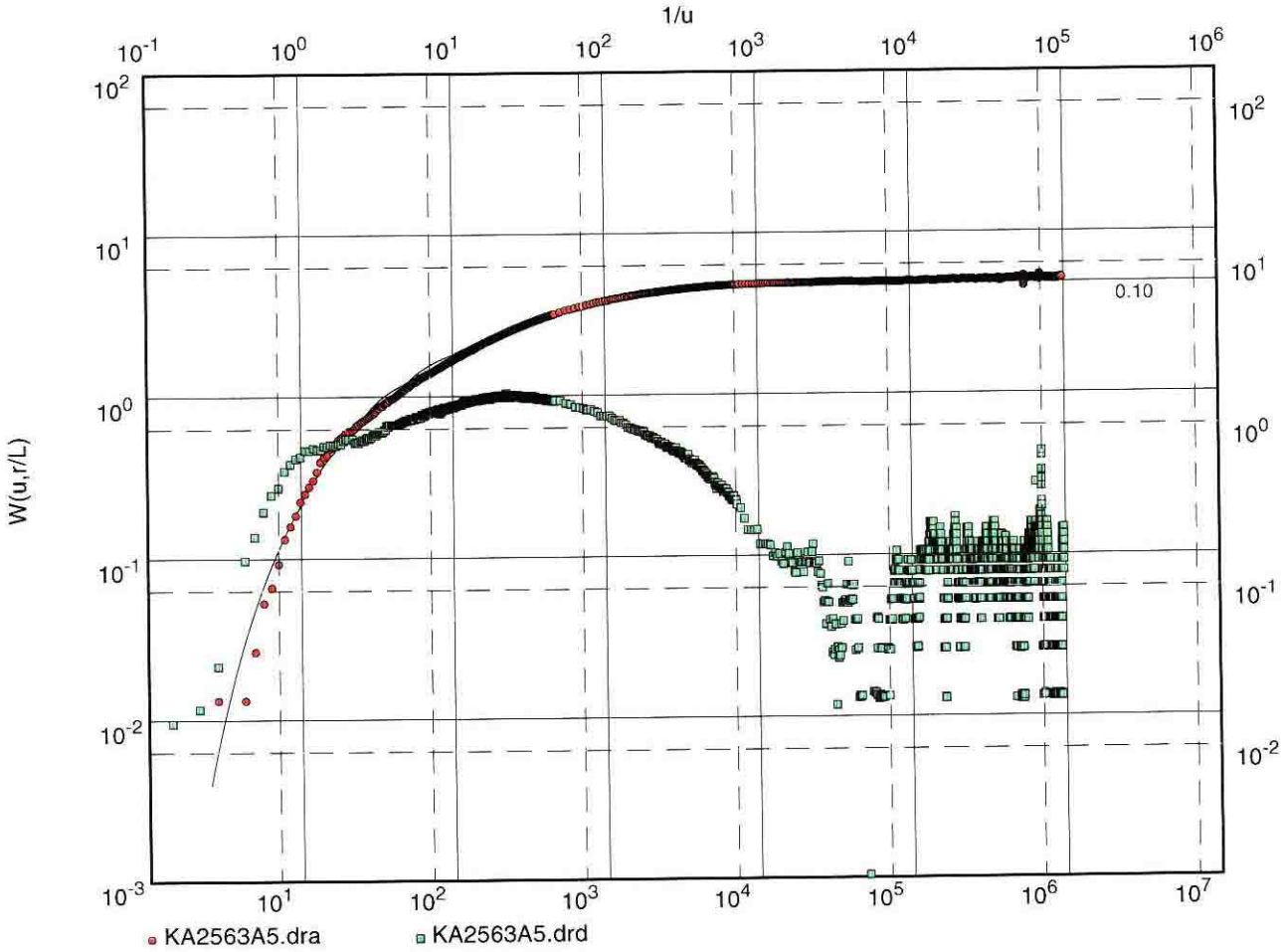
Storativity: 4.13×10^{-9}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 6, Page 3 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KA2563A:R5	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 8.68×10^{-7}

