University of Stavanger

Faculty of Science and Technology

MASTER'S THESIS

Study Program/ Specialization: MSc Petroleum Engineering Drilling Engineering	Autumn Semester, 2010 Open
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Title of Thesis: Application and Design of Passive Inflow Control Devices on the Eni Goliat Oil Producer Wells	
Credits (ECTS): 30	
Key words: ICD Standalone Screen Lower completion Goliat field	Pages: 138 + enclosure: 419 Stavanger, 10/12/2010 Date/year

GOLIAT

Application and Design of Passive Inflow Control Devices on the Eni Goliat Oil Producer Wells

Eni Norge

Preface

The writing of this thesis ends my Master degree in petroleum technology with specialization in Drilling Engineering.

I wish to thank Eni Norge, Reslink/Schlumberger and the University of Stavanger for letting me write this thesis. Especially I would thank my supervisors Steve Pattie and Lasse Hermansson at Eni Norge and Bernt Aadnøy at the University In Stavanger. They have been very important in delivering this thesis, providing me with good inputs and detailed knowledge on the subject of the thesis. Thanks also to reservoir engineers Claire Le Maitre and Emanuela Libonati working in Eni Norge for their good help with running Eclipse™ simulations required for my thesis, as well as inputs to the thesis. I would also thank the clever engineers working at Reslink/Schlumberger for good support and help with the thesis, especially Gabriela Nass Colmenares and Edmund Leung. Finally, I would like to thank the employees working at Eni Norge for making my time there enjoyable and interesting.

My fellow students also deserve to be thanked for all the good times and companionship we have had during the studies. Without them the studies would not have been as interesting and enjoyable as they have been.

And not least, I would like to thank my family for supporting me throughout my studies and for believing in me.

Stavanger 10/12/2010

Hans-Emil B. Torbergsen

Abstract

During the recent years installation of ICD completions has become more common in new wells. ICDs have proven to be an operationally simple and reliable completion solution. The primary benefits of installing ICDs are increased hydrocarbon production, reduced water production and balanced inflow from the entire reservoir section. Other benefits are a better cleanup, reduced annular velocity and thereby reduced risk of screen erosion.

This thesis considers the application of ICDs on the Goliat field development. Two oil producer wells have been selected for detailed studies; KP7 and KP9. A number of sensitivities have been run for the two wells. Sensitivities on number and size of ICD nozzles, changes in GOR, WC and pressure depletion, changes in permeability and changes in well length has been done. Both wells have been studied using NETool^{TM} software, but only KP7 have been studied using Eclipse^{TM}. Several time steps in NETool^{TM} have been investigated to achieve the best understanding of the well behaviour.

A recommended completion set up for the two wells have been put forward. In the recommended completion set up ICDs, open hole packers and blank pipe has been used. For KP7 the best result proved to be a uniform ICD solution (i.e. same ICD sizing along the well). In KP9 a tailor made ICD solution gave the best results (i.e. different ICD sizes along the well).

Table of Contents

Nomenclature

ΔP: pressure difference

K: flow coefficient used for correlating between equations and reality

ρ: density of fluid

L: length of tube

v: velocity

g: gravity constant

f: friction coefficient

d: diameter of tube

h_f: head loss due to tubing friction

h_m: head loss due to minor piping losses

a_1: equipment specific parameter

a_2: equipment specific parameter

b_1: equipment specific parameter

b_2: equipment specific parameter

Re: Reynolds number for the flow

K_{lowR}: flow coefficient for low Reynolds number

K_{highR}: flow coefficient for high Reynolds number

c: equipment specific parameter

d: equipment specific parameter

t: equipment specific parameter

v_{liq} velocity of liquid

Δp_{liq}: pressure difference for the liquid

Abbreviations

BHP: Bottom Hole Pressure

DHFC: Down Hole Flow Control

GOR: Gas Oil Ratio

GIIP: Gas Initially In Place

HC: HydroCarbons

HIVICD: HIgh Velocity Inflow Control Device

ICD: Inflow Control Device

KP: Kobbe Producer

LOVICD: LOw Velocity Inflow Control Device

LWI: Light Well Intervention

LWD: Logging While Drilling

MWD: Measurement While Drilling

NCS: Norwegian Continental Shelf

PICD: Passive Inflow Control Device

RIH: Run In Hole

OIIP: Oil Initially In Place

SAS: Stand Alone Screen

TD: Target Depth

WC: Water Cut

WWS: Wire Wrap Screen

Chapter 1 Introduction

1.1 Thesis General

This thesis considers the oil producers at Goliat and the application of ICDs in the lower completion. ICD (Inflow Control Device) is a technology used for increasing the production of oil and limiting the production of gas and water. As well as equalizing the inflow. The ICD unit affects the inflow from the reservoir into the well by creating an extra pressure drop over the completion. Normally, this pressure drop is not present. A result of that is an uneven inflow profile. Uneven inflow in horizontal wells is common due to differences in permeability, variations in pressure, distance to gas/oil contact, distance to oil/water contact and a difference in drawdown along the wellbore. It is the permeability that is the main factor in creating an uneven inflow profile, since it will vary the most along the wellbore. Also some high producing zones in the well may produce so much that lower producing zones cannot produce under those conditions. High producing zones are practically flooding the well. If a homogeneous reservoir exists a more uniform inflow profile may be seen in the well. A very heterogeneous reservoir will have a more uneven inflow profile due to larger variations in permeability. The extra pressure drop created by ICDs gives an equalizing effect on the production profile along the wellbore and reduces coning tendencies. Below is an inflow plot from the well KP7 with a Wire Wrap screen completions in 2018. From the plot we see an uneven flow profile for the well, equalizing this profile is the idea with ICDs

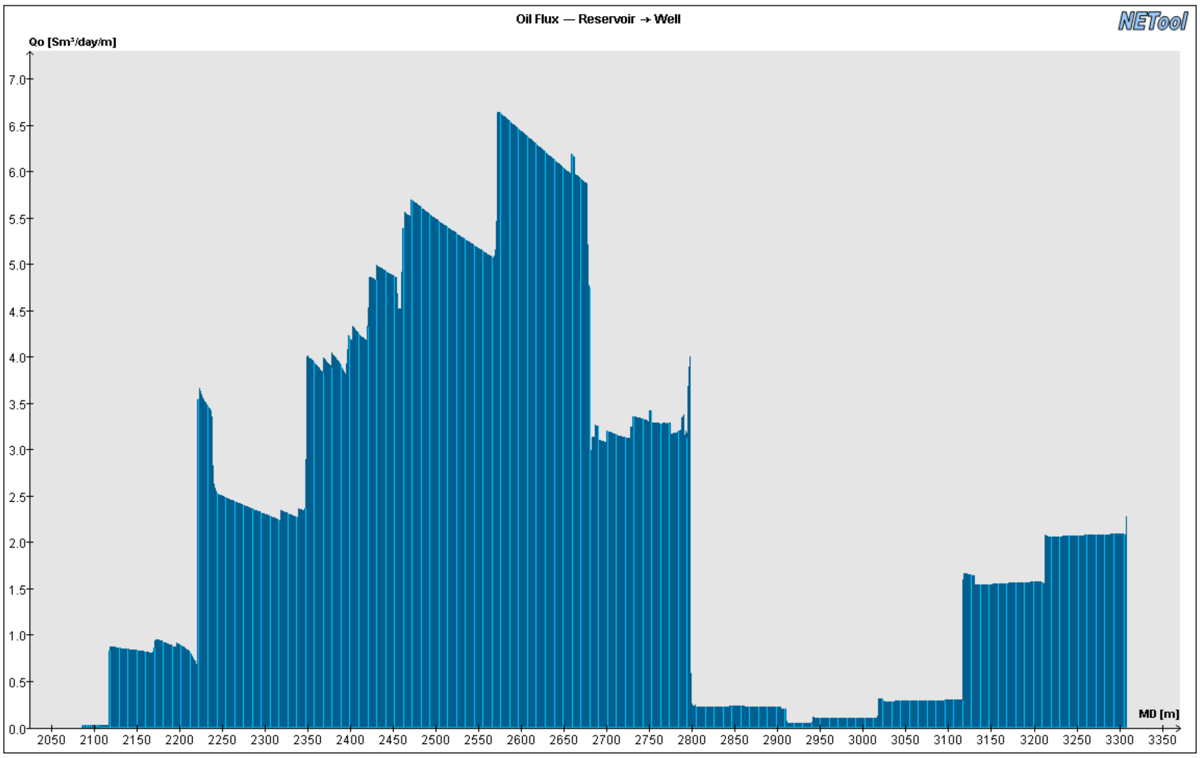

Figure 1 Inflow profile for the Well KP7 at 1826 days (2018)

For the thesis a review of applicable industry and academic literature has been done and relevant information extracted. The main sources of information has been SPE articles, other industry articles, internal documents in Eni and public information from company web pages. From researched literature the technology has been referred to as PICD, passive DHFC, ICD and Inflow Control Devices. For this thesis it is referred to as ICD. The main parts of the thesis are the literature review, simulation work, analysis of the results and conclusions.

The thesis has mainly focused on the ICD technology provided by Schlumberger/Reslink, since they have been awarded the contract for the lower completion supply at Goliat. ICD technology from other vendors has also been investigated.

Simulation work was done together with Schlumberger/Reslink using NETool™ and Eclipse™ software. Quality of the reservoir and its effect on design of the ICD has also been investigated. Different wellbores planned for Goliat was simulated with different ICDs. The main objective of the thesis has been to highlight the optimal configurations of the ICDs in the Goliat lower completion.

In the thesis two wells have been selected for further studies; well KP7 and KP9. NETool™ studies have been done for both the wells. Eclipse™ simulations have only been done for KP7 and with a limited number of ICD settings. This is due to limitations on time available for running simulations and the amount of work needed for preparing the simulations. For the well KP9 it was tried to simulate it in Eclipse™, but there was an error in the model and no result could be obtained within the time frame of this thesis. The reason for this error is currently being investigated and the result of this investigation is not clear when submitting the thesis. Only two wells were chosen because of work and time limitations. The wells selected have different challenges with regards to reservoir properties and geology. The possibility to highlight the effect of ICDs in different well types was also one of the reasons for selecting the two wells.

Below is a detailed list of what is covered in the thesis.

- Collated and reviewed existing ICD work for Goliat
- Collated and reviewed existing information within industry
- Reviewed industry failures with the ICD technology and extracted experiences of relevance to Goliat
- Investigated differences between different ICD types
- Investigated sensitivity of shorter wells, - when do we lose the equalising effect of the ICD screens
- Investigated sensitivity of longer wells, - what should be changed if wells become significantly longer that currently planned
- Investigated the impact of standardising on one uniform choke setting
- Investigated the effect of changing screen size (5 ½” versus 6 5/8”) on the ICD design
- Investigated the sensitivity to reservoir quality uncertainty, i.e. poorer / better sands. How would the ICD design change?
- Investigated the effect of compartmentalisation using swellable packers. How much effect is lost if swellable packers are not run? What is the optimal spacing between swell packers?
- Investigated sensitivity to changing GOR, WC and pressure depletion (changes during life of field)
- Are there cases where sections of the well should be isolated with blank pipe and swell packers?
- Investigated the ICD effect during the initial well clean-up (only theory)
- Assessed annular flow velocity outside of the sand screens with and without ICD during life-of-well, and quantify the risk of sand screen erosion for the two cases
- Assessed the risk of ICD choke erosion and loss-of-ICD-function

- Summarized the work and recommended flexible base case design(s) as well as ICD changes if the well design / reservoir conditions change. Identify potential opportunities/new technology of value.

1.2 Goliat General

Goliat is an oilfield located in the Barents Sea about 50 km South East of Snøhvit and 85 km North West of Hammerfest, in PL 229 and PL229B. Its main parts stretch across blocks 7122/7 and 7122/8 and there are some parts in 7122/10, 7122/11.[1]

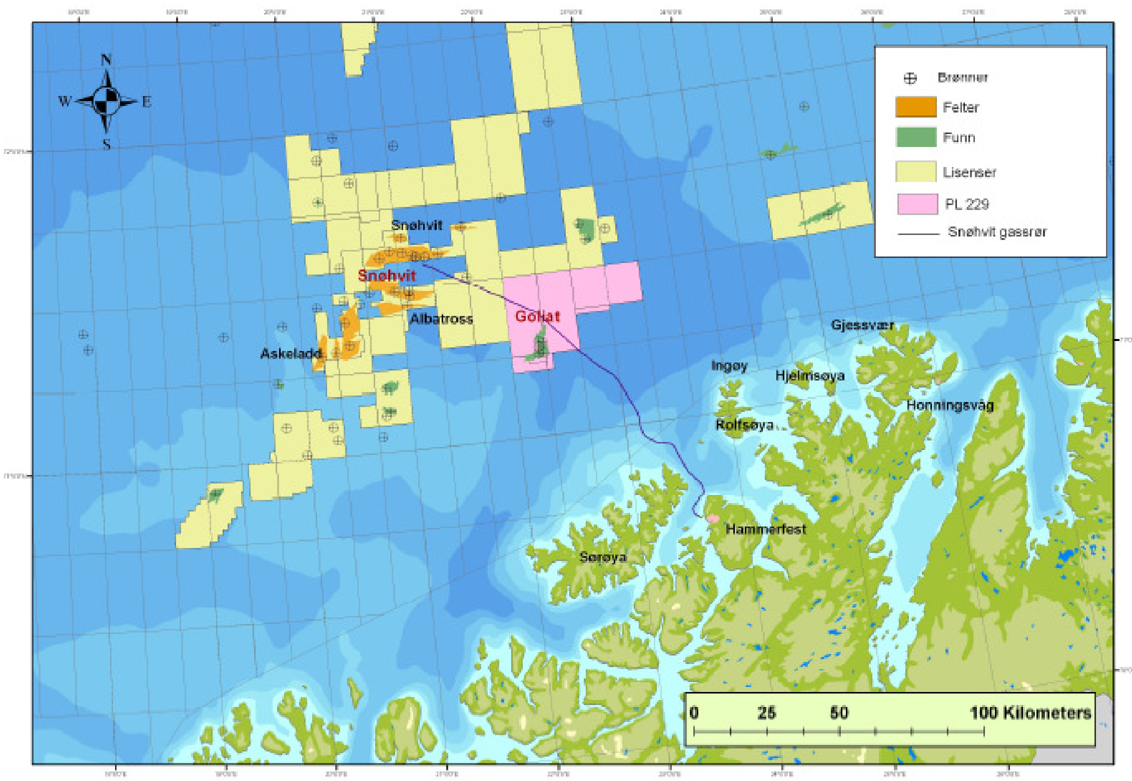

Figure 2 Location of Goliat in the Barents Sea [1]

The reservoir is a sandstone reservoir located in Realgrunnen and Kobbe formations. Deposition of the Kobbe formation happened during mid Triassic, while Realgrunnen was deposited in late Triassic. The overall geological field structure is a result of tectonic extension during late Jurassic and early Cretaceous. Realgrunnen is the most segmented of the two reservoir formations and it can be divided into three separate rotated horst structures. The Kobbe anticline is segmented by small faults which doesn't make up own structures. In figure 3 below an overview of the reservoir on Goliat is seen, with both the Kobbe and Realgrunnen reservoir. The Kobbe reservoir is divided into two main parts with Upper and Lower Kobbe. These two main parts are divided into smaller parts which make up the segments in the reservoir model. In total the Kobbe reservoir is divided into eight segments. Many if the segments are in communication with each other and this represents a challenge for placing the wells and maximizing the recovery. The two wells selected are located in the following segments, [1]:

Segment	Unit	Well
M0	Upper Kobbe	KP7
S-3	Lower Kobbe	KP9
S-4S	Lower Kobbe	KP9
M0	Lower Kobbe	KP9

Table 1 Segmentation of the Kobbe reservoir for the two wells studied in the thesis [1]

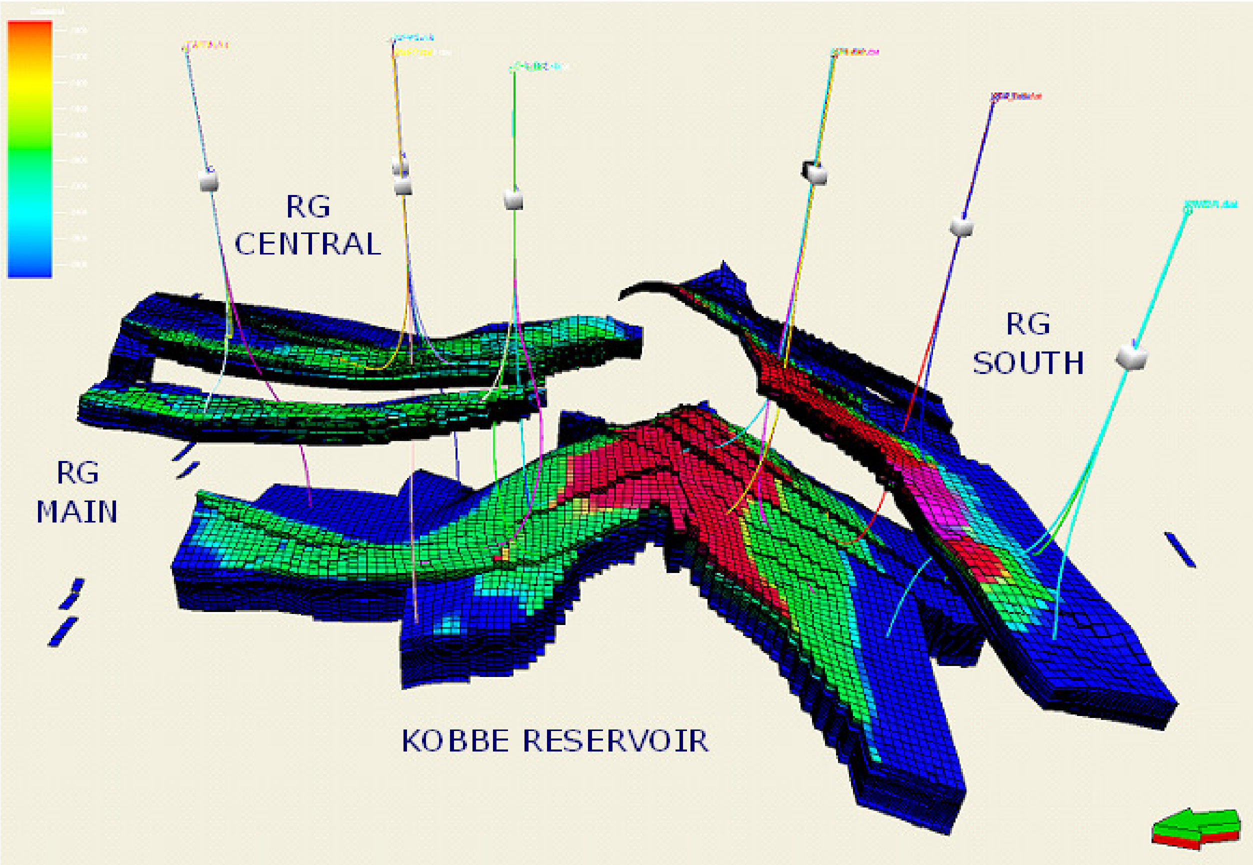

Figure 3 Reservoir layout on Goliat, both Kobbe and Realgrunnen [2]

Reservoirs at Goliat are quite shallow compared to the rest of NCS (Norwegian Continental Shelf) and this represents a challenge for drilling and completing the wells. Depth of the reservoir is around 1200 m for Realgrunnen and around 1800 m for Kobbe. The shallow reservoir is low temperature, Realgrunnen have only 30-35ºC and Kobbe have 48 ºC. Although the reservoirs are shallow and with low temperature, the oil is fairly light and has an API gravity of 31-33 for Realgrunnen and 43-44 for Kobbe.[1]

Water depth at Goliat ranges from 320-390 meters. The plan is to develop the field with an FPSO and eight subsea templates with a total of 22 wells. Production start is planned in 2013. There are 9 water injectors, 2 gas injectors and 11 oil producers planned. In the picture below the planned field layout on Goliat is seen, with the FPSO and the associated templates.