Storativity: 1.94×10^{-7}

Hydraulic resistance (c) [s]: 2.91×10^{10}

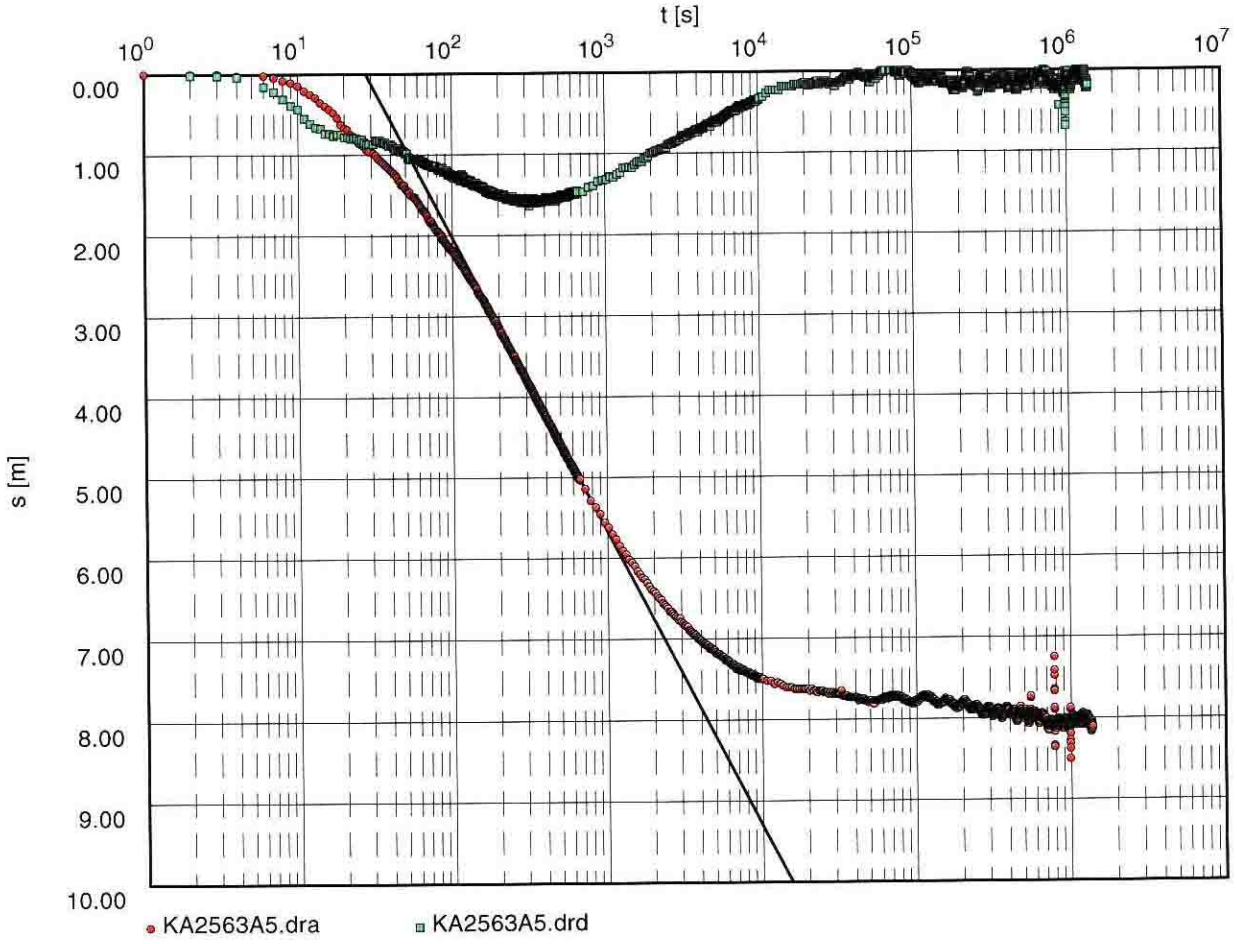
Pseudo-radial flow at early times.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/m'=3.4E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 4 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KA2563A:R5	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 8.69×10^{-7}

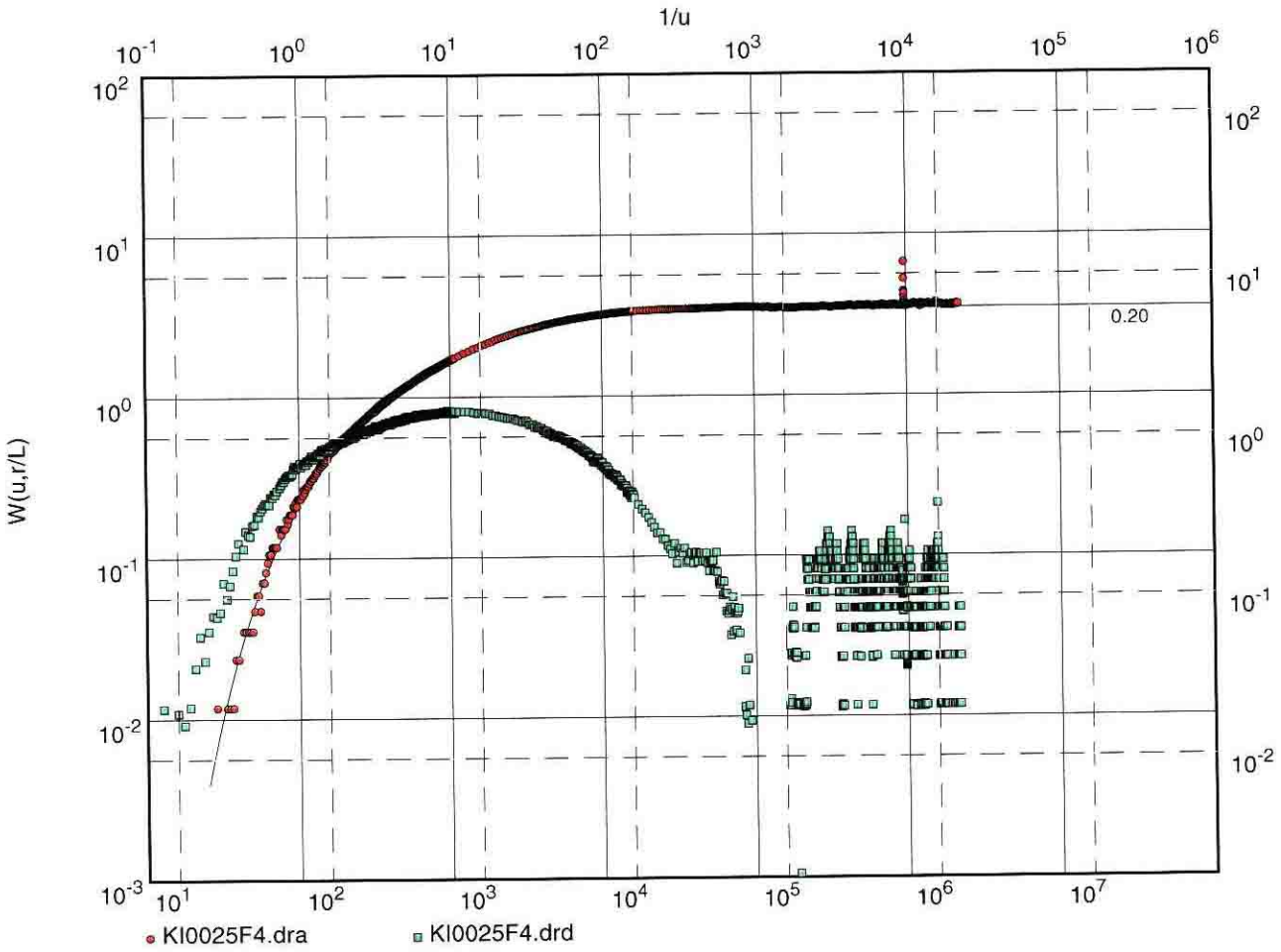
Storativity: 2.14×10^{-7}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 6, Page 5 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0025F:R4	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 7.74×10^{-7}