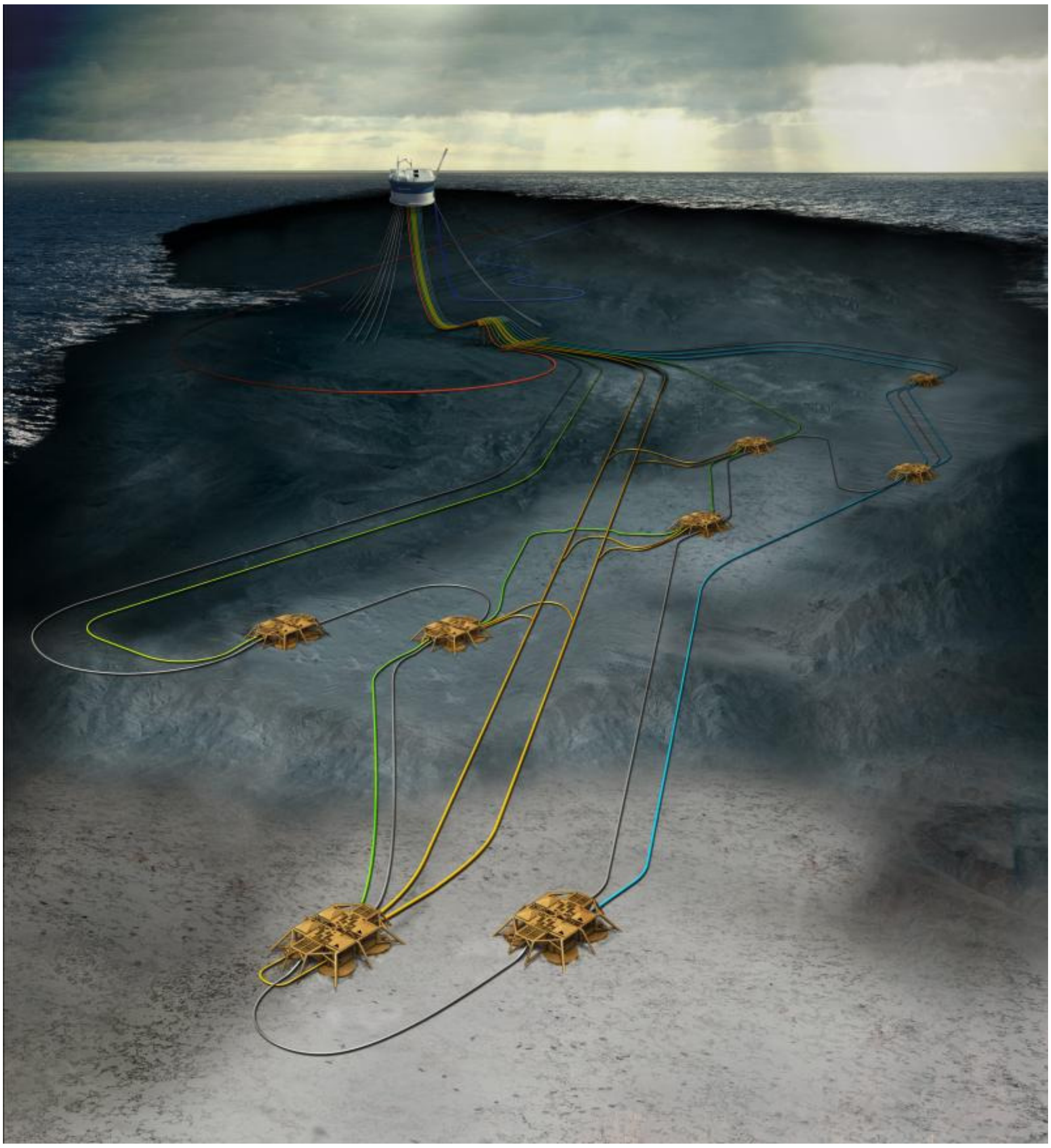

Figure 4 Goliat field layout [3]

Of the oil producer wells there will be 3 multilateral wells and the rest of the wells will be single oil producers. Average total well length is around 3100m. The oil producer wells will all be horizontal and most of them are planned with a long reservoir section. The longest horizontal section is close to 2000 meters. One challenge is to run the completion to TD. The completion selection for the oil producers is a stand alone screen completion with ICDs for better drainage and equalized inflow. Selection of the right ICDs is important for the life of individual wells, as well as for the total recovery of hydrocarbons. Multilateral wells are not planned with ICDs, however they will have active down hole flow control to control production from each branch. Water injectors will be installed with active down hole flow control to select which zone water is injected in. Gas injectors will be completed with expandable screens, without active or passive flow control.[1]

Since the reservoir at Goliat is unconsolidated there is a need for sand control. In the planning of Goliat several completion types were evaluated, such as open hole gravel pack, cased and perforated liner and stand alone screen. When selecting the completion type for Goliat the main objects was to find the best overall technical application, lowest risk solution, most cost effective and simple as possible. In this evaluation a stand alone screen completion with ICDs came out as the best option. [4]

Running a stand alone screen completion with ICDs and swell packers is an operationally simple solution and arguably reliable for the life of the well. Because the wells are planned with ICDs, sand control is important due the risk of plugging or erosion of the ICDs. Sand control can't stop all sand production, but it will exclude the larger sand particles that could cause erosion and plugging. [4]

Due to thin reservoir layers early breakthrough of gas and water is a problem for the wells. ICDs were added as a remedy for this problem. The ICDs will also help improve the cleanup and removal of the filter cake as well as creating a smoother drawdown and inflow [1, 4]

A typical well completion schematic is found in appendix A.1. [5]

1.3 Input data for the thesis

Field	Goliat	
Where	Barents Sea	
Discovered	2000	
Production Licence	PL 229 and PL229B	
Blocks	7122/7, 7122/8	
Shareholders	Eni Norge (Operator) 65%, Statoil 35%	
PDO approved	18/6/2009	
Concept selection	FPSO with subsea templates (Sevan type)	
Reservoir type	Sandstone	
Reservoirs	Kobbe and Realgrunnen	
Oil wells	2	
Average Well length	3100m	
Completion selection for oil wells	Stand Alone Screen with ICD	
Wells with ICD planned	6-8	
Deviation of wells	~90deg	
Open hole section	8 ½”	
Oil density @ reservoir pressure	652,5 kg/m^3	
Oil viscosity@ reservoir pressure	0,32 cP	
Gas density@ reservoir pressure	210 kg/m^3	
Gas viscosity@ reservoir pressure	0,021 cP	
Water density@ reservoir pressure	1069 kg/m^3	
Reservoir Pressure	180 bar	
Reservoir Temperature	51,2°C	
API deg @ Standard Conditions	44°	
GOR (R_s)	198,3	
Planned field recovery factor	30,5%	
	KP7	**KP9**
Well length	3309,6 mMD	4120,5 mMD
Water depth	374 m	346 m
Depth to reservoir	1792,6 mTVD	1776,1 mTVD
Oil/Water contact)	1851,0 mTVD	1887,0 mTVD
K_h (average)	1000 mD	390 mD
K_v (average)	230 mD	40 mD
K_v/ K_h	1	1
Drawdown	65 bar	10 bar
Base case oil rate	2200 Sm^3/d	1000 Sm^3/d
Flowing BHP	135 bar	170 bar
PI	37,28 Sm^3/d/bar	66,66 Sm^3/d/bar

Table 2 Input data for the thesis [4, 6-8]

Chapter 2 ICD Theory

2.1 Definition

An ICD is a choking device installed in the lower completion that is used to equalize the drainage/inflow from the reservoir and into the well. It is a passive down hole flow control method, meaning it has no active parts that can be controlled or modified to adjust the flow through it. The ICD unit adds an extra pressure drop across the completion and gives a higher drawdown on the formation that will change the inflow along the well. Since the settings of the ICD cannot be changed after installation, most of them are self regulating. This means that the flow through the ICD will follow a predetermined equation. A change in the flow parameters will result in a changing pressure drop. [9-11]

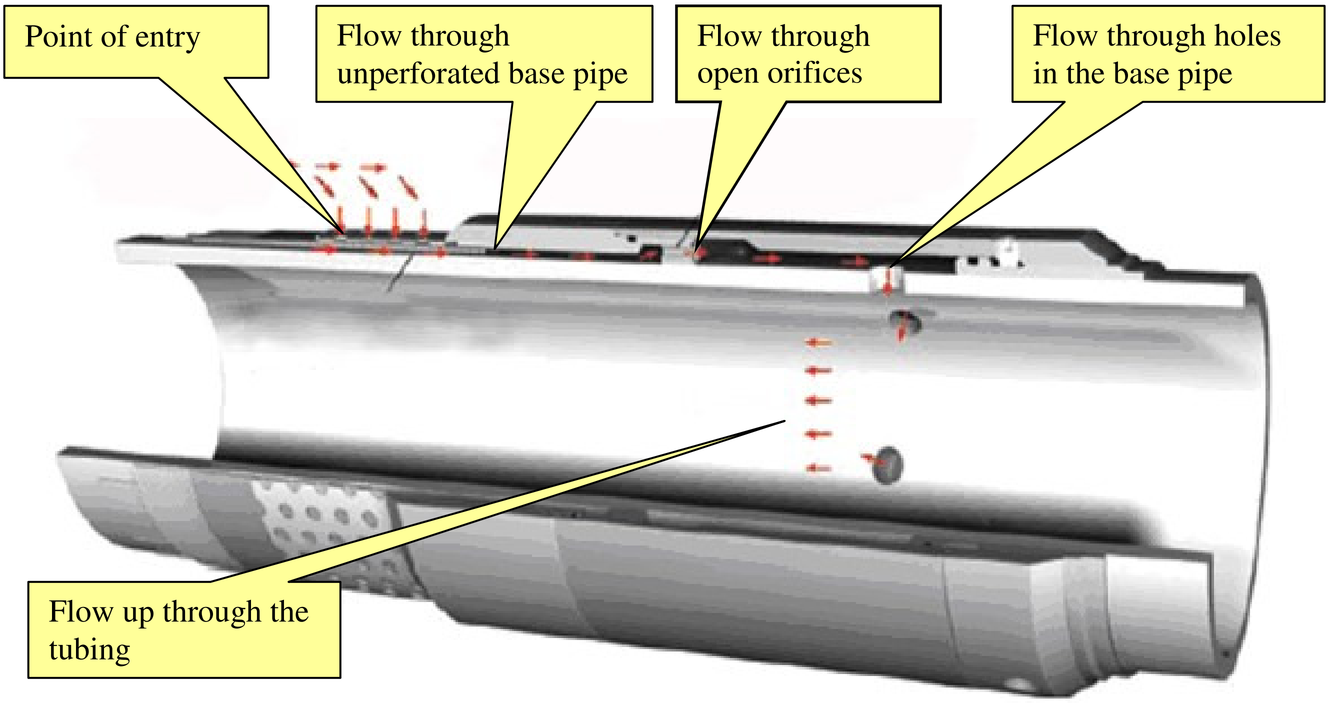

Figure 5 ICD example, Weatherford FloReg^{TM} [12]

Active down hole flow control is the opposite, since it has parts that can be manually closed or partially shut to reduce or increase the flow. An example is the DIACS system. Such an active system is controlled by hydraulic lines, electrical lines or by doing wireline intervention. This type of system is common in multilateral wells, since it can control the flow from each branch being produced.

Both active and passive down hole flow control can also be used for injection wells were an equalized injection pattern is needed or injection into selected zones is crucial.[13]

Normally the down hole flow control is equipped with some sort of sand control to prevent sand production and erosion of the equipment. With an ICD completion most sand face completion concepts can be used. Swell packers are often installed together with down hole flow control to limit annular flow. Reduced annular flow is important to reduce the risk of screen erosion. [14, 15]

2.2 General ICD Description

Down hole flow control equipment is included in the lower completion and is run as a part of the completion string. Objectives for using ICD are:

- better clean up of the well after drilling is finished,
- a more uniform production profile for the well
- produce from selected zones
- an even injection profile or matrix injection
- prevent coning in the heel of the well
- get more production from the toe of the well
- delay early breakthrough of gas and/or water
- improve sand control and productivity to minimize annular flow
- prevent screen erosion

The benefits of using ICDs increases as the horizontal section of the well gets longer and the exposure to the reservoir increases. The reason for this is that there is a big frictional pressure drop inside the lower completion itself and the inflow at the toe has to overcome this. At the heel of the well the extra frictional pressure is not seen. This will lead to preferential production at the heel because of a larger drawdown. One seeks to prevent this by installing ICDs and open hole packers. If a conventional completion is installed, early breakthrough of water and/or gas can be experienced and also severe coning. Coning tendencies are most common at the heel of the well and the flow here can be high over small areas. The reason for having more coning tendencies in the heel part is the pressure drop inside the tubing. With long horizontal wells this pressure drop becomes significant and the oil producing zone at the toe has to overcome this pressure in order to produce. For the heel part it is little or no pressure drop in the tubing part in the reservoir. Therefore the heel will produce more easily, thus promoting coning. [9, 16]

For production purposes a good clean up and a more equalized production profile are normally the important objectives, which normally will lead to increased production and recovery. [17]

Restricting high permeable zones is often important since they can produce at too high rates and lead to early breakthrough of gas or water. They can also produce at such high rates that they limit production from poorer zones in the well. Preferential flow from high permeable zones is not optimal as it will reduce the recovery from low permeable zones, thus reducing the overall recovery. Furthermore, there is a possibility that early gas or water breakthrough is experienced in high permeable zones. [14, 18-21]

Injection wells are often completed with active or passive DHFC. This could result in a more even injection profile and the injected water have a higher possibility to support the zones that require pressure support. Compared to a case of no passive or active DHFC there will be a significant improvement in placement of injection water. By installing active or passive DHFC in injectors it is possible to control or distribute this injection. Both passive and active DHFC are used in injection wells. Active DHFC is more commonly used to direct the injection water. [13]

2.3 ICD Overview

There are several types of ICDs available. They can be grouped into four different types;

- Helical channel type
- Orifice (Nozzle) type
- Tube type
- Hybrid type

Figure 6 Helical channel type ICD, Equalizer^{TM}, Baker Oil Tools [22]

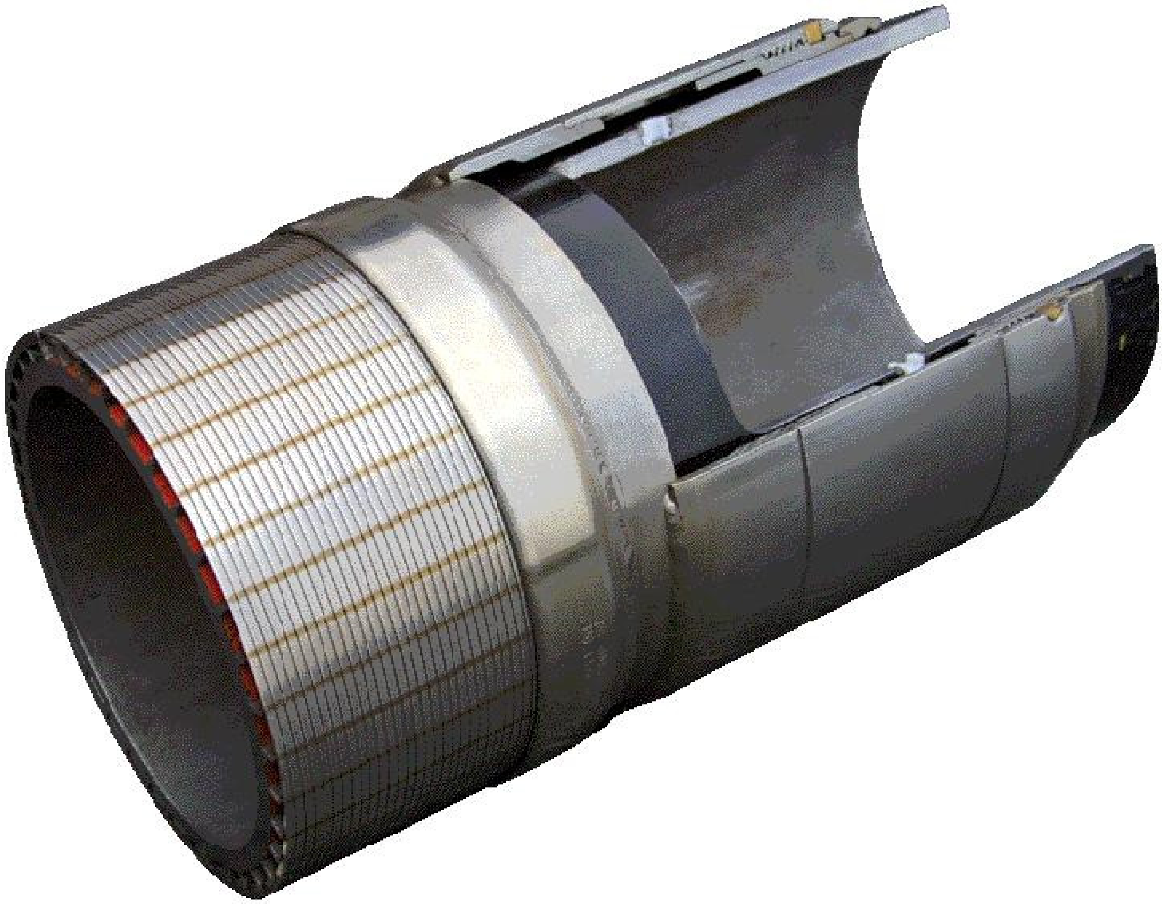

Figure 7 Nozzle type ICD, Resflow^{TM} Schlumberger. [23]

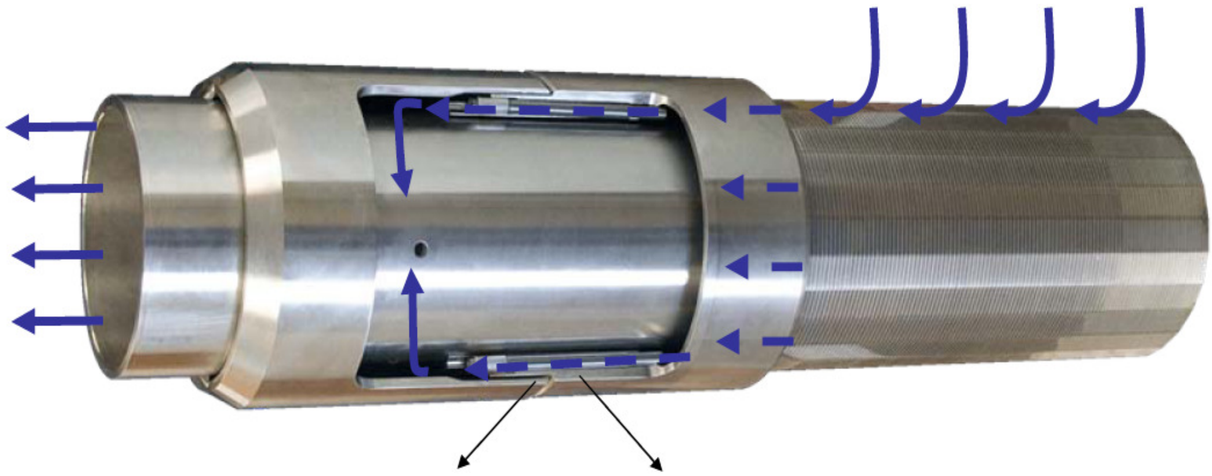

Figure 8 Tube type, EquiFlow^{TM} ICD, Halliburton [24]