Storativity: 1.10×10^{-7}

Hydraulic resistance (c) [s]: 5.72×10^{10}

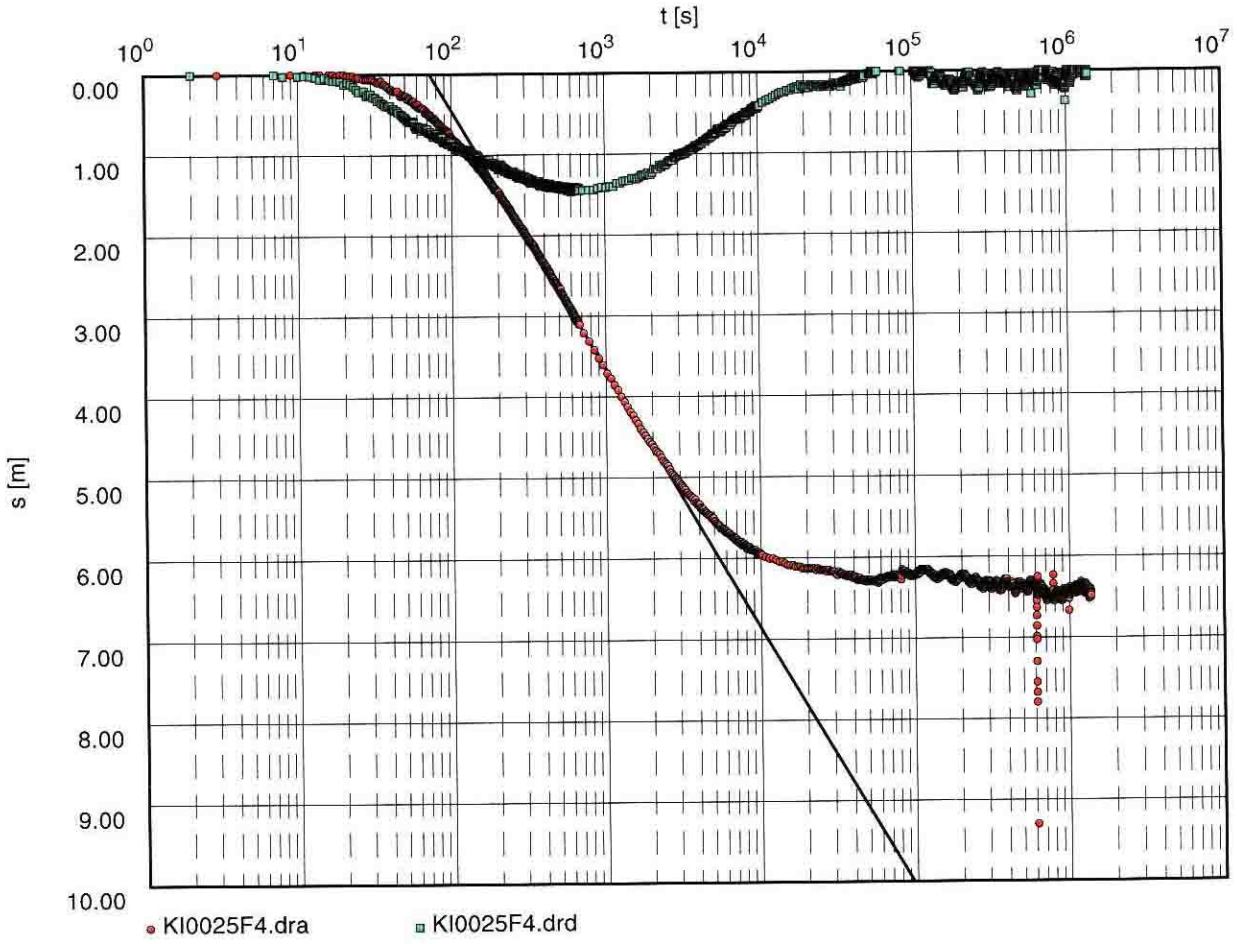
Pseudo-radial flow at early times.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/m'=1.7E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 6 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0025F:R4	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 9.86×10^{-7}

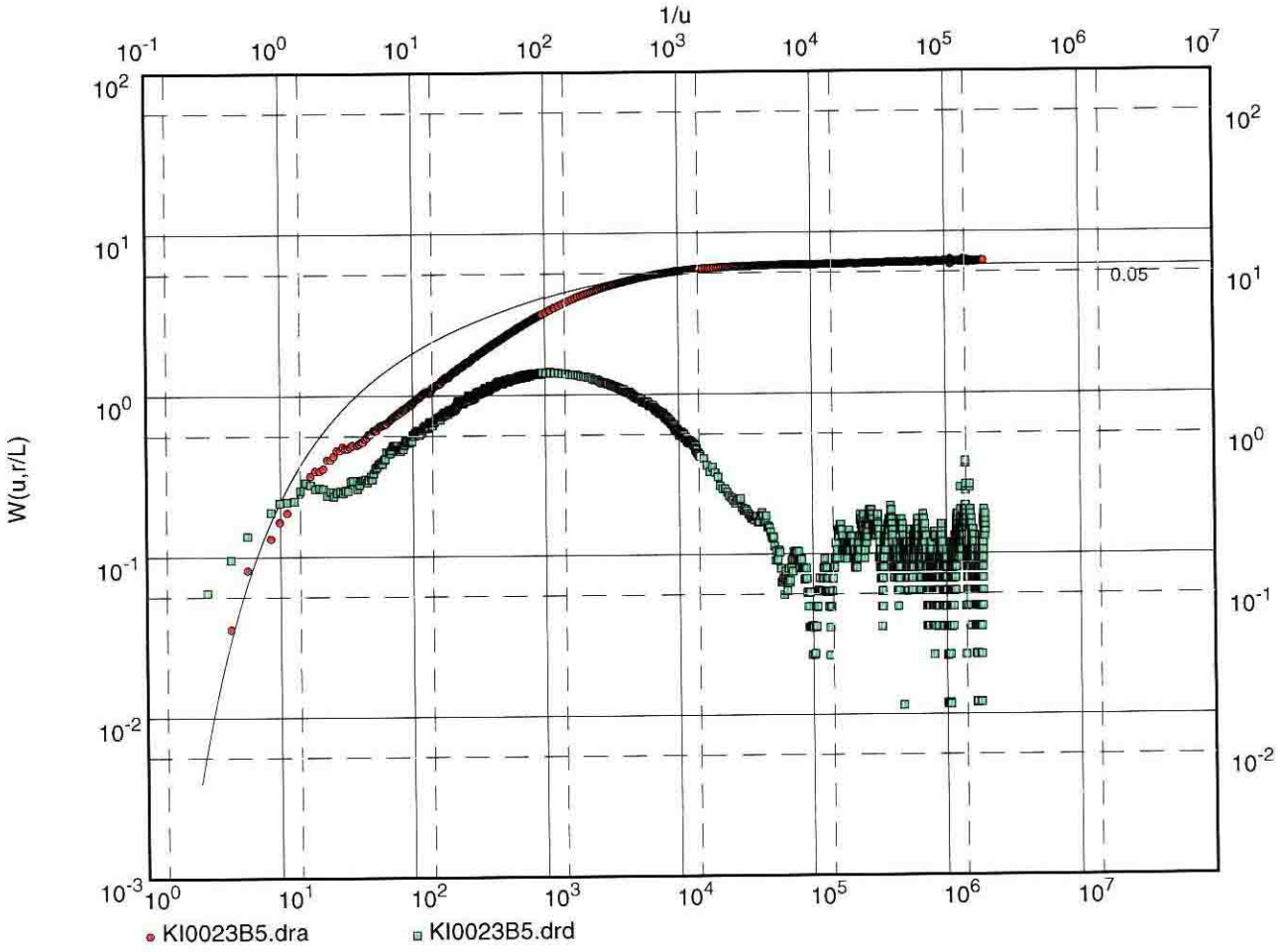
Storativity: 9.05×10^{-8}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis HANTUSH's method Leaky aquifer, no aquitard storage	Enclosure 6, Page 7 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0023B:P5	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 7.74×10^{-7}