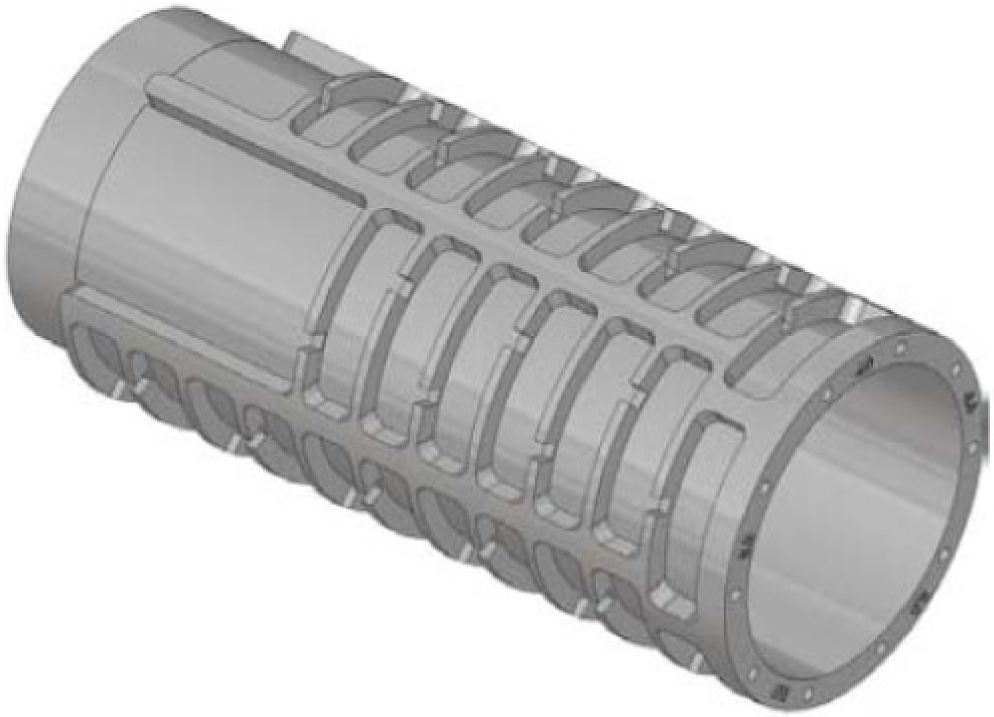

Figure 9 Hybrid type ICD, Equalizer^{TM} Select ICD, Baker Hughes [25]

These four ICD types can be divided into two main groups, reflecting the flow velocity through the ICD. That is: LOVICD (LOw Velocity Inflow Control Device) and HIVICD (HIgh Velocity Inflow Control Device). Typical velocity for a LOVICD type is below 50 m/s. For a HIVICD it is above 50 m/s. The number stated in this thesis should be regarded as an indication of the velocity boundary between LOVICD and HIVICD.

For a well with an ICD completion installed, velocity through the ICDs will vary during life of the well. The velocity will vary regardless of whether a LOVICD or HIVICD type is installed. LOVICD apply to helical channel and hybrid ICD types. HIVICD apply to orifice/nozzle and tube type. Figure 5 summarizes the ICD grouping. Since the objective of this thesis is about the application and design of ICD on Goliat, only passive DHFC was subjected to investigation. Active DHFC are outside the scope of work for this thesis. [21]

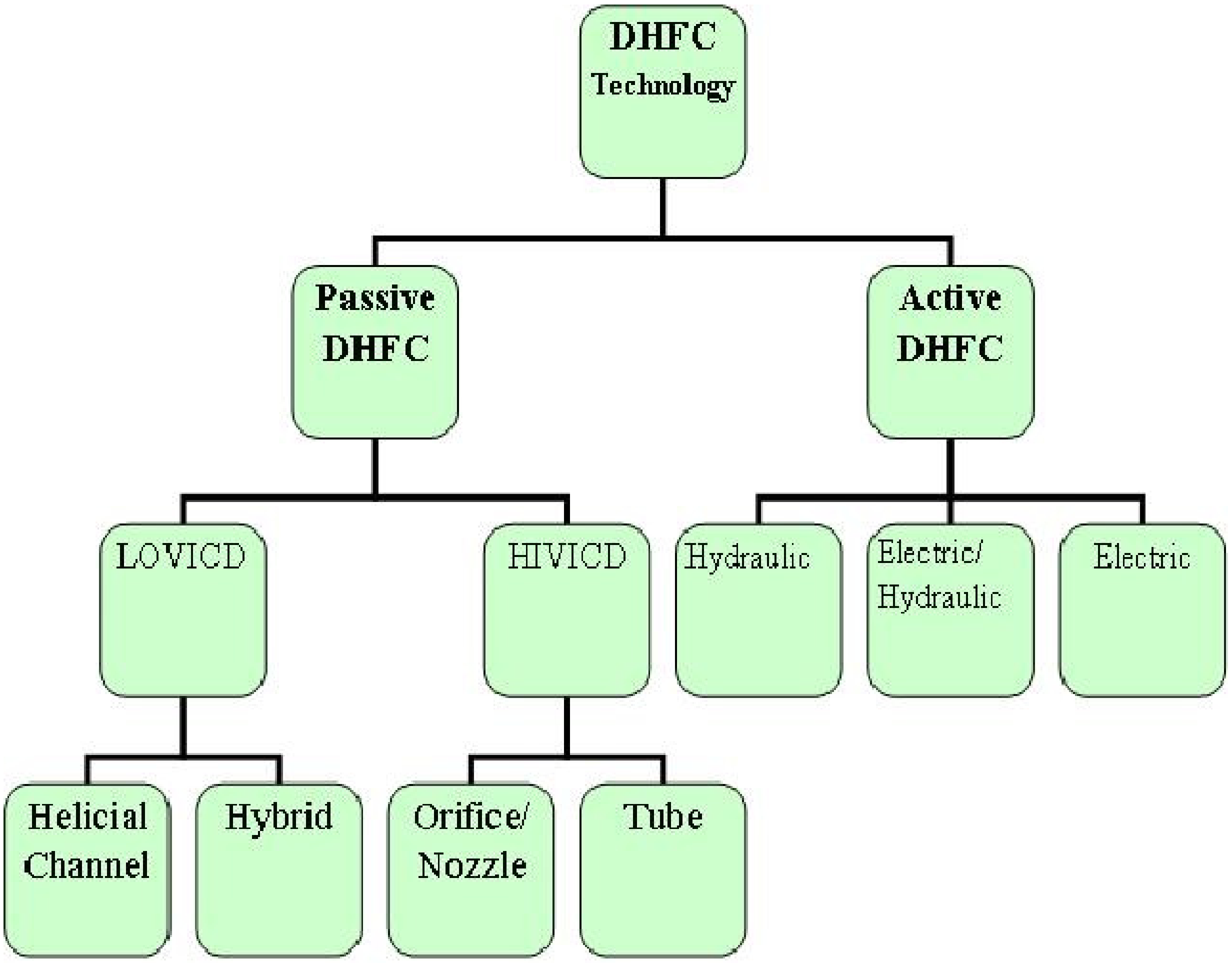

Figure 10 Graphical presentation of ICD technology. [26]

Today there are several suppliers of ICDs. The main vendors are Weatherford, Schlumberger, Baker Hughes, and Halliburton. There are also some smaller companies, such as Tendeka. The ICD will in most cases be combined with some form of sand control. The most common way to use ICDs is in a combination with a SAS completion and open hole packers. It has also been used in gravel pack completions.

The HIVICD are most vulnerable to erosion, since the velocity is high and erosion can occur. LOVICD is less prone to erosion due to a lower velocity and larger flow area.

Another issue is the risk of plugging the ICD regardless of what type being used. Plugging of the ICD will result in reduced flow from the well and may trigger a well intervention. Because of the small flow area found in HIVICDs they are more exposed to plugging than the LOVICD. The reason for this is the design of the ICD itself, where the small area of the HIVICD is more sensitive to plugging/bridging by larger particles that may form a bridge over the opening and thus plug it. Since the ICD equipment normally is delivered with a screen part designed to block of big particles, plugging of the opening in the ICD rarely is an issue. Then plugging of the screen can be a more important issue. The design of the LOVICD involves a larger flow area, but also a lower velocity. This can cause settling of particles inside the ICD. A long suspension time between completion of the well and start of production will promote settling of particles in the horizontal section. This settling can in some occasions happen inside the ICD and may plug the flow path. To mitigate potential plugging problems a good drilling fluid selection and management is critical. [11, 20, 27, 28]

Investigation of fluid design requirements for an ICD completion is outside of the scope of work for this thesis.

Most importantly there is a significant difference in the size of the ICD opening compared to the screen slot opening; this will make it more difficult to plug the ICD. When designing the screen size it is common to do sand retention testing on the sand present in the reservoir. This testing of the sand will point out the best screen size to use and how much particles that will be blocked by the screen. A good designed sand screen blocks the biggest particles and let the smaller particles flow through. If the screen is designed with a too big slot opening production of sand through the screen may be experienced. A common used size of the screen slot opening is 250 microns, 0,25mm. If the size of the screen slot opening is compared to the smallest nozzle size, 1,6mm, we see that the nozzle size is 6.4 times larger than the screen slot opening. If the biggest nozzle size, 4mm, is compared with the screen slot opening. The nozzle is then 16 times bigger than the screen slot opening. This difference prevents plugging by larger particles as they will be stopped by the screen. If the completion experiences screen erosion, the ICD might also be eroded or it can be plugged due to loss of sand control. So from the size comparison between the screen slot opening and the nozzle size it is clear that the screen is more prone to plugging than the nozzle. So a careful selection of the screen slot opening is crucial for avoiding plugging problems. [29]

In reviewed literature only one example of a possible ICD plugging is found. That is from a BP development West of Shetlands, Schiehallion CP23. Completion selection for the field was a SAS completion with ICDs and DHFC to regulate flow from two different reservoir sands. Completion activities were done as planned and the well was not flowed back after completion, but put on suspension for 3 months. When the well attempted to be cleaned up back to the FPSO only low and unstable flow was seen from the lower zone, no flow from the upper zone. An internal investigation was done to find the reason for that the well failed to flow. Result of the investigation revealed that the screen assembly was plugged, most probably the ICDs. The most likely reason found for this is the fluid systems used for the well and its compatibility with the completion run. Not flowing back the well immediately after completion is another important factor in the West of Shetlands case. Apart from the BP’s case no other cases has been found. [29]

Plugging does not have to come from settling of particles or bridging. It can also come from scale or asphalthenes being deposited. The risk of scale increases with water breakthrough. If sea water is injected into the reservoir the risk of forming scale increases even more. An acid treatment could possibly solve the problem and remove the debris plugging the ICD. Scale inhibition chemicals mixed into the injection water is a way to reduce the risk of scale being created. Scale reducing agents can also be injected directly into the well by a chemical injection line. [14, 30]

The ICD “section” is quite small and normally there is one ICD “section” for every joint of 10-12m pipe. The number of ICDs used is determined from how the reservoir is expected to behave and what inflow profile to expect. To enhance the effect of ICDs it is common to seal parts of the annulus with open hole packers, thus creating compartments for the ICDs. This prevents annular flow and cross-flow between zones that could otherwise result in lower total production and earlier gas/water breakthrough. Furthermore compartmentalisation can improve the drainage and production of the well. It will also prevent sand screen failure by lowering the annular velocity. [11, 31, 32]

Orifice or nozzle type ICDs, (see figure 11 below), consist of a housing containing the nozzles. The flow enters the housing through a screen. When the fluid has entered the housing it is directed through the nozzles. An example of an ICD nozzle can be seen in figure 12 below. The nozzles are placed 180 degrees apart in the ICD. Due to flow in the tubing the jet stream from the nozzles will not hit the tubing wall, since drag forces will force it upwards in the tubing. The existing tubing flow ensures that jetting is a less of an issue for the nozzle type ICD than it otherwise would be. If the jet stream reaches a velocity high enough to overcome the drag forces, it will be neutralized by the jet stream from the other nozzle and the energy will be dissipated. For a nozzle type ICD there are normally 4 nozzles, but 2 or 4 nozzles can be used. It is not an option to use an odd number of nozzles as this will cause jetting. Erosion from nozzle jet stream can also happen if one nozzle is plugged while others are still open. The pressure drop across the screen is negligible compared to the pressure drop over the nozzles. [16, 33-37]

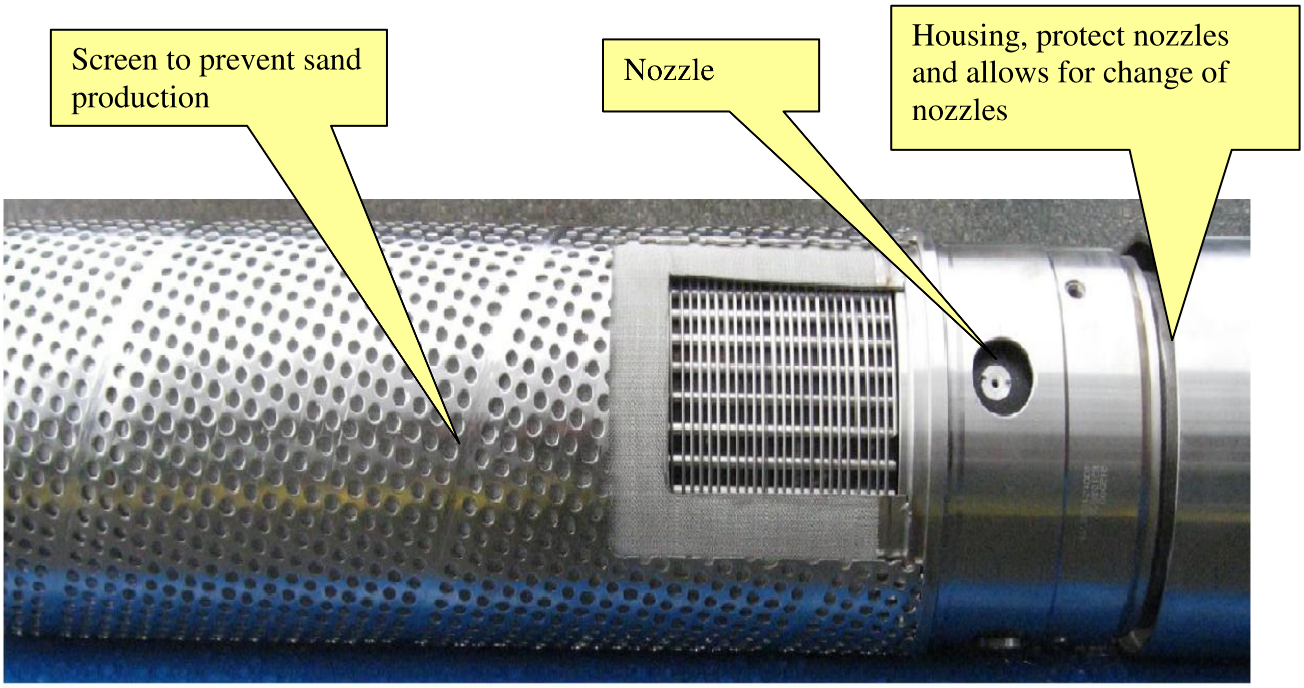

Figure 11 Nozzle type ICD, ResflowTM, Schlumberger. [23]

Figure 12 Nozzle insert, FloCheck nozzle, Tendeka [38]

A tube based ICD (see figure 13), is constructed in a similar manner to the orifice/nozzle type. The ICD equipment consists of housing containing the tubes and a screen part. The fluid is transported between the screen and the base pipe and into the housing. Flow from the screen is directed into the housing and then into the tubes. After exiting the tubes the fluid flows through predrilled holes in the base pipe and into the tubing. Normally there are 3-5 tubes per ICD and the standard tube length is around 4". This can be adjusted if required. The length of the tube and the ID of the tube control the pressure drop. For long tubes the system becomes viscosity dependent and will adhere to the same principles as the Helical channel ICD. To reduce this viscosity dependence, Halliburton recommend having the tubes as short as possible. Short tubes adhere to the Bernoulli equation, with an extra term for the length of the tubes. See section 2.5 for ICD physics. [24, 39-41]

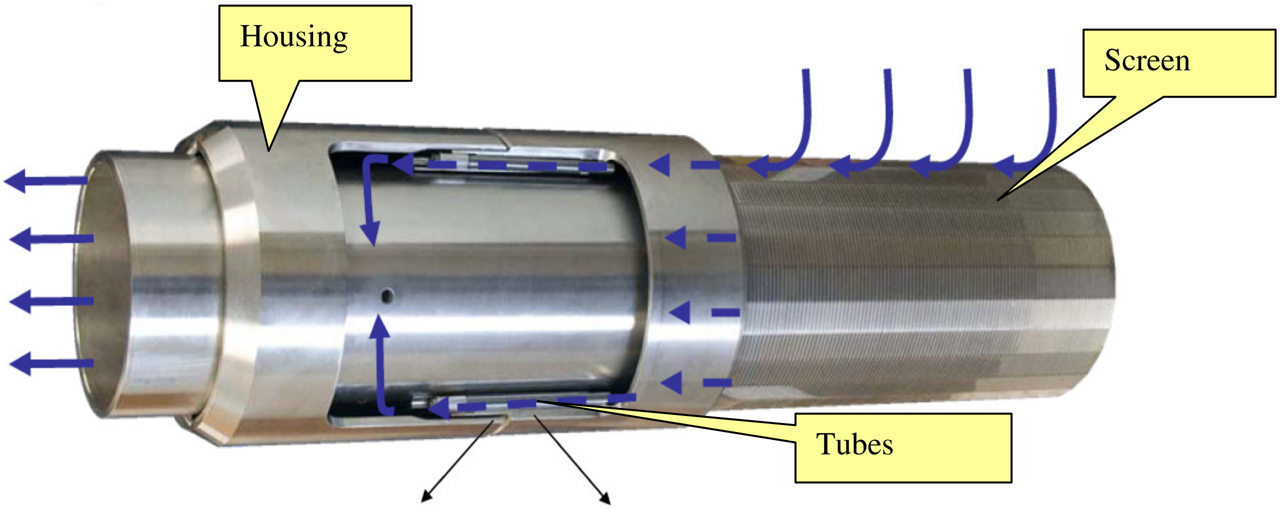

Figure 13 Tube type, EquiFlowTM ICD, Halliburton [24]

A Helical channel ICD see figure 14, is basically a long tube-type ICD that is wrapped around the base pipe so that it forms a helical channel. The oil enters through the screen and into the housing and channel. The flow velocity in this system is low, so the channel has to be relatively long to generate enough pressure drop. After the flow has passed through the channel, it exits through the base pipe and joins the tubing flow. Since the channel is long, typically 120", the flow is very sensitive to viscosity and emulsion effects. Selecting the wrong size for the given viscosity can be costly. This type of ICD relies strongly on the simulation work done and what knowledge one has about the reservoir. [9-11, 25]

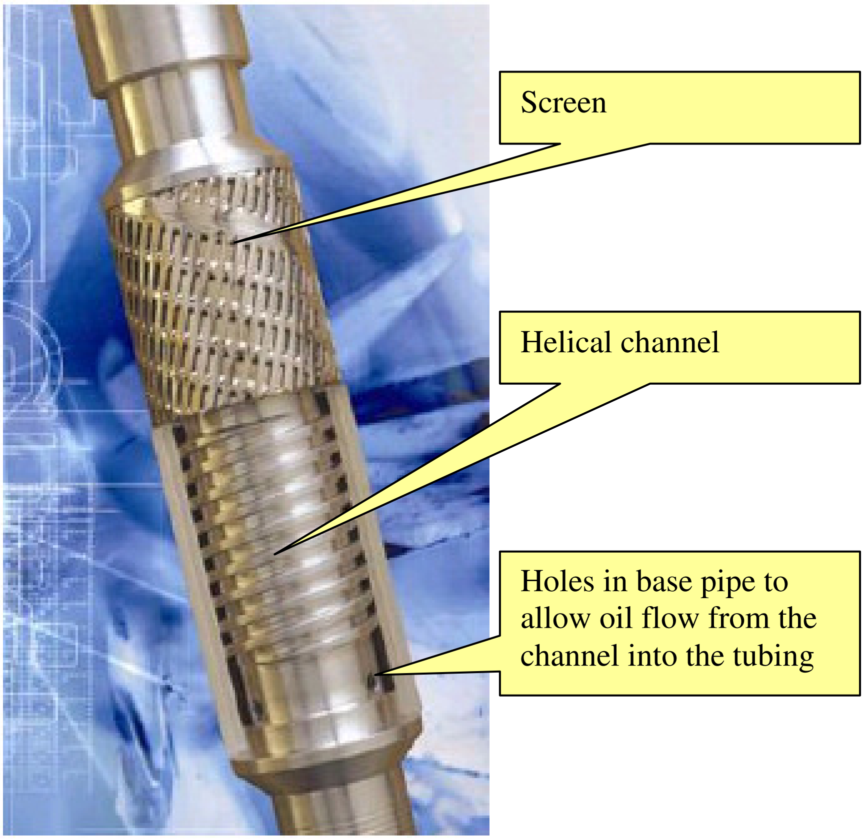

Figure 14 Helical channel type, EqualizerTM, Baker Oil Tools [22]

A Hybrid type ICD see figure 15, is a combination of the helical channel and the orifice/nozzle type. The HC (hydrocarbons) flow through a set of compartments that are linked together with small nozzle like openings. The openings are set up in a staggered design that causes the flow to shift direction when passing through the openings thus reducing velocity through the ICD. This design has a low velocity and the frictional reduction of the pressure is adjustable in terms of how many compartments are open to flow. The Hybrid ICD is set up with 4 possible flow paths, quadrants. The most suited quadrant is selected. The quadrants have different pressure ratings, so deciding on which one to use is vital. Selection is done based on simulations and how the quadrants are set up to meet the objectives of that particular well. [9, 11, 25, 42, 43]

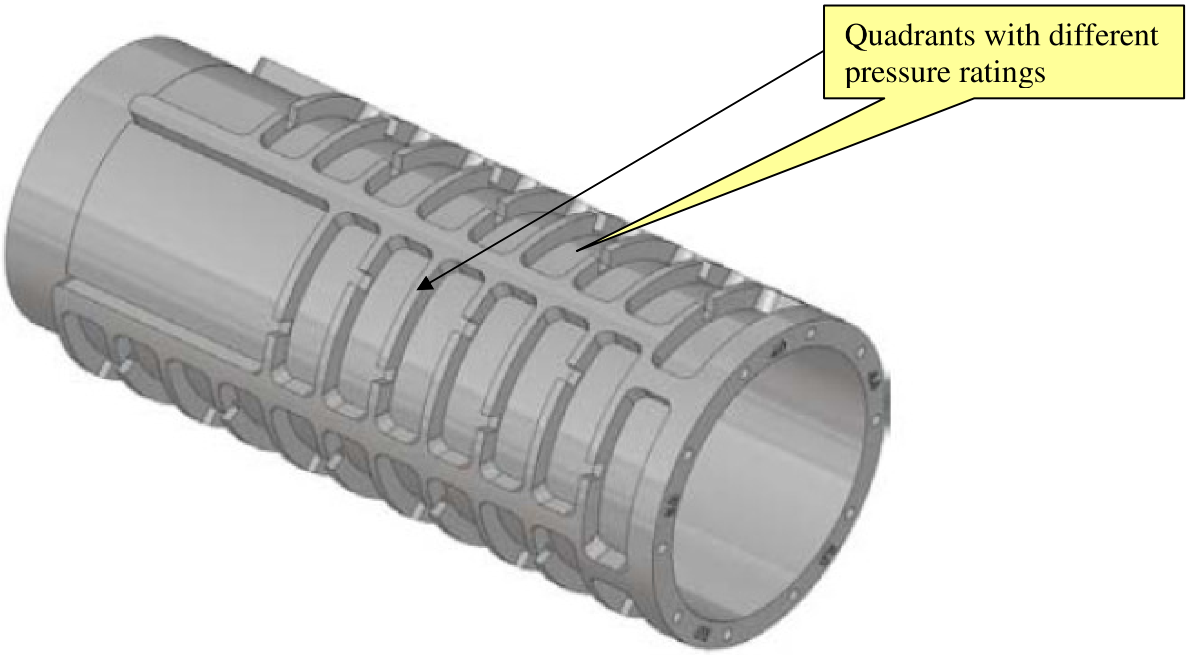

Figure 15 Hybrid type ICD, Equalizer™ Select ICD, Baker Hughes [25]

2.4 Optimisation, reservoir uncertainty and practicality

When designing the ICD equipment and the whole completion for a new field development there is limited knowledge about the reservoir and the geological uncertainty is great. This represents a challenge for finding the best design and implementing it. The predicted reservoir geology may be worse or better than what planned for. This will represent a challenge with regards to how well the completion design fits with the present geology. If the difference between the designed completion and the seen geology is too great, the completion design may not give the benefits wanted. It may actually decrease the performance of the well in the worst cases. In a case with large differences the completion design should be revised in order to get the best possible design. From this the importance of importing data from logging tools and rerunning the simulation software to determine the best design is highlighted. The new design should then be compared to the other wells planned with ICD, so that any changes or optimisations can be done for those wells. [44, 45]

Geological information from drilling operations is also put into the full field model that reservoir engineers use. Though this model often takes a long time to run and allow for optimisation. Time that normally is not present when drilling because of high costs associated with the rig and a tight schedule. That is why third party software that runs in minutes, such as NETool™, can be used for optimizing the design. So one can only find the best design for the ICDs from the available information when designing the completion. Since more detailed information about the well does not exist until drilling of the well is finished. [44, 45]

ICD design for an already developed field is easier and less uncertain than for a new development. Reason for that is more wells drilled, more core samples; more seismic available and information from already producing wells. All this extra information makes the design easier and more correct with regards to the actual down hole conditions. Even though more information is present there could still be unexpected geology down hole that needs to be incorporated into the design. Therefore running the simulation again with the updated information will ensure better optimisation and a better result. [46, 47]

Because the geology of the reservoir is uncertain one might have to change the design of the ICD equipment (number of nozzles and the size) or the whole completion design prior to RIH. This is a challenge with regards to how easy it is to do, amount of work needed and the possibility to do such an operation either onshore or offshore.[44, 45]

When changing the design of the equipment it is normally changing the nozzles, tubes or quadrants used for creating pressure drop. Where to set packers can also be changed, but that is much easier to change than the design of the ICD equipment. If blank pipe is a part of the completion, changing the amount and placement of it is easy compared to adjustment of the ICD equipment. Changing the Helix type ICD is very hard to do as it is dependent on machining equipment and drilling of new holes in the base pipe. The other three types of ICDs nozzle, tube and hybrid are all adjustable and designed to be refitted if it is needed because of new information. It is recommended that the designs of these ICDs are as robust as possible.

If long sections (>500m) of ICD completions are run it will be a big job to refit the equipment and it might not be practical to do. Taking the equipment back onshore and do it will be too time consuming and very costly. Doing this refitting on the rig will be a logistical and practical nightmare as there are a lot of screens and the possibility to keep a good overview of the process is limited. The available space on the rig floor is also a constraint for this operation. Doing the refitting onshore before sending it out whit the supply vessel can be done, but once again it is difficult to keep track of the process and have control on which screens that have been modified. A contingency plan for the case of totally wrong ICD sizing is to run SAS in the entire well. So in conclusion it is best to find the most robust design possible and if that don't work SAS can be run. [44, 45]

If a completion cannot be run to TD (Target Depth) because of tight hole, collapsed formation or other hole stability problems. A problem is if the completion RIH matches with the present formation of the now shorter wellbore. This all depends on the design that has been decided prior to drilling the well and running the completion. Beforehand one can tailor the design to be a perfect optimisation to the well or have a uniform set up. The completion most sensitive to changes in placement down hole is a tailored ICD setting were number and size of nozzles are optimized to match the reservoir. This type of completion can be very good on paper, but very hard to work with in real life. The reason for that are difficulties to keep track of different settings on the screens stacked on the rig and actually running the right screen at the right time. Also the tailored design will maybe not fit well with the permeability found in the shorter wellbore. One can avoid this problem by choosing a uniform set up for the well. Then it does not matter if the completion lands on TD or if it is landed higher up in the well. This non-relevance to landing depth is one of the benefits of a uniform completion. So a uniform set up of the completion is not as strongly dependent on the geology as the tailored solution. Also the uniform completion is easier from a practical point of view. The problem with a highly optimized completion is that the design may not be practical or possible to RIH. Some optimisation for different zones can be run, such as the upper $1/3^{rd}$ part of the well with a different setting. The best practical case however is to have a uniform setting for the whole well. [20, 46, 47]

If the completion cannot get to TD, loss of both production and recovery will occur. That case will be a difficult scenario for the completion regardless of the design chosen. The reason is that big oil producing zones may not be producing or water zones may experience increased production. From a production perspective this is an unwanted effect, but a likely consequence for the case of not reaching TD. The tailored design has of course the biggest down side from not getting to TD. A uniform setting will also experience losses in production and recovery if not run to TD. The advantage here is that the part of the completion down in the well and in contact with the reservoir is designed for the zones covered. [44, 45]

Another problem with not getting the completion to TD is that placement of the packers may not correspond to changes in reservoir quality. A high annular flow may be the result. High annular flow can cause erosion of the screens and increased sand production. If the packer spacing is not correct a lower production and recovery can be expected because the well flow will be dominated by high producing zones. This effect is only seen if an optimized packer setting is used with placement of packers predetermined to match the reservoir. To mitigate this problem one can run packers every 5^{th} joint of screen and then it will not matter if the completion is run to TD or not. [44, 45]

In some wells there is a need for running blank pipe in the completion to seal high water producing zones. Use of blank pipe can be important in the late life of the well when water breakthrough is seen. If the blank pipe part of the completion is placed in a different location down hole it may seal of highly productive oil zone or not cover the high productive water zone. This can reduce the recovery of the well and lead to earlier water breakthrough and possible earlier shutdown of the well because of high water cut. Since the impact of placing the blank pipe in the wrong place can be significant one should seek to find an optimal placement of the blank pipe and the tolerance for misplacing it. This placement of blank pipe is strongly dependent on good geological information. If the information present when designing the completion cannot clearly say that this zone will produce much water it is better to run just ICDs in that zone. The reason is that predicting the zone that is going to produce water is difficult without knowledge about the geology down hole. Also one must take into account interaction from other wells and injection wells that may inject directly towards a producer. So for the design of a completion without much geological information it may be best to go for an ICD completion without blank pipe. [44, 45, 48]

2.5 ICD Physics

ICD physics are related to generating pressure drop over the available ICD flow area. Pressure drop in the HIVICD follows a Bernoulli equation. The Equations for the LOVICD types has not been published. A generic correlation for calculating pressure drop for all ICD types is published and it will be used for demonstrating the flow performance of the LOVICD types. [10, 11, 16, 25, 49]

As the different types of ICDs have different properties, the area of application is different for each type. Though there are some similarities for those which sort under LOVICD and HIVICD types. Since the HIVICDs adhere to a Bernoulli equation they are normally assumed independent of viscosity, though in some recent presentations a small impact of viscosity on the nozzle ICDs have been proven from lab tests. For the thesis work and simulation in NETool™ the impact from viscosity on the Resflow™ ICD is deemed small and negligible. [50]

From published literature and presentations reviewed for this thesis it is apparent that the LOVICD are viscosity dependent. The new hybrid type ICD is an exception to this, since it has been shown to be more insensitive to viscosity than other LOVICD types. The helical channel type ICD has a higher dependency on viscosity than other ICD types. What makes the of viscosity dependence different for the two LOVICD types is the geometry of the equipment. For a more detailed description of the equipment, see section 2.3. From this it is apparent that the hybrid is the most insensitive to viscosity. Both LOVICD types are represented by the generic correlation published. [9, 25]

The equation for LOVICDs has not been published in any papers found during the literature review. A general correlation for flow performance for all ICDs has been published and this correlation will be used to describe the flow performance for the LOVICDs. The correlation found in IPTC 13863 is [10]:

$$K_{highR} = a_1 \cdot \mathrm{Re}^{b1}$$

$$K_{lowR} = a_2 \cdot \mathrm{Re}^{b2}$$

$$K = K_{lowR} + \frac{\left(K_{highR} + K_{lowR}\right)}{\left(1 + \left(\frac{\mathrm{Re}}{t}\right)^{c}\right)^{d}}$$

$$\Delta p_{liq} = K\rho_l \left(\frac{v_{liq}^2}{2g_c 144}\right) \qquad (1)$$

From this correlation one can see that there are 7 parameters controlling the flow performance and the Reynolds number. Some of theses parameters are specific for the equipment and not available due to confidentiality issues. It mainly concerns the parameters a_1, a_2, b_1, b_2, c, d and t. These parameters also affect the flow coefficient so without knowledge of the value of these the flow cannot be modelled. What we can see from the correlation is that it is affected by the flow coefficient for a low and a high Reynolds number. What this tells us is that the equipment following this correlation is dependent on fluid behaviour at low Reynolds number. This will be different from behaviour at high Reynolds numbers. This dependence on low values gives us a clear indication that the viscosity plays a big role in the performance of the equipment. [51]

Selection of a viscosity sensitive ICD type may have undesirable effects during the life of the well as water or gas breaks through. The reason for this is that there will be a difference in viscosity for gas, oil and water. If this difference is significant a big change in the pressure drop over the ICD can be seen. A change in the pressure drop will affect the production from the zone were breakthrough is happening. If the change is big enough it will affect the rest of the well and cause either increased or decreased production in some zones. The increased production can in some cases be beneficial if it happens in an oil producing zone. However if a water producing zone experience increased production it is not good for the well. If the difference in viscosity between water and oil is low, the selection of a viscosity dependent ICD type may not have so big consequences. But it is not only viscosity dependency that governs the selection of ICD type; it is only one of the factors to take into account when selecting the ICD type

This viscosity dependence is one of the major differences between the ICDs.

The general equation for HIVICD types is [15, 49]: $\Delta P = \frac{1}{2} K \rho v^2 = K \frac{\rho Q^2}{2A^2}$ (2)

If a tube type ICD is used another term has to be added to account for friction loss in the tube. Then the equation will then be [49]:

$$\Delta P = \rho g (h_f + h_m)$$

$$h_f = f \frac{L}{d} \frac{v^2}{2g}$$

$$h_m = \sum K \frac{v^2}{2g}$$

$$\Delta P = \rho g \left(f \frac{L}{d} \frac{v^2}{2g} + \sum K \frac{v^2}{2g} \right) = \rho g f \frac{L}{d} \frac{v^2}{2g} + \rho g K \frac{v^2}{2g}$$

$$\Delta P = \rho f \frac{L}{d} \frac{v^2}{2} + \rho K \frac{v^2}{2} = \underline{\underline{\rho \frac{v^2}{2} \left(f \frac{L}{d} + K \right)}} \qquad (3)$$

The pressure drop over the orifice/tube is not dependent on viscosity, but largely dependent on flow rate and flow area. Due to the dependence on flow area these types of ICDs are more sensitive to erosion. Normally the nozzle/tube material has very strong erosion resistance, but erosion can happen and the effect of increased flow area will be large. A typical nozzle material is ceramics; tubes are normally constructed of stainless steel. Ceramics is a very hard material and exhibits a high erosion resistance. Stainless steel can be eroded if the right metallurgy is not chosen. Therefore it is important to select the right metallurgy for the tubes. To decide the optimal metallurgy the predicted flow rate through the ICD and the amount of sand production has to be quantified. These two factors are important in the selection of the needed metallurgy and strength. It is important to select the right metallurgy, but also not to over exaggerate the strength by opting for a very hard and expensive material. [15, 33, 34, 45]

An increased flow through the nozzles from gas or water breakthrough will alter the pressure drop across the ICD. From equation (2) it is seen that an increase in the flow rate will cause the pressure drop to increase significantly. Changes in density of the flow from the well will have an impact on pressure drop. This is dependent on if gas, water or both are breaking through. Gas breakthrough will most likely give the biggest additional pressure drop because of a bigger difference in density between oil and gas compared to oil and water

The flow through the ICDs does not adhere 100% to the Bernoulli equation. To account for this the companies introduce a flow coefficient to reduce the differences, named K in equation (2) and (3). This coefficient is different for each manufacturer and for each type of ICD equipment. The coefficient is normally between 0.6-0.97. For the Resflo^{wTM} ICD planned on Goliat a coefficient of 0.953 applies. The coefficient only applies to the HIVICD types as the LOVICD types are modelled by a different equation. [33, 34]

A change in flow area or flow rate will cause a big change in the pressure drop over the nozzles/tubes. A change in density will not have the same big impact. As a response to the change in pressure drop the production will regulate itself. This self regulating effect is a key benefit for the HIVICD.

The HIVICD types are more common in field developments were the oil is more viscous and heavy. But they can also be used in a reservoir with light oil; it only has to be accounted for in the design.

When deciding the optimum ICD type one has to understand the hydrocarbon properties and what drawdown is likely. Also the reservoir pressure and flow rates will have to be known. This can be achieved through modelling in reservoir simulators such as Eclipse™ and steady state simulators such as NETool™. From the modelling results the best possible candidate is chosen. This can be a uniform solution for the well or a tailored made solution. [44, 45]

2.6 Modelling Tools

For the thesis most of the modelling and simulation work was done in NETool™. This is much simpler and faster modelling software than Eclipse™, which is a numerical simulator, i.e. a dynamic model. It requires a lot of data to run and high end computing power. NETool™ is a steady state simulator, meaning a static model. This requires a lot less computing power and the amount of input data is less. What NETool™ does is that it creates a sector model for the well to be studied and it uses the reservoir data from the Eclipse ™ model. The possibility to import Eclipse™ data and use that to simulate the well makes the results from NETool™ more accurate and in line with Eclipse™. This increases the amount of work possible to do in a master thesis. [45, 52]

Eclipse™ is an advanced modelling tool, with the possibility to investigate the whole life of a field or a well. With NETool™ only one well can be studied at a time. NETool™ cannot simulate the whole life of the well, but requires time steps in order to run simulations. The selection of these time steps is important for the accuracy and consistency of the simulation results. There will be some difference in accuracy between Eclipse™ and NETool™ due to the different ways of simulating the well and reservoir behaviour. NETool™ will deliver the result quicker and for the scope of work in this thesis it is considered accurate enough. For more detailed studies and in depth simulations more time and resources are needed.