Storativity: 4.11×10^{-7}

Hydraulic resistance (c) [s]: 2.75×10^{10}

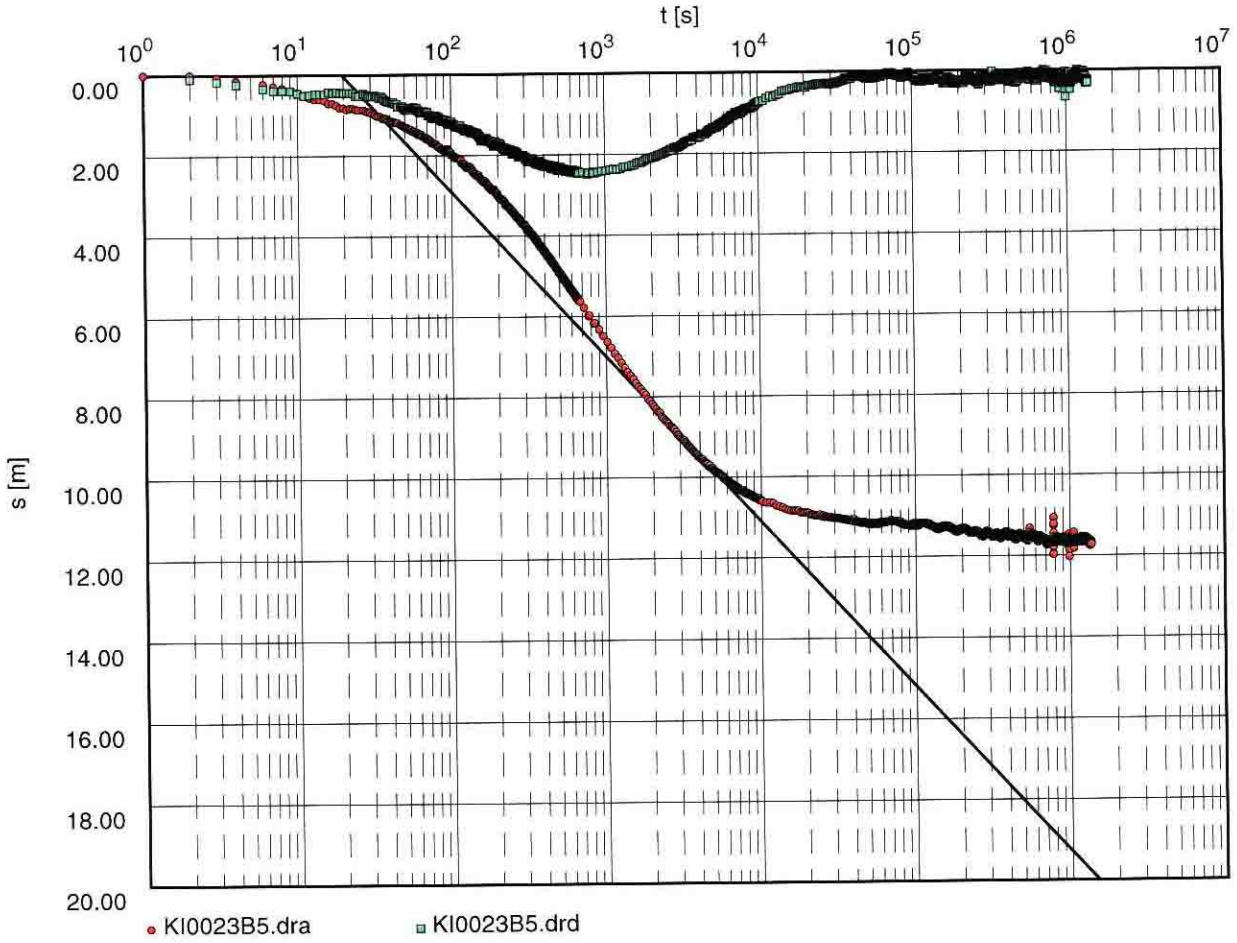
Early borehole effects? may distort presumed early pseudo-radial flow period.