As mentioned above NETool™ runs by a set of constraints to simulate the wells behaviour. These constraints have to be put in manually and will govern the life of the well. Normally one use constraints such as oil production, water production, gas production, total liquid rate and BHP. These constraints are the ones normally used and the ones that are easily extracted from Eclipse™ production data.

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Chapter 3 Simulations and Results

Several simulation runs have been made with different ICD settings. From these runs an optimal theoretical option has been identified. Since the theoretical option often is difficult to install reliably a more practical case has been put forward.

On Goliat 11 oil producer wells are planned. In this thesis two wells have been selected for detailed studies. Only two wells are selected due to time and workload limitations. The chosen wells are KP7 in upper Kobbe and KP9 in lower Kobbe. Challenges for both wells are related to gas and water breakthrough.

After the wells were selected the directional survey was entered into NETool™ and the well trajectory was adjusted to match the well path in Eclipse™. A discrepancy was found for KP9s trajectory, this was corrected and the simulations run with the correct trajectory. Consistency in well trajectory between NETool™ and Eclipse™ is important as this will determine much of the wells behaviour.

To investigate life of well effect of the ICDs, simulations have been run at different time steps. The time steps chosen for KP7 are at 730 (2015), 1826 (2018) and 7305 (2033) days. For KP9 it is 730 (2015), 1826 (2018), 2556 (2020), 4017 (2024) and 5113 (2027) days. Time steps available in Eclipse™ and production data have been used for selecting the time steps. Simulating an ICD completion in NETool™ requires a minimum of three time steps.

In order to have an accurate and consistent NETool™ model, it is required to match it to Eclipse™ data for each time step. Changing the output from NETool™ can be done by adjusting the transmissibility, permeability scaling, saturations scaling and what constraint the model is run under. Since NETool™ cannot read all Eclipse™ information it does not import any restriction put on the well in Eclipse™. These restrictions have to be put in manually. These restrictions are what govern the NETool™ model. For the two wells studied restrictions in BHP, oil rate, gas rate and total liquid rate were used.

The matching of output data is vital to get consistent results and a NETool™ model that is useable. NETool™ simulations have to be adjusted for each time step modelled. There is often not a 100% correlation in the outputs, and this is virtually impossible to achieve. The most important outputs to be matched between Eclipse and NETool™ are BHP, liquid rates and gas rate if the well is producing much gas.

The difference between NETool™ and Eclipse™ for KP7 is roughly 1 bar for BHP, a few cubic meters for liquid rate and as close as possible for the gas rate. For well KP9 it was difficult to get an accurate match of the BHP, but the other outputs matched well. In the simulations for KP9, the BHP is off with 3-5 bars. This difference in BHP is not big enough to make the data unrealistic or unreliable.

The challenge is often to get the right relation between water and oil production rate, since the production rate of these two is related. Keeping the gas production as low as possible has been identified as important for the upper Kobbe wells. The need for consistency between NETool™ and Eclipse™ constraints make it difficult to show a reduction in gas production. A gas constraint had to be used for simulating KP7, because of gas injection and limitations in gas processing on the FPSO. For KP9 production of gas is also important, but here the main gas production comes from dissolved gas. So the water plays a bigger role in KP9. Having a high amount of dissolved gas will make it harder to achieve the right composition when adjusting the output.

For the well KP7 there was no problems getting output data to match; only a slight difference in gas production rate at the last time step was observed. For KP9 it was more difficult and the BHP was the largest discrepancy. All the other parameters were close to what Eclipse™ predicted. It was not possible to get a good match of the BHP and the model was run as is. The impact on the results from this mismatch is considered to be small.

3.1 Input data for KP7

The following plots represent the most important input data entered into NETool™ for the different time steps chosen. More details about input and configuration of the NETool™ model for KP7 can be found in appendix A.2-A.29

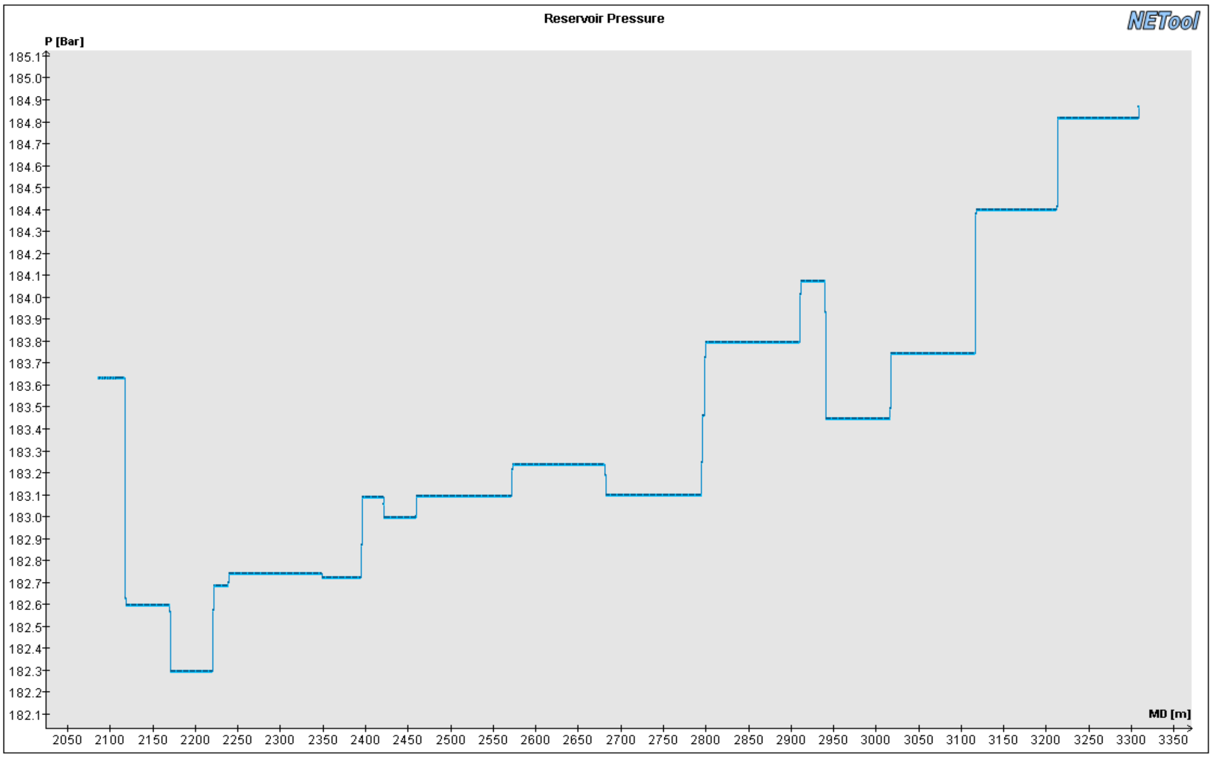

Figure 16 Reservoir pressure along KP7 reservoir section for 730 days, year 2015

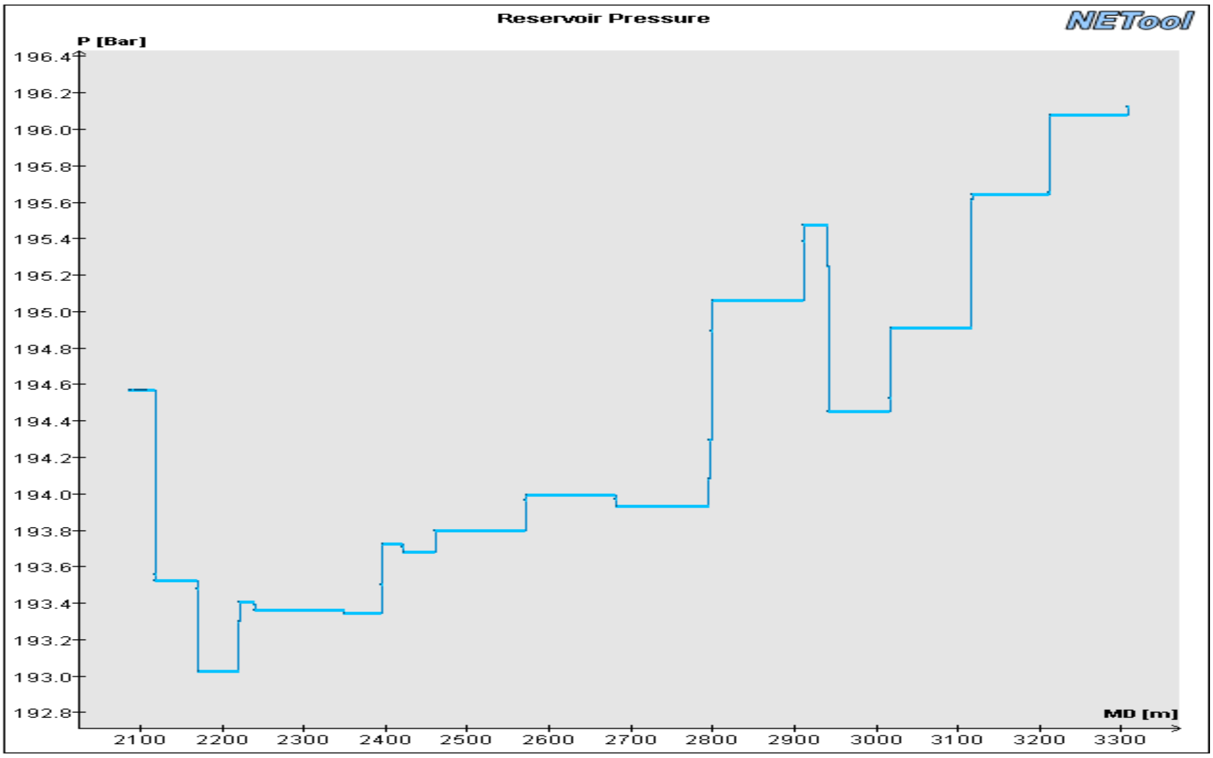

Figure 17 Reservoir pressure plot along KP7 reservoir section 1826 days, year 2018

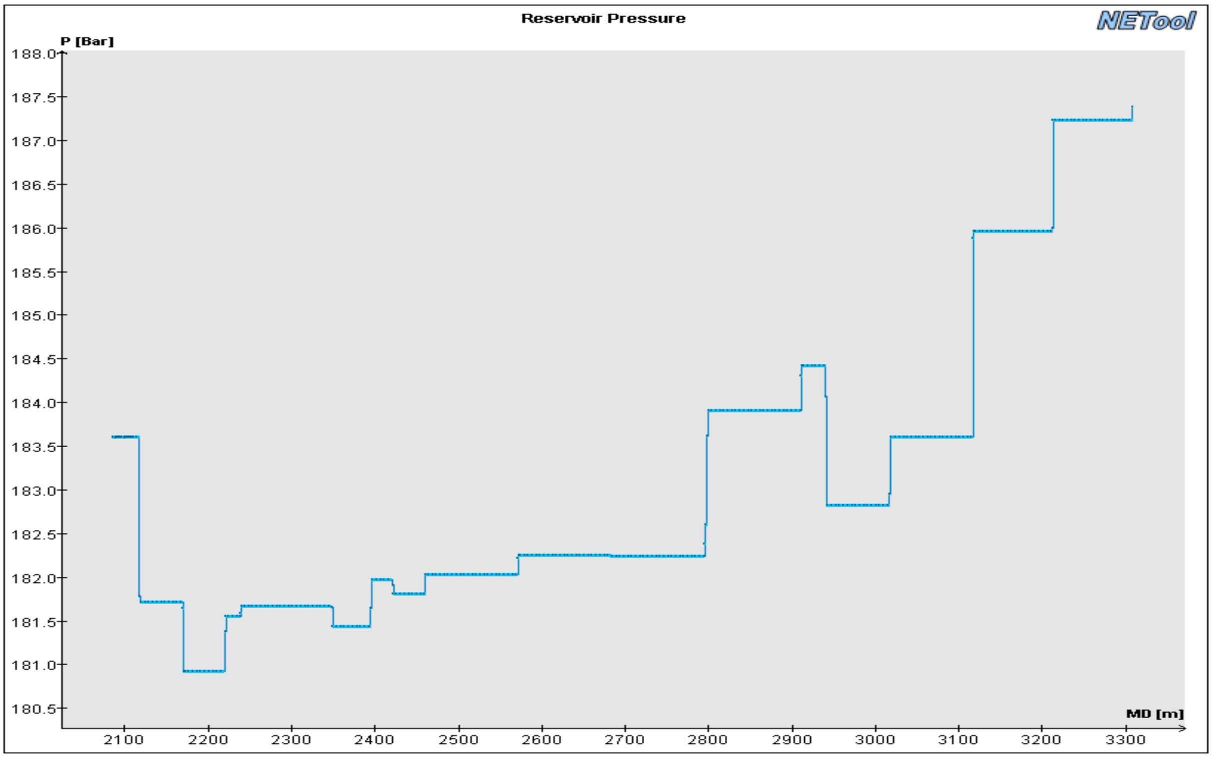

Figure 18 Reservoir pressure along KP7 reservoir section at 7305 days, year 2020

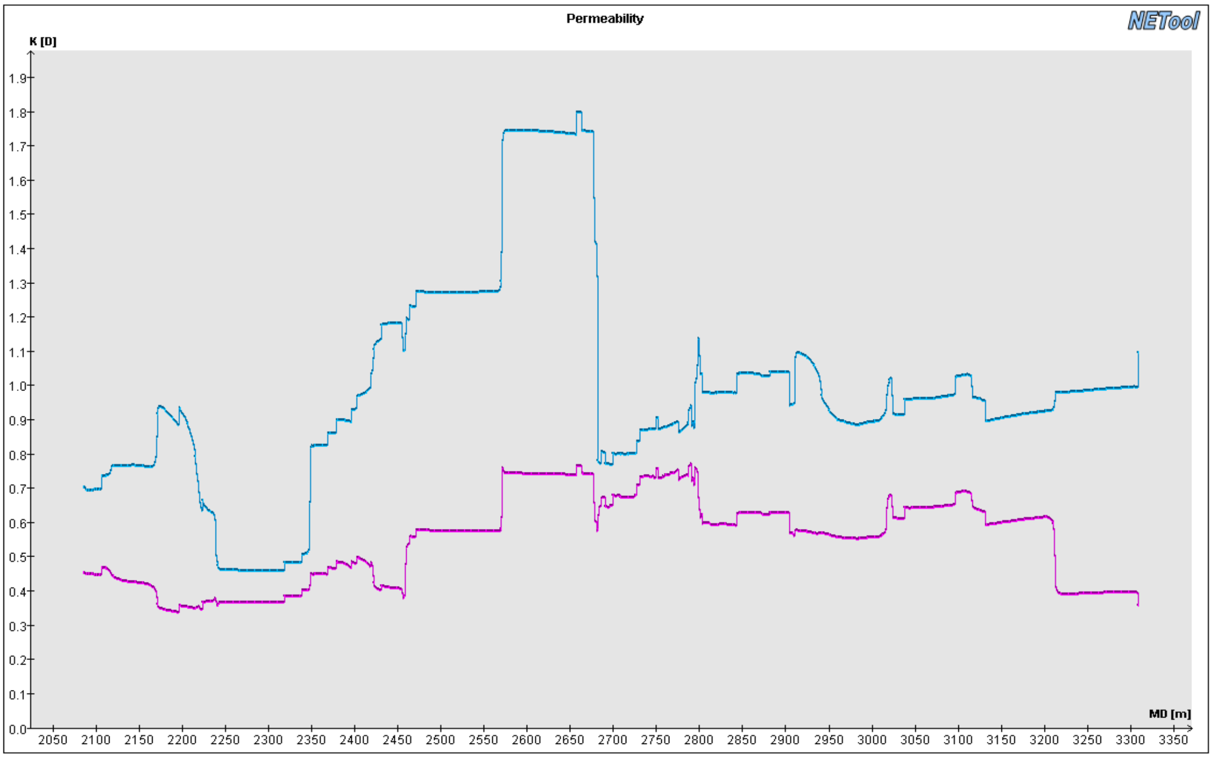

Figure 19 Permeability distribution along KP7 reservoir section (K_h=blue line, K_v= purple line)

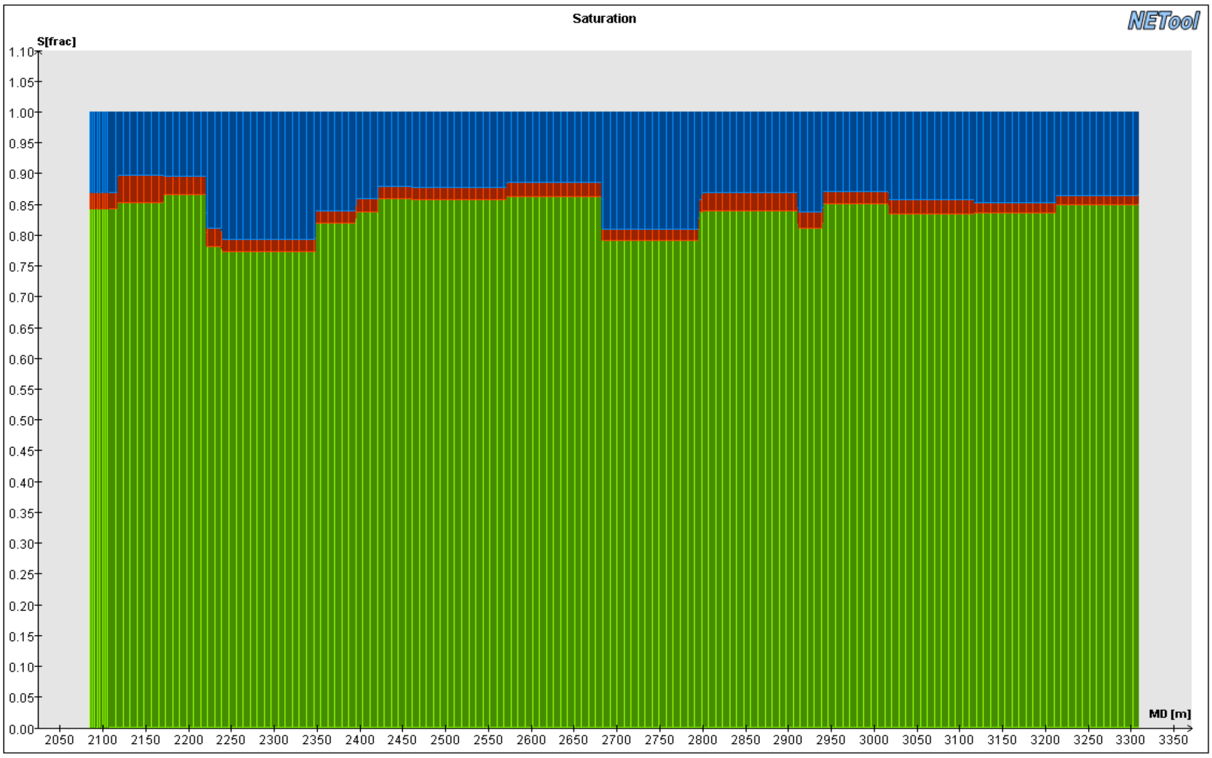

Figure 20 Saturation plot along KP7 reservoir section for 730 days, year 2015 (Oil= green, Gas= red and Water=blue)