Leaky (pseudo-spherical) flow at intermediate and late times.

K'/m'=3.64E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 8 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0023B:P5	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 7.72×10^{-7}

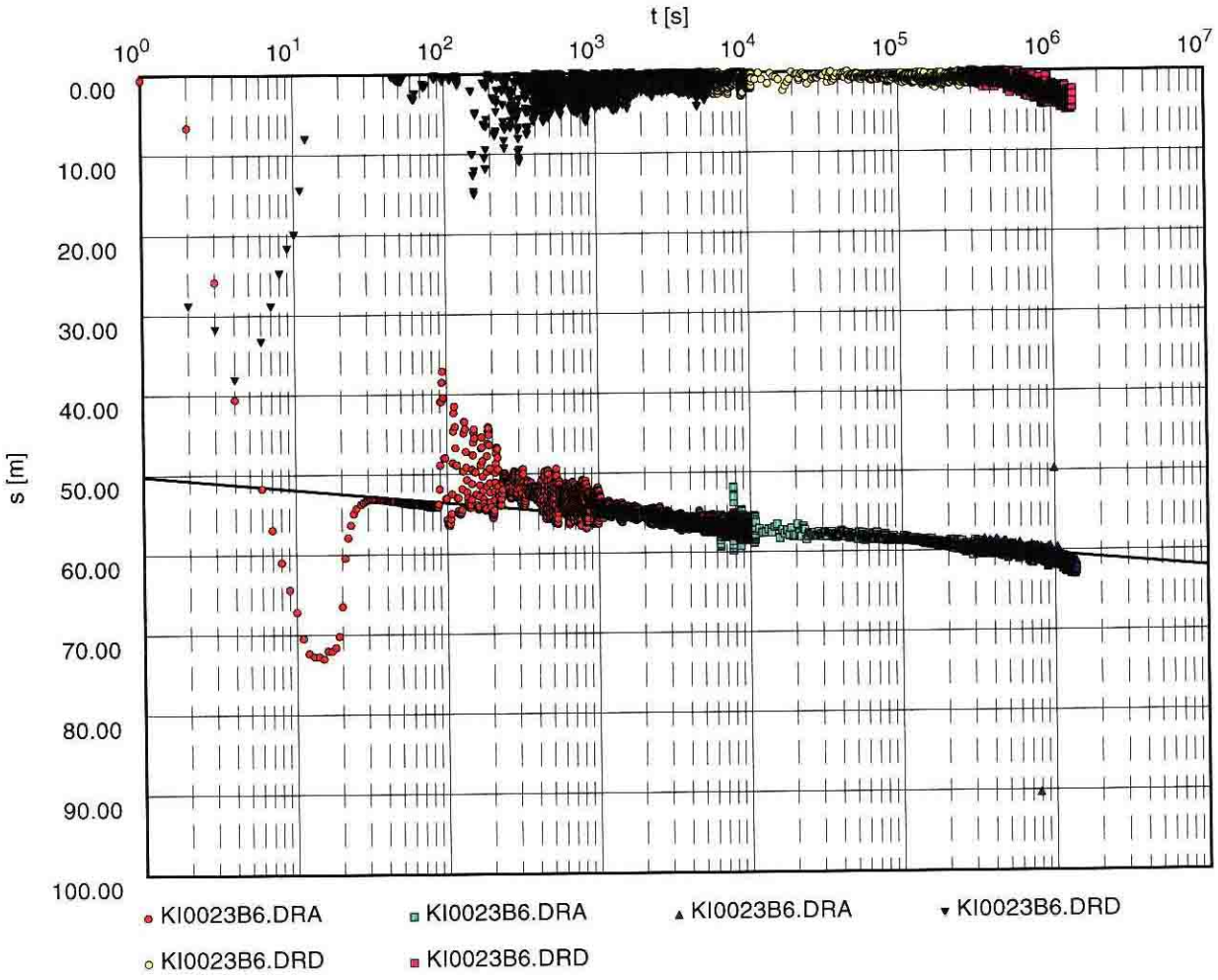
Storativity: 6.37×10^{-7}

Early borehole effects? may distort presumed early pseudo-radial flow period.