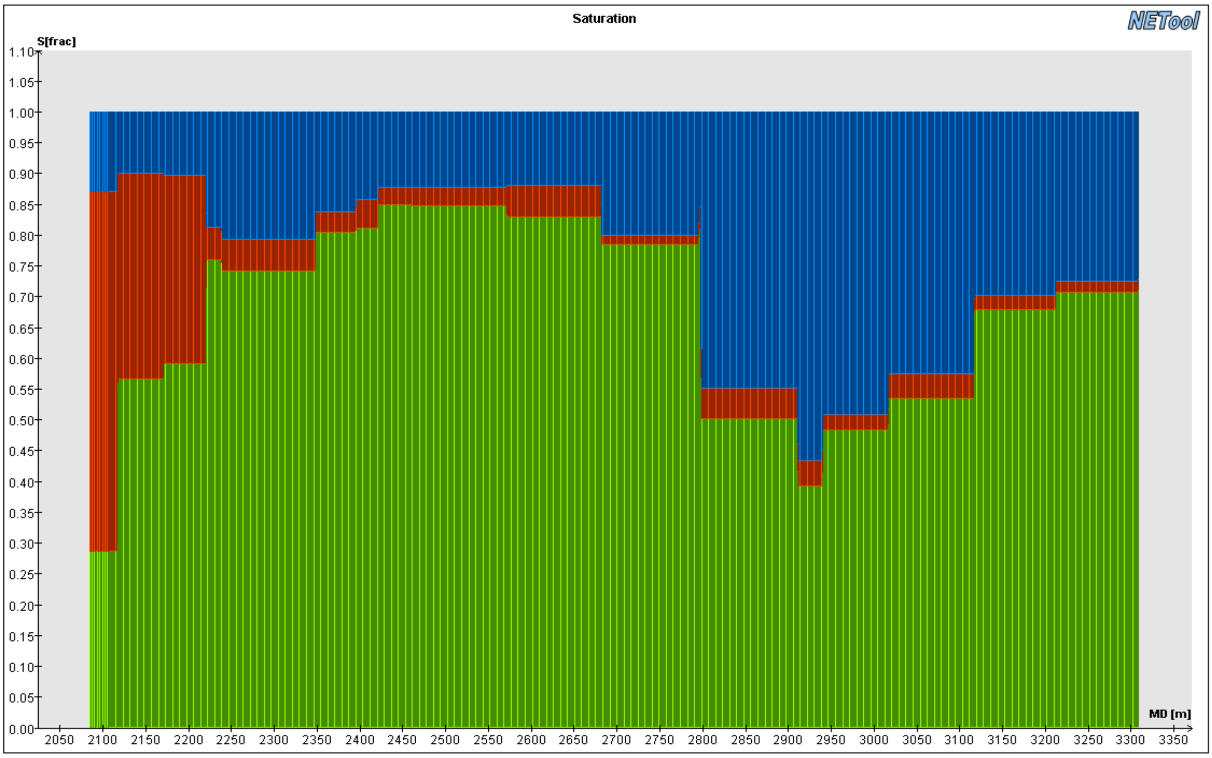

Figure 21 Saturation plot along KP7 reservoir section for 1826 days, year 2018 (Oil= green, Gas= red and Water=blue)

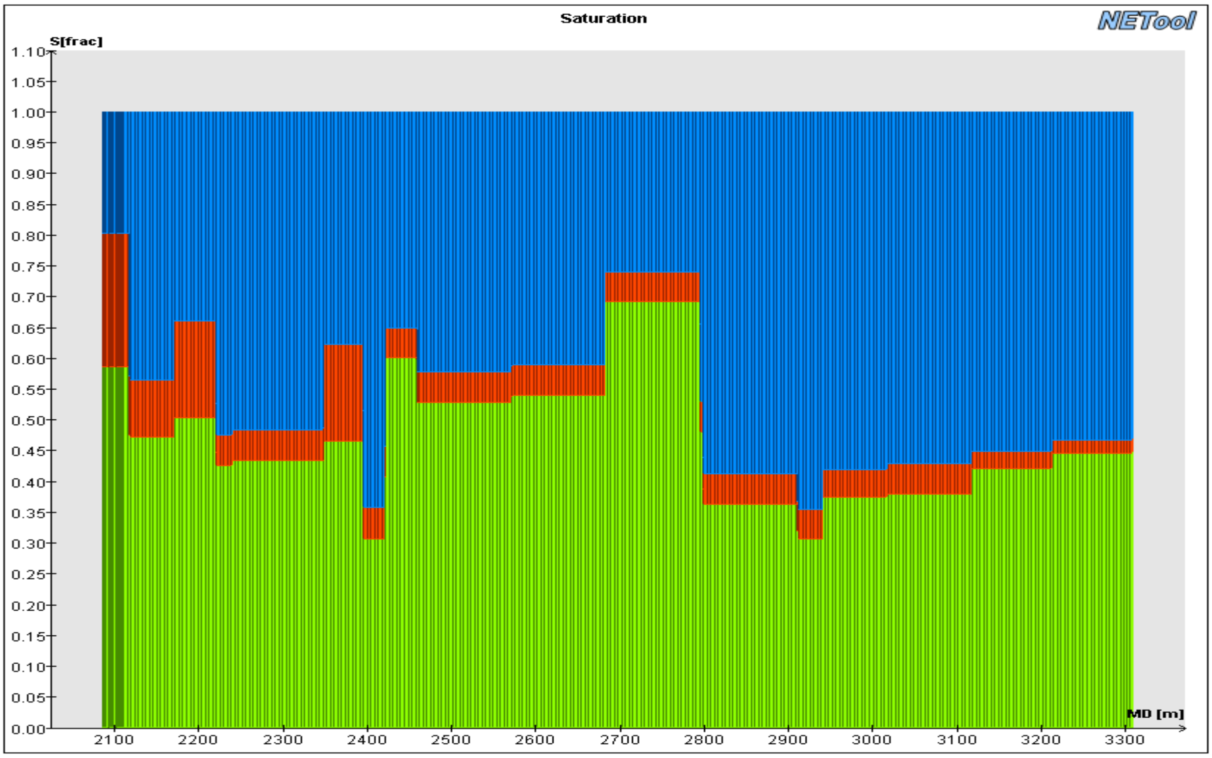

Figure 22 Saturation plot along KP7 reservoir section for 7305 days, year 2033 (Oil= green, Gas= red and Water=blue)

From figures 16 to 18 a slight decrease in reservoir pressure is seen. Because of pressure support from day one the reservoir pressure does not drop very much. Figure 20-22 is showing the saturation of oil, gas and water at the different time steps. Oil saturation is dropping in all the figures and water saturation is increasing in all the figures. The gas saturation is increasing from figure 20 to 21 and here high gas saturation can be seen at the heel part of the well. In figure 22 lower gas saturation can be seen. Also it is clear that water saturation increases much more in the toe area of KP7, because of water injection in a nearby well.

3.2 Simulations and Results for KP7

Case	Days	Description	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT	BHP	Comments	Appendix
1	730	Initial	2 200	0,42	2	193	0,1	181	Base case for KP7	A.2
2	1826	Open Hole	1 049	0,75	330	715	23,9	192	Reference case for time step 1826d	A.3
3	1826	2x1.6 mm ICD	2 843	0,75	777	264	21,5	77	First simulated ICD setting, ruled out because of low BHP	A.4
4	1826	2x2.5 mm ICD	2 808	0,75	729	267	20,6	171	Second ICD setting, ruled out because of low BHP	A.5
5	1826	2x4 mm ICD	2 635	0,75	565	285	17,7	188	Ruled out because of high water rate	A.6
6	1826	4x1.6 mm ICD	2 823	0,75	746	266	20,9	162	Fourth ICD setting, ruled out because of low BHP	A.7
7	1826	4x2.5 mm ICD	2 702	0,75	620	278	18,7	186	Ruled out because of high water rate	A.8
8	1826	4x4 mm ICD	2 359	0,75	439	318	15,7	190	ICD setting selected, before final blank pipe set up	A.9
9	**1826**	**ICD Recommended**	**2 364**	**0,75**	**337**	**317**	**12,5**	**190**	**Recommended ICD setting for the well**	A.10
10	1826	Tailored ICD design	2 267	0,75	373	331	14,1	190	Tailored ICD completion.	A.11
11	1826	Practical case	2 303	0,75	290	326	11	191	4x4mm ICD and packer every 5th joint	A.12
12	1826	WWS completion	2 972	1,30	202	439	6,4	189	WWS completion simulated for showing difference in erosion resistance	A.14
13	1826	5.5" Screen	2 174	0,75	281	345	11,5	189	Simulated for showing potential in a 5.5" completion	A.13
14	1826	OH +25% Kh	5 125	2,56	1 037	499	16,8	190	Reference case for 25% increase in Kh	A.15
15	1826	Recommended ICD + 25% Kh	2 745	0,86	384	314	12,3	190	Recommended ICD completion run with 25% extra Kh	A.16
16	1826	OH + 50% Kh	5 575	2,93	1 117	526	16,7	190	Reference case for 50% increase in Kh	A.17
17	1826	Recommended ICD +50%Kh	2 865	0,89	399	312	12,2	190	Recommended ICD completion run with 50% increase in Kh	A.18
18	1826	OH - 25% Kh	3 785	1,69	780	448	17,1	190	Reference case for a 25% reduction in Kh	A.19
19	1826	Recommended ICD -25% Kh	2 901	0,92	414	316	12,5	190	Recommended ICD completion run with 25% reduction in Kh	A.20
20	1826	Recommended ICD -250m	2 235	0,75	327	336	12,8	190	Recommended ICD completion run with a wellbore 250m shorter	A.21
21	1826	Recommended ICD +250m	2 531	0,75	217	296	7,9	191	Recommended ICD completion run with 250. longer wellbore. ICD and packers every 5th joint.	A.22
22	7305	Open Hole	295	0,08	2 604	261	89,8	179	Reference case for time step 7305d	A.23
23	7305	Tailored ICD design	529	0,14	2 370	258	81,7	177	Simulated for showing potential in Tailored completion setting	A.24
24	**7305**	**ICD Recommended**	**531**	**0,14**	**2 368**	**258**	**81,7**	**177**	**Recommended ICD setting for the well**	**A.25**
25	7305	Practical case	562	0,14	2 337	257	81	177	4x4mm ICD and packer every 5th joint	A.26
26	7305	WWS completion	362	0,10	2537	276	87,5	178	WWS completion simulated for showing difference in erosion resistance	A.27
27	7305	5.5" Screen	582	0,16	2 317	271	79,9	175	Simulated for showing potential in a 5.5" completion	A.28
28	7305	Recommended ICD -250m	883	0,22	2 016	254	69,6	174	Recommended ICD completion at 7305d run with 250m shorter wellbore	A.29
29	7305	Recommended ICD +250m	560	0,13	2 339	234	80,7	179	Recommended ICD completion at 7305d run with 250m longer wellbore. ICD and packers every 5th joint in new part	A.30

Table 3 Summary table of all simulations for well KP7

The above table summarises the different cases simulated for KP7 and the results obtained. The numbers in red highlight that the well is constrained by that particular output. When both water and oil is coloured red a total liquid rate constraint has been used.

The recommended ICD setting is written in bold face and coloured light brown. The recommended ICD setting also include a blank pipe section seal a high productivity water zone. See Appendix A.10 for completion and ICD setting details. The recommended ICD setting was based on oil rate, water rate, water cut and BHP. The selected recommended ICD setting does not have the highest oil production, but the lowest water rate and a sufficiently high BHP. Recommended setting was determined after running it both for 1826 and 7305 days.

3.2.1 Sensitivity on ICD nozzle size, KP7

See appendix A.4-A.11 for more details of completion set up and simulation results.

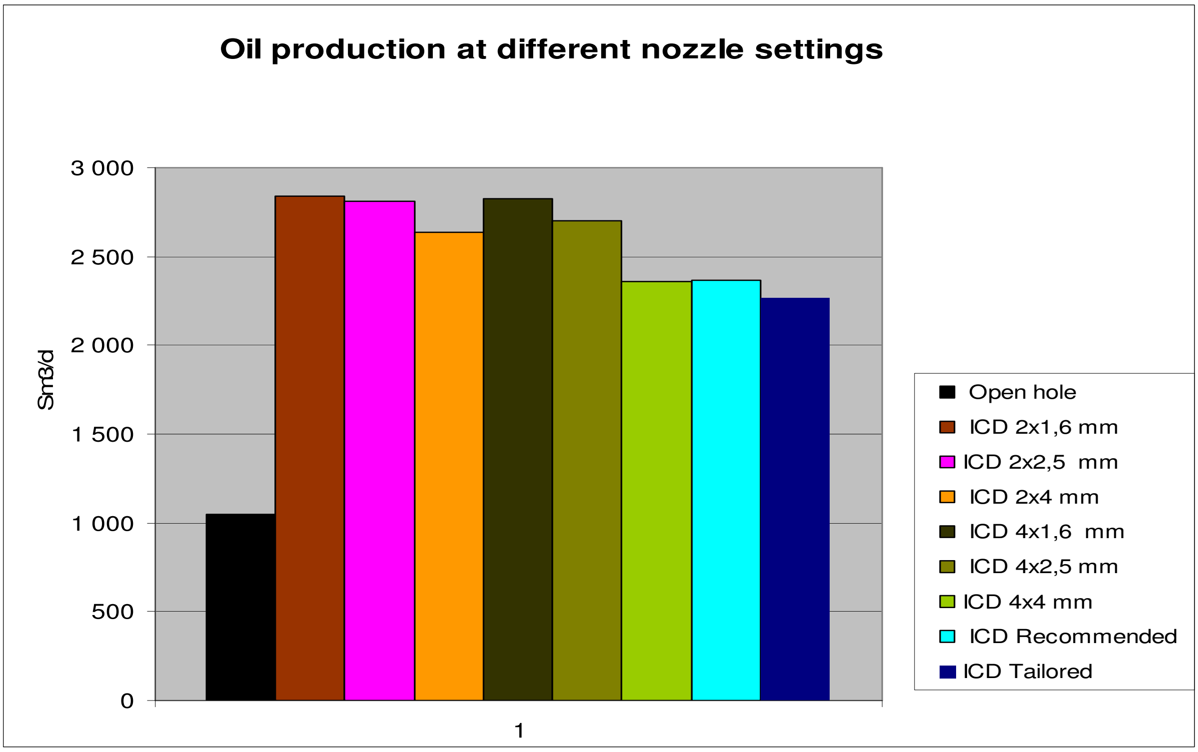

Figure 23 KP7 oil production at 1826 days (year 2018)

This plot shows the oil production at the time step 1826 days (year 2018). From this plot it can be seen that the smallest nozzle diameter gives the highest oil production. It also shows that a tailored (i.e. different nozzle sizes along the wellbore as well as a tailored packer setting and a blank pipe section) ICD solution does not give a benefit in oil production for the KP7 well under these conditions. The recommended completion is made up of the same ICD setting along the wellbore, a tailored packer setting and a blank pipe section. Further details on completion set up for the recommended and tailored ICD setting can be found in appendix A.10 and A.11.

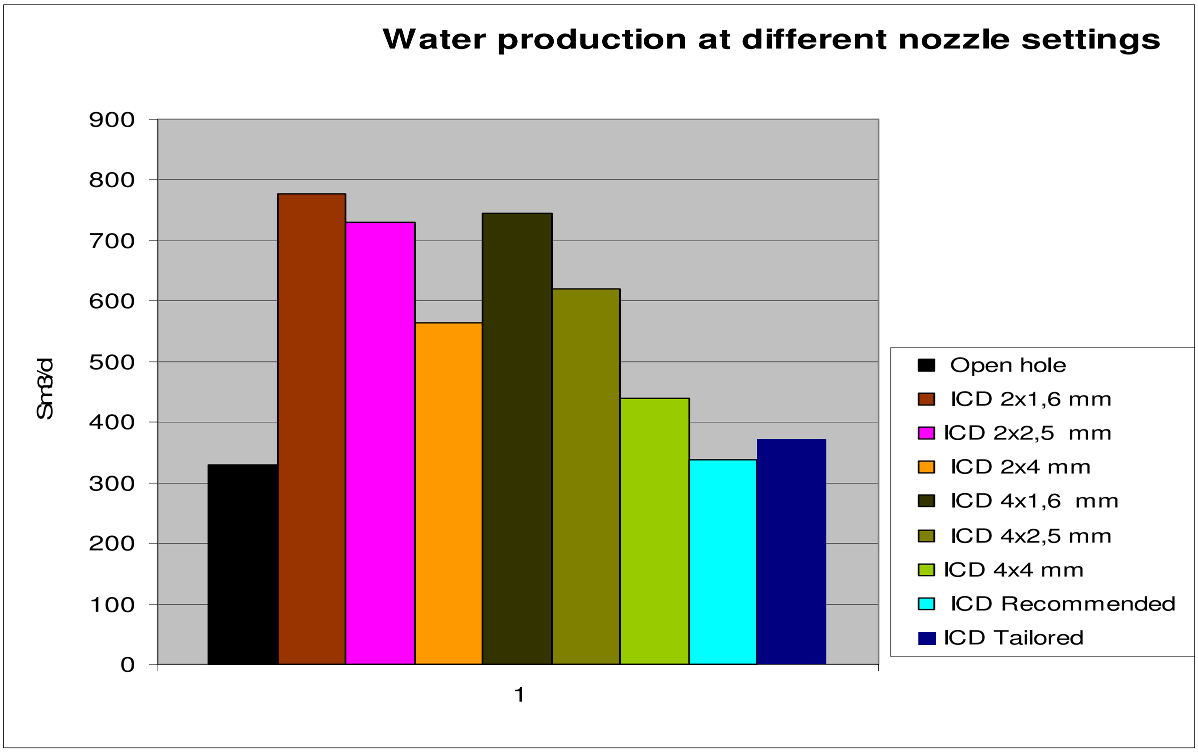

Figure 24 KP7 Water production at 1826 days (year 2018)

Figure 24 highlights the water production at 1826 days (year 2018). The recommended setting is giving the lowest water production. The smallest nozzle size is producing high rates of water. It is also clear that the tailored ICD design does not lower the water production as much as the recommended design.

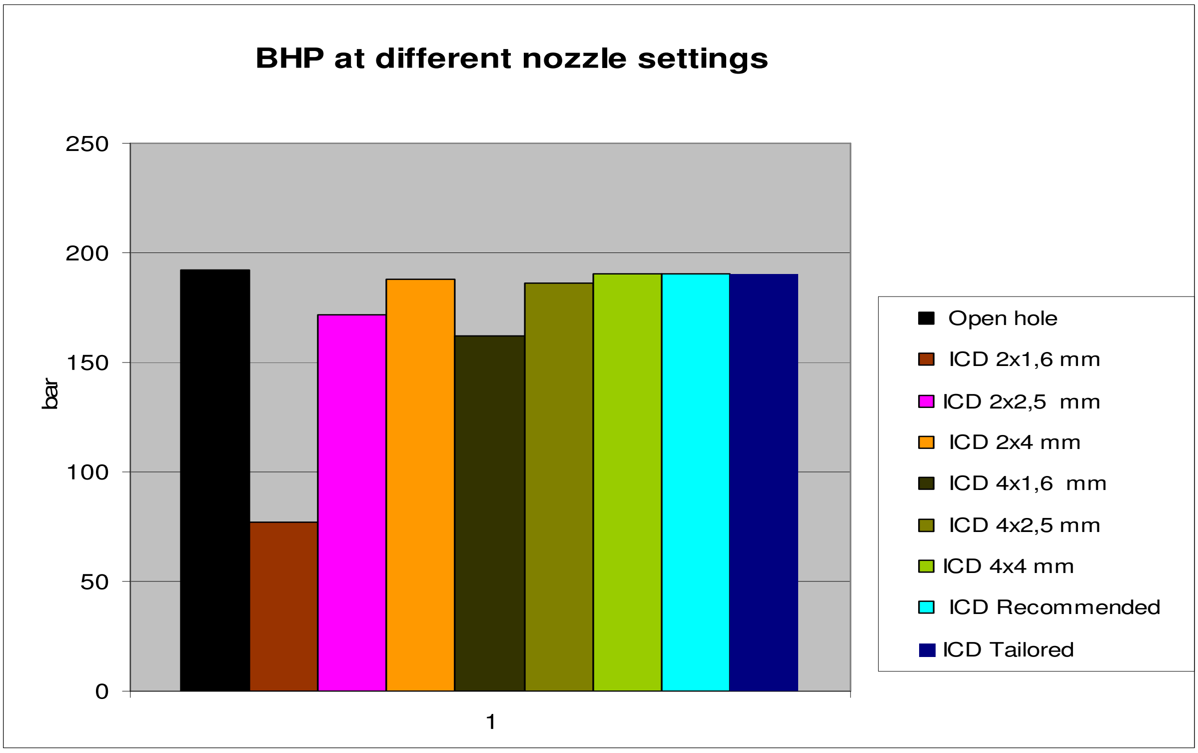

Figure 25 KP7 BHP for the different nozzle settings at 1826 days

The plot above illustrates the flowing BHP for different ICD settings. As expected the smallest ICD setting is choking the well most and there is much less choking for the larger nozzle sizes. The low flowing BHP for the small nozzle size is too low for producing the well, as it wastes too much pressure (energy).

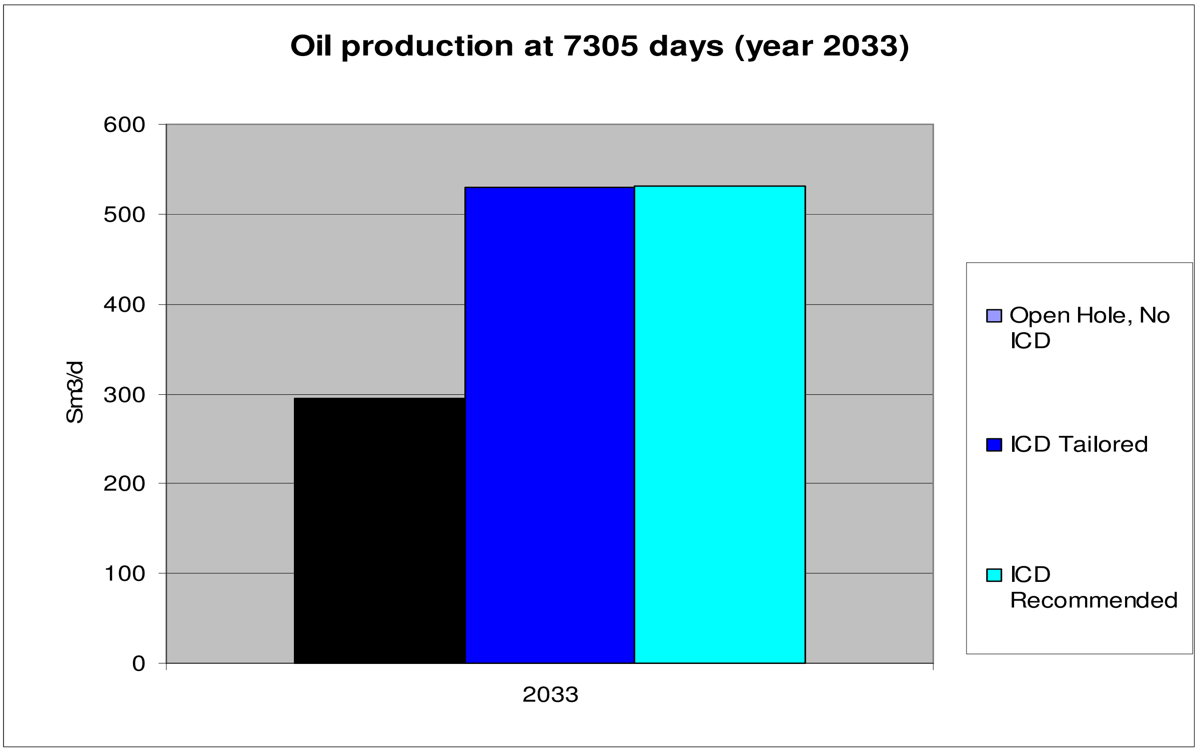

Figure 26 KP7 oil production at 7305 days (2033)

The graph above shows the oil production in late life, i.e. after 7305 days (2033). For this case only open hole, tailored ICD design and recommended ICD design was simulated, for simplicity. There is a significant benefit of ICDs in late life. It is also clear that there is no benefit from a tailored ICD design.

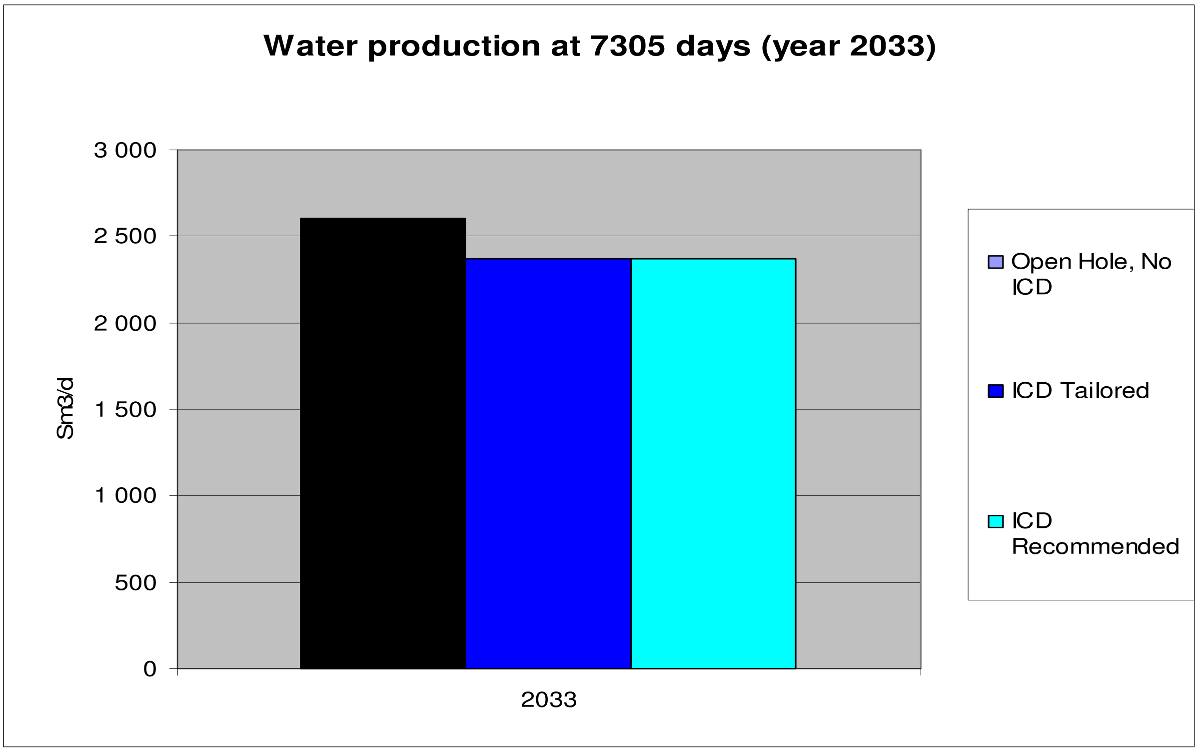

Figure 27 KP7 Water production at 7305 days (2033)

From figure 27 it can be seen that the open hole (no ICD) case produces the most water. Both simulated ICD settings produce practically the same amount of water in late life.

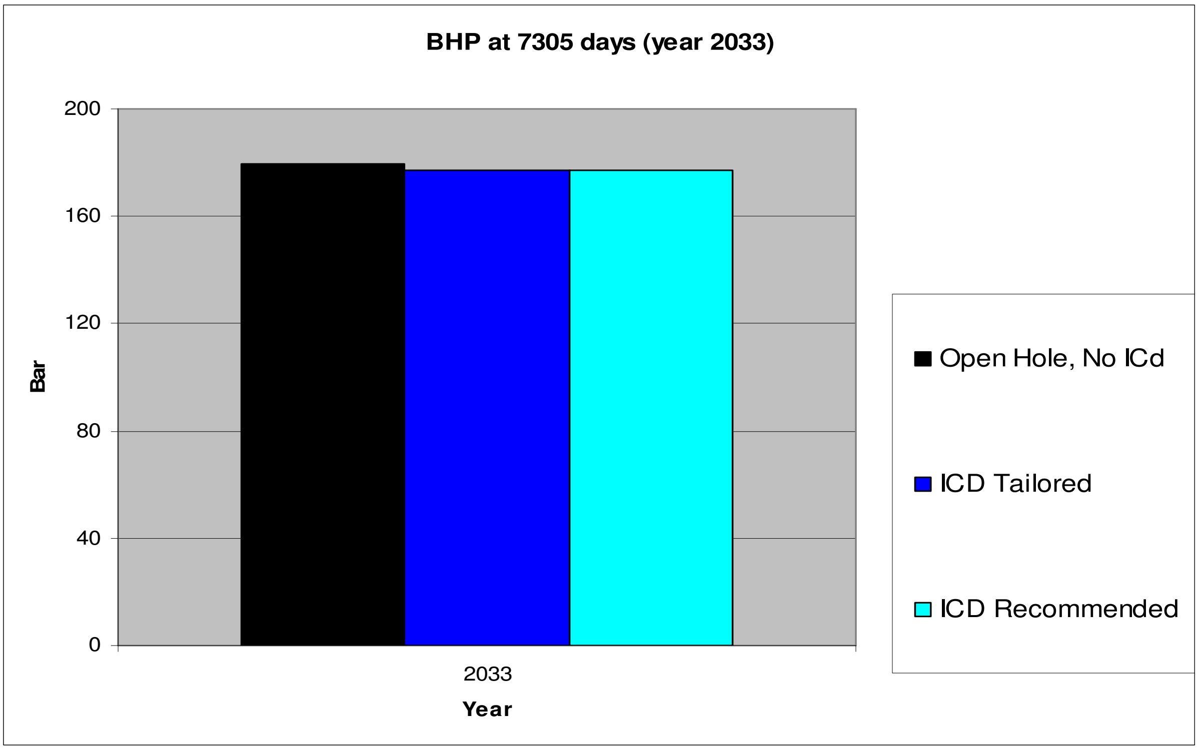

Figure 28 BHP for the different ICD set ups and pen hole at 7305 days (2033)

The drawdown of the well is small for both the recommended and tailored case. A small drawdown as seen in figure 28 is beneficial to avoid wasting energy (pressure).

See appendix A.23-A.25 for more details and simulation results on sensitivities run at 7305 days.

3.2.2 Permeability sensitivities KP7

Permeability sensitivities have been done at 1826 days (year 2018) and only for the recommended ICD completion set up. Refer to appendix A.15-A.20 for more details on set up, permeability profiles and results. For these sensitivities the well has been run with a flowing BHP constraint (including the reference case). This was done in order to investigate the full effect of an altered permeability. The reference case has the same permeability profile as in the Eclipse™ data.

Refer to chapter 4.1.3 for more discussions on the results from the simulated permeability sensitivities.

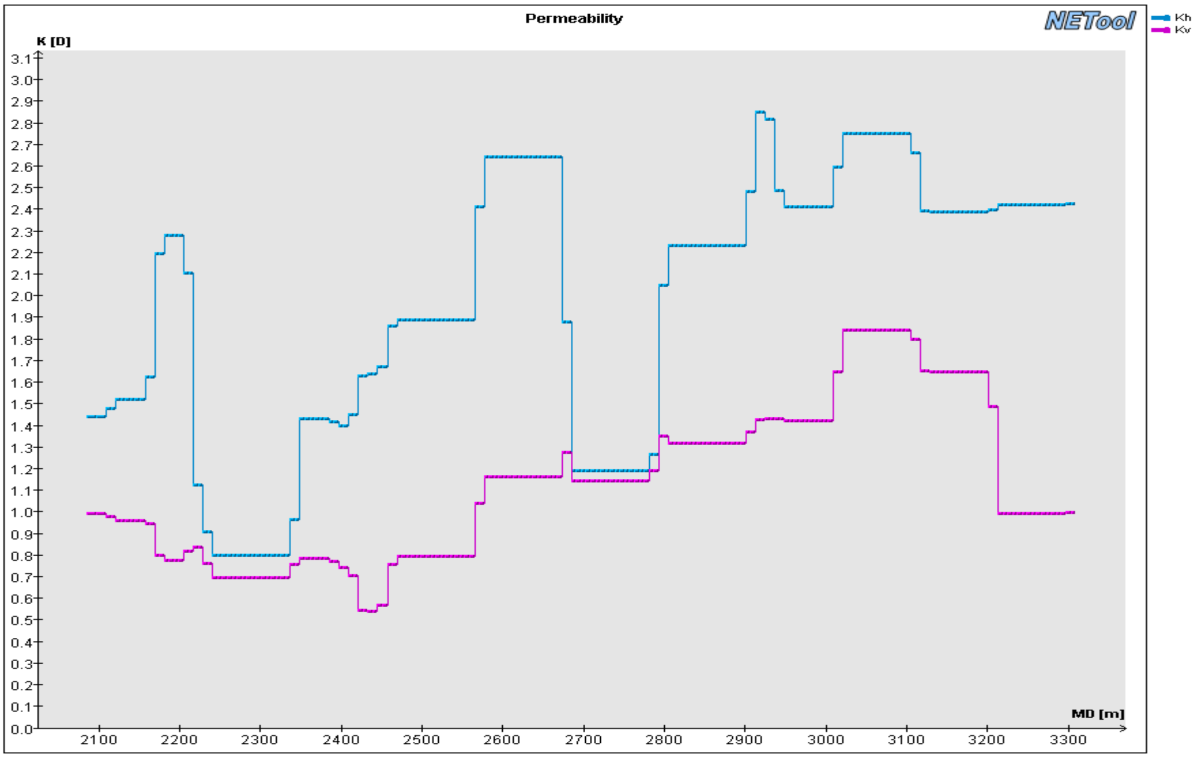

Figure 29 Permeability plot with 25% increase in K_h (K_h=blue line, K_v= purple line)

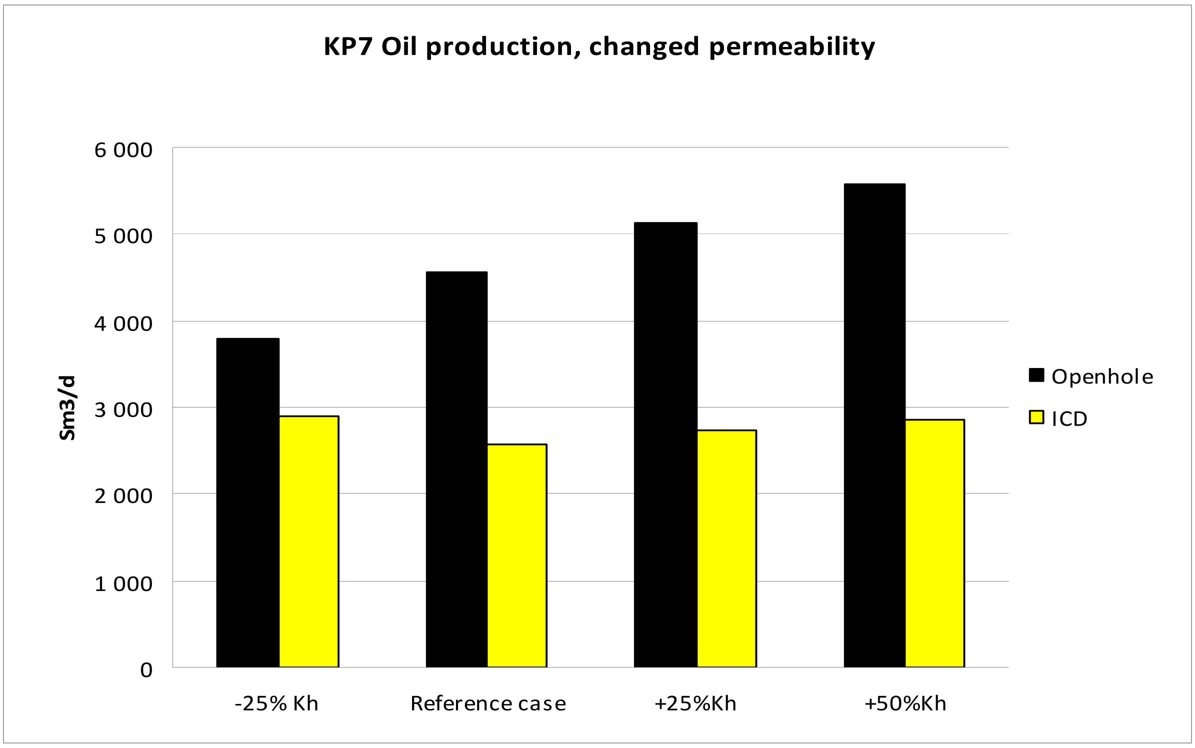

Figure 30 KP7 oil production for varying permeabilities

This graph shows the oil production for an altered permeability case with open hole completion and no ICDs (black) compared to the recommended ICD completion set up (yellow). It is clear that the open hole case with no ICDs produces significantly more than the ICD completion, since no topside gas constraint is applied. Production from the ICD completion is more or less the same for each of the altered permeability cases.