Leaky flow at intermediate and late times.

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 9 Project: TRUE Block Scale Evaluated by: JEL | Date: 28.10.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0023B:P6 (Source)	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 1.86×10^{-6}

Storativity: 8.01×10^{-33}

Source section.

Drawdown data indicate a very high positive skin factor during early times. Thus, the calculated value of storativity (zero skin) is not representative.

Pseudoradial flow during intermediate times.

Effects of apparent no-flow hydraulic boundary at late times.

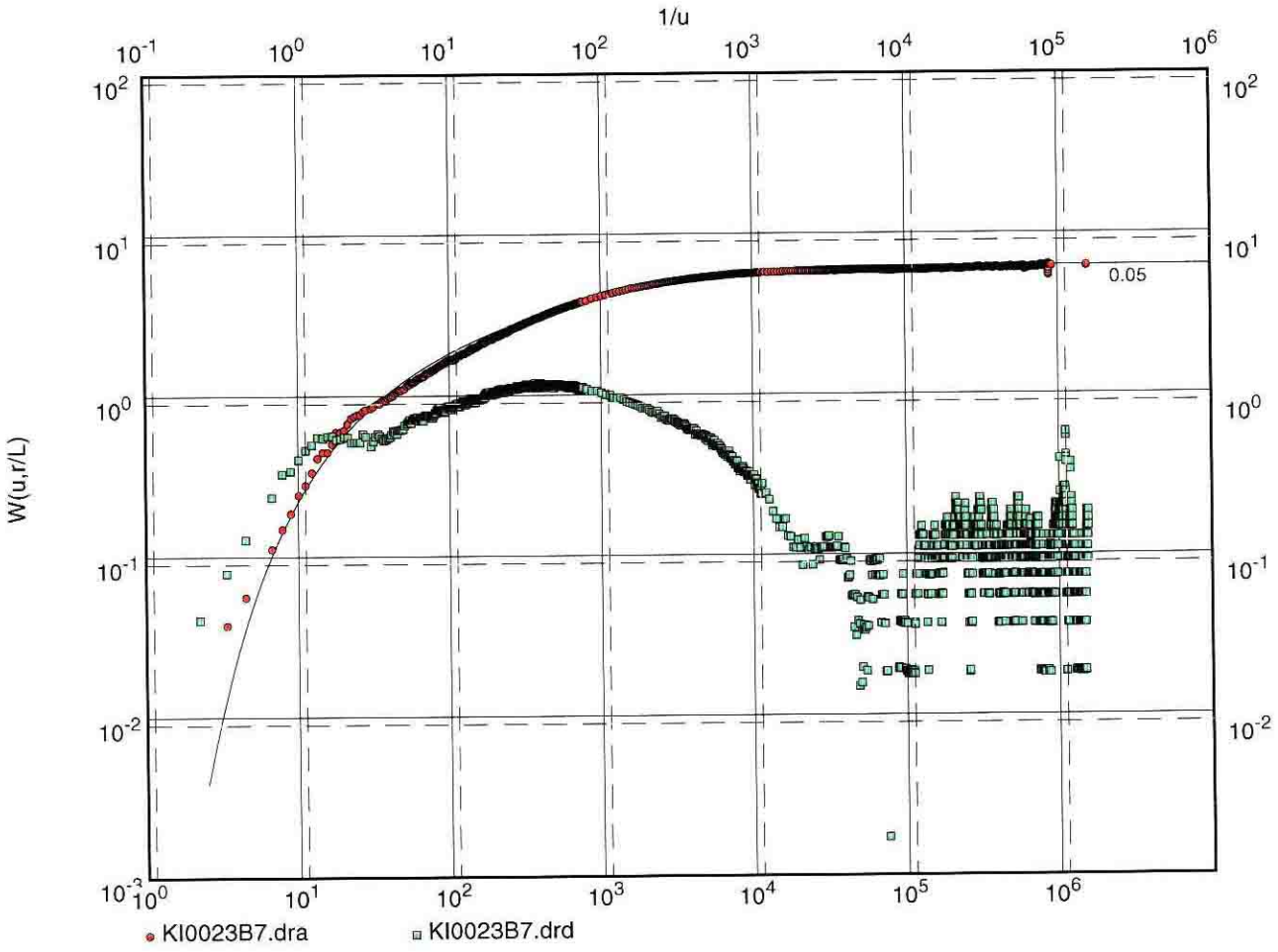
GEOSIGMA AB
P.O. Box 894
S-751 08 Uppsala
Sweden

Pumping test analysis
HANTUSH's method
Leaky aquifer, no aquitard storage

Project: TRUE- BLOCKSCALE

Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0023B:P7	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 1.22×10^{-6}

Storativity: 2.08×10^{-7}

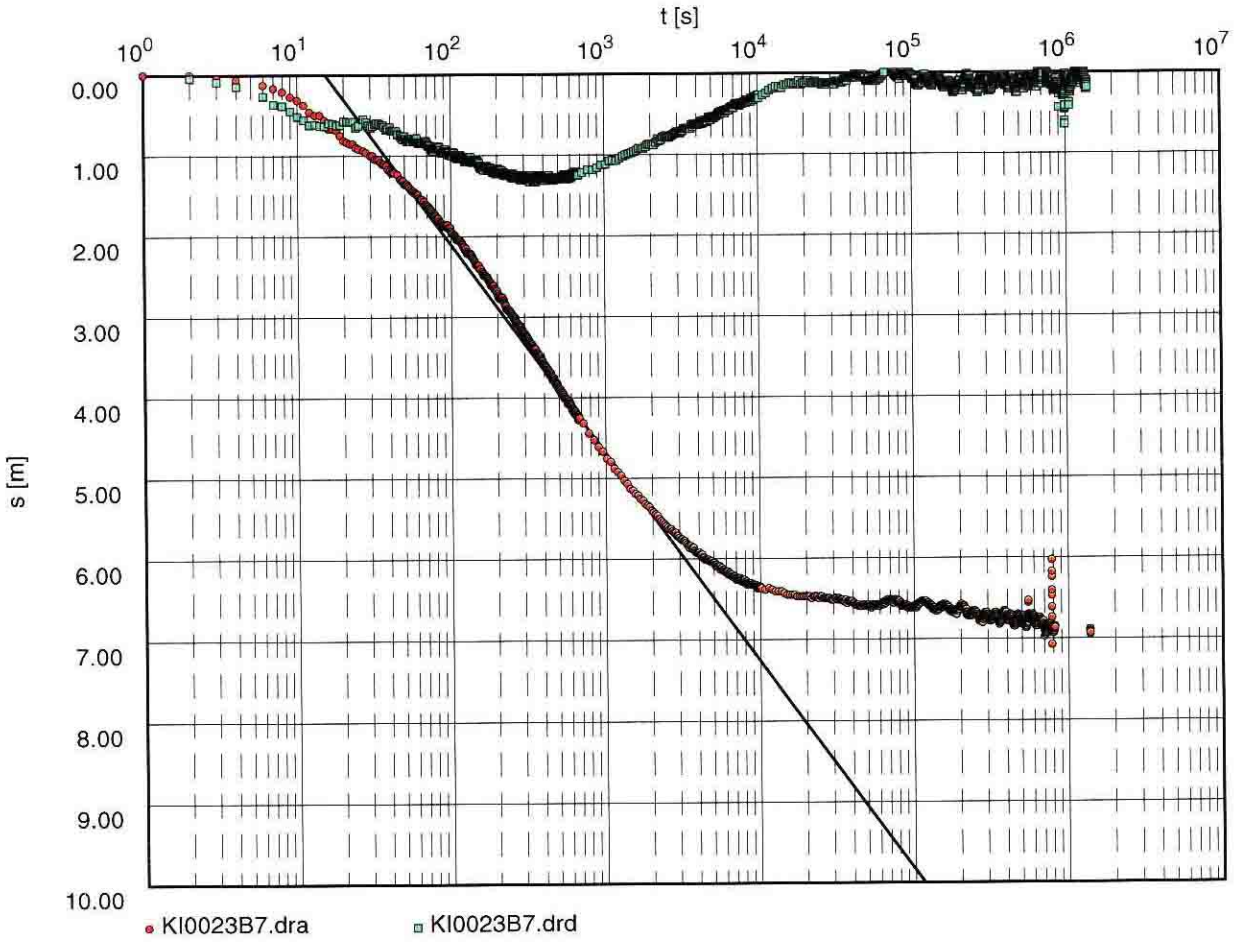
Hydraulic resistance (c) [s]: 6.85×10^{10}

Leaky (pseudo-spherical) flow by the end of test

K'/m'=1.5E-11 (1/s)

GEOSIGMA AB P.O. Box 894 S-751 08 Uppsala Sweden	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Enclosure 6, Page 11 Project: TRUE Block Scale Evaluated by: JEL | Date: 24.06.1998

Pumping Test No. ESV-1c	Test conducted on: 1998-04-08
KI0023B:P7	
Discharge 0.02 l/s	



Transmissivity [m²/s]: 1.22×10^{-6}

Storativity: 2.00×10^{-7}

Pseudo-radial flow at early times.

Leaky flow at intermediate and late times.