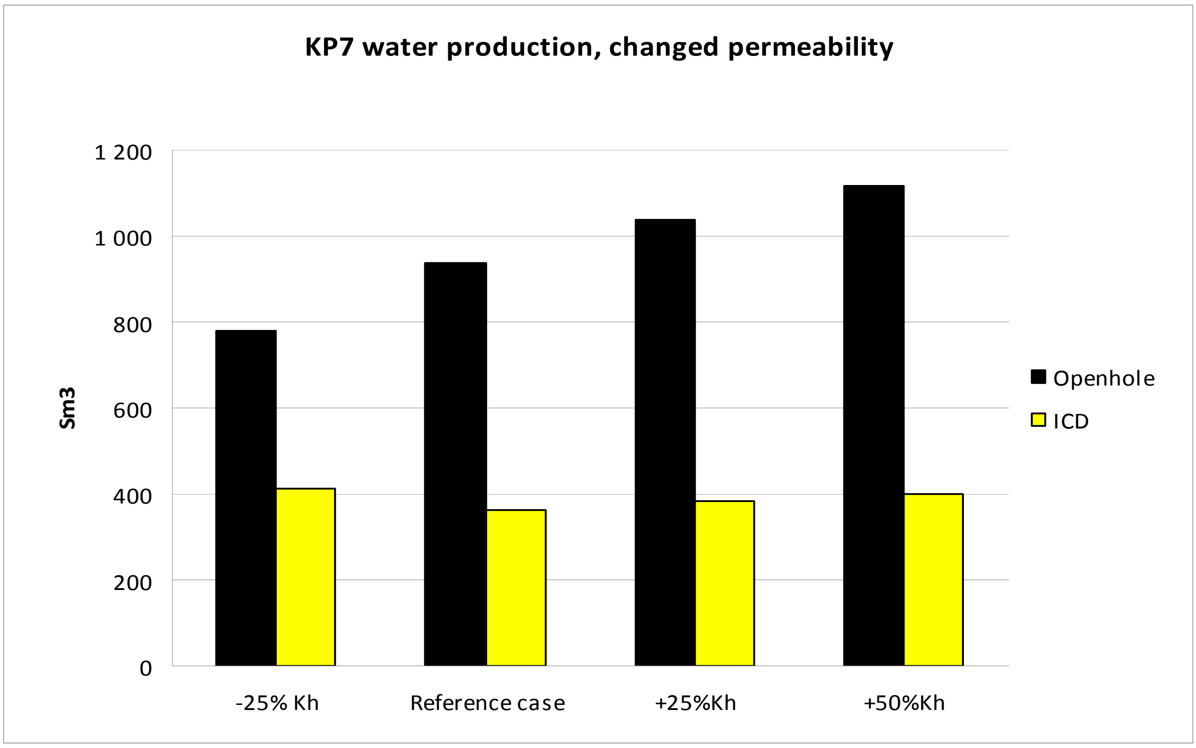

Figure 31 KP7 Water production for the altered permeability case

The above plot shows the water production from KP7 with altered permeability. It is apparent that the ICD completion greatly reduces water production compared to the open hole case. There is little variation in water production for the ICD completion with varying permeability.

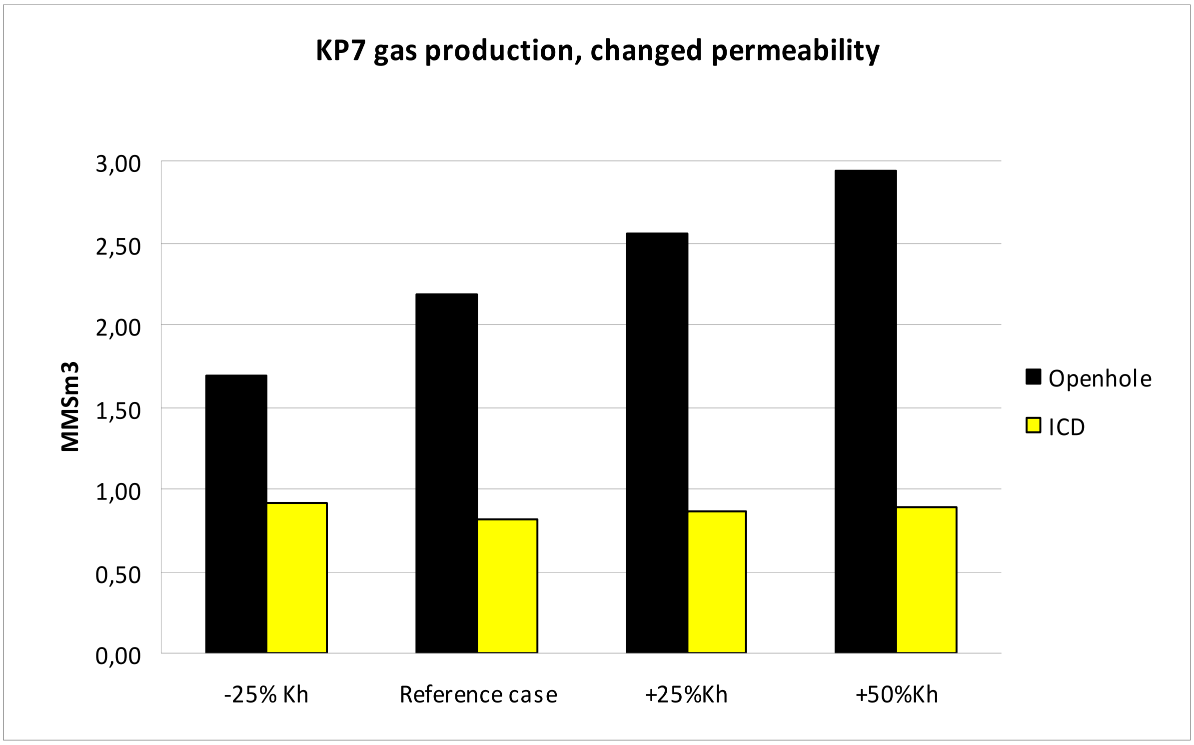

Figure 32 KP7 gas production for the altered permeability case

Figure 32 highlight the gas production for KP7 with altered permeability. A sizeable reduction in gas production is seen from the recommended ICD completion. Since the well is run by a flowing BHP constraint and not a gas constraint, a high gas production is seen for the open hole case.

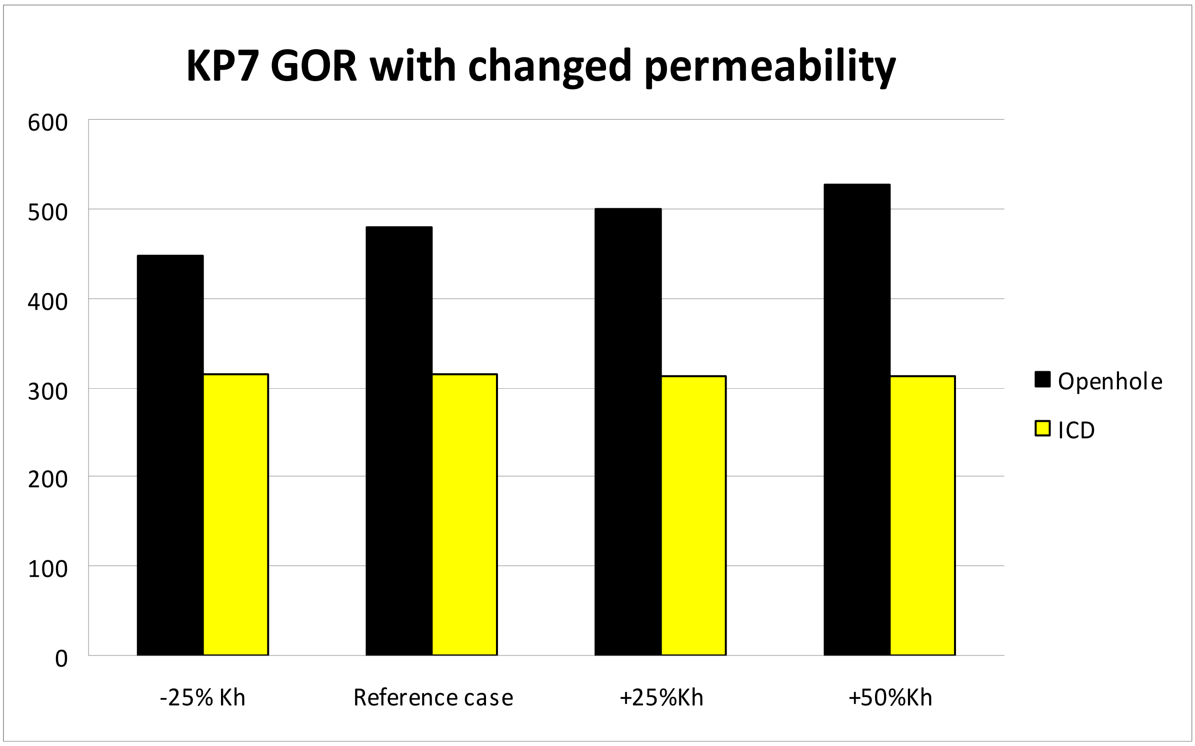

Figure 33 KP7 GOR variations with permeability

Figure 33 shows changes in the GOR with altered permeability. It can be observed that the GOR for an openhole are increasing with higher permeability, due to increased gas production. For the ICD completion the GOR is practically constant due to choking of the well, thus reducing gas production and maintaining constant oil production.

In summary good benefits are still seen for the recommended ICD completion if the permeability is altered.

3.2.3 Sensitivity on well length KP7

A length change of +/-250m was used in the modelling. This length change was chosen to have comparable length changes for both wells. A shorter wellbore was created by removing the reservoir connection for the last 250m in NETool™. For making the well longer the reservoir layers with the highest oil saturation was chosen for the additional part of the well. The direction of the new wellbore was the same as the original wellbore and the target was to not deviate too much from the original direction.

The completion set up for this case is the same as for the recommended case. In the added part of the well packers are run every 5^{th} joint. A gas rate and total liquid rate constraint was used. The gas rate constraint was used for the early time step (1826 days, year 2018), due to limitations in gas processing topside. In the late life time step a total liquid rate constraint was used. The amount of liquid was constant for both the longer and shorter wells. Since the total liquid rate was the same in the late life time step for both cases the numbers found and presented in the summary table cannot be regarded as actual numbers. The numbers found and the plots below will only serve as an indication on what benefits may exist. To get more accurate numbers an Eclipse™ simulation is required. See appendix A.21-22 and A.29-30 for more details on set up and results.

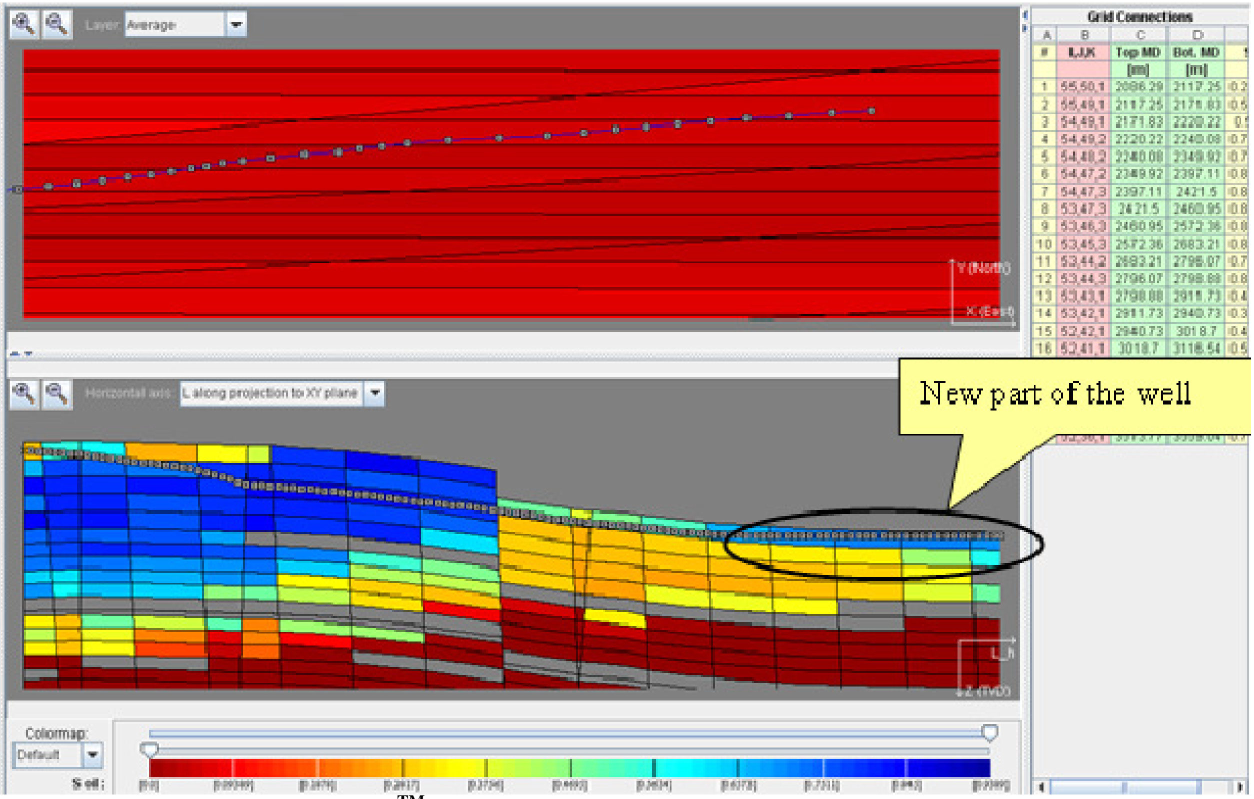

Figure 34 Screenshot from NETool™ with a 250m longer well for KP7

Figure 34 illustrates were the new part of the well is placed. The new part of the well is placed in the layers with high oil saturation (blue colour).

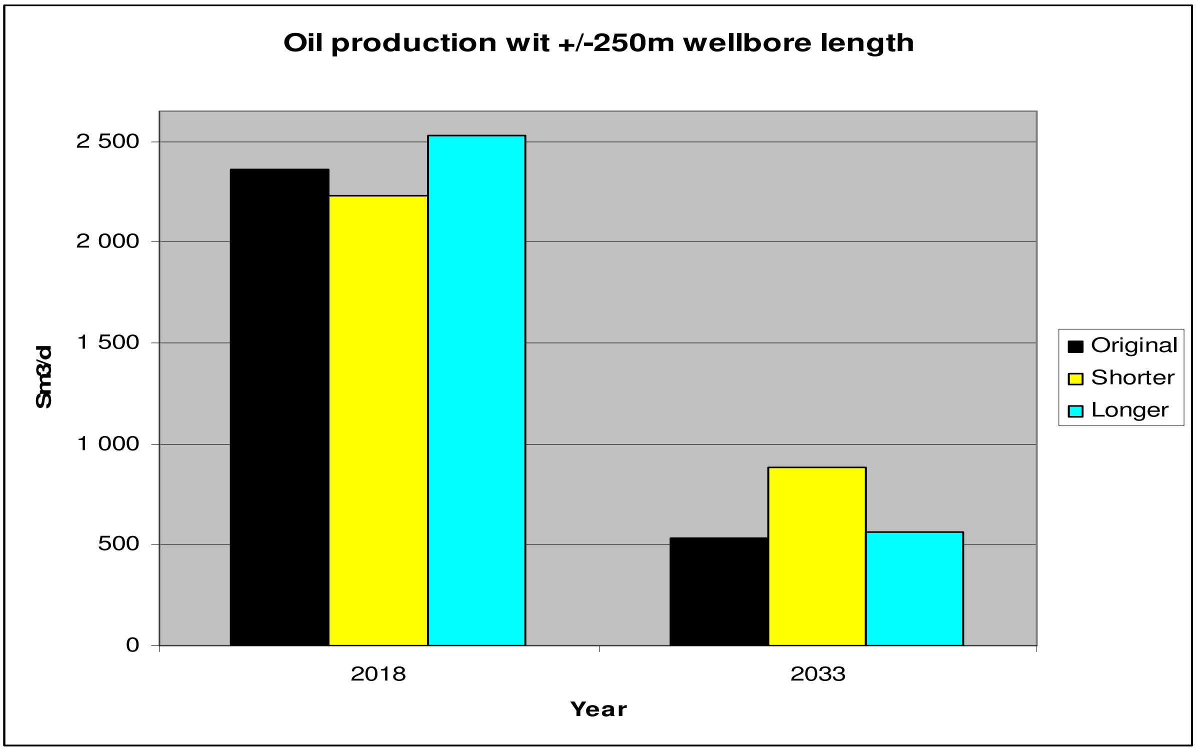

Figure 35 KP7 Oil production with +/- 250m length interval

Figure 35 is a comparison of the oil production with the original wellbore, a 250m shorter and a 250m longer wellbore. It can be observed that a longer wellbore is producing more oil in 2018 and roughly the same amount of oil in 2033 compared to the original wellbore. For a shorter wellbore less production is observed in 2018, but significantly more in 2033. This increase in production in 2033 is seen because of the total liquid rate constraint used when simulating the time step 2033.

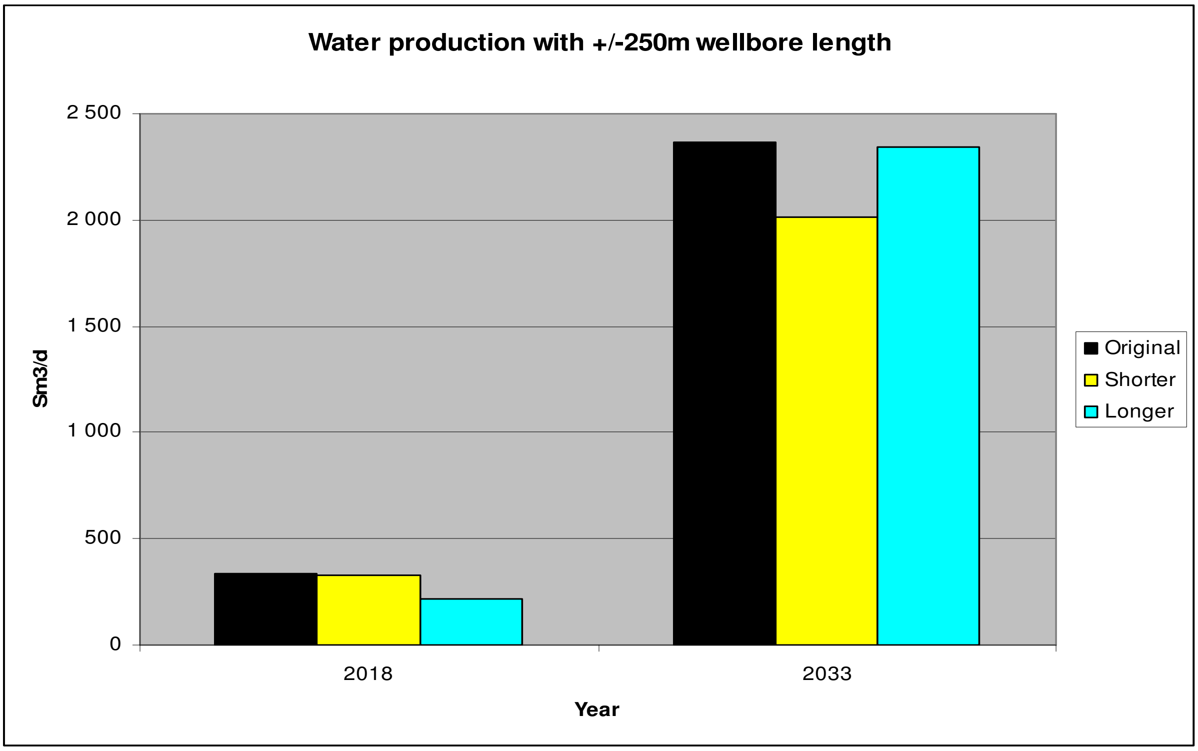

Figure 36 KP7 Water production with +/-250m change in wellbore length

The above graph highlights the water production with a longer and shorter wellbore. A longer wellbore will reduce water production in the early life of the well (2018) and is roughly the same in the late life (2033). This indicates that a benefit from making the well longer may exist. A shorter well will produce almost the same amount of water early in the wells life (2018), but significantly less in late life (2033). The reason for it is the total liquid rate constraint used in simulating the well.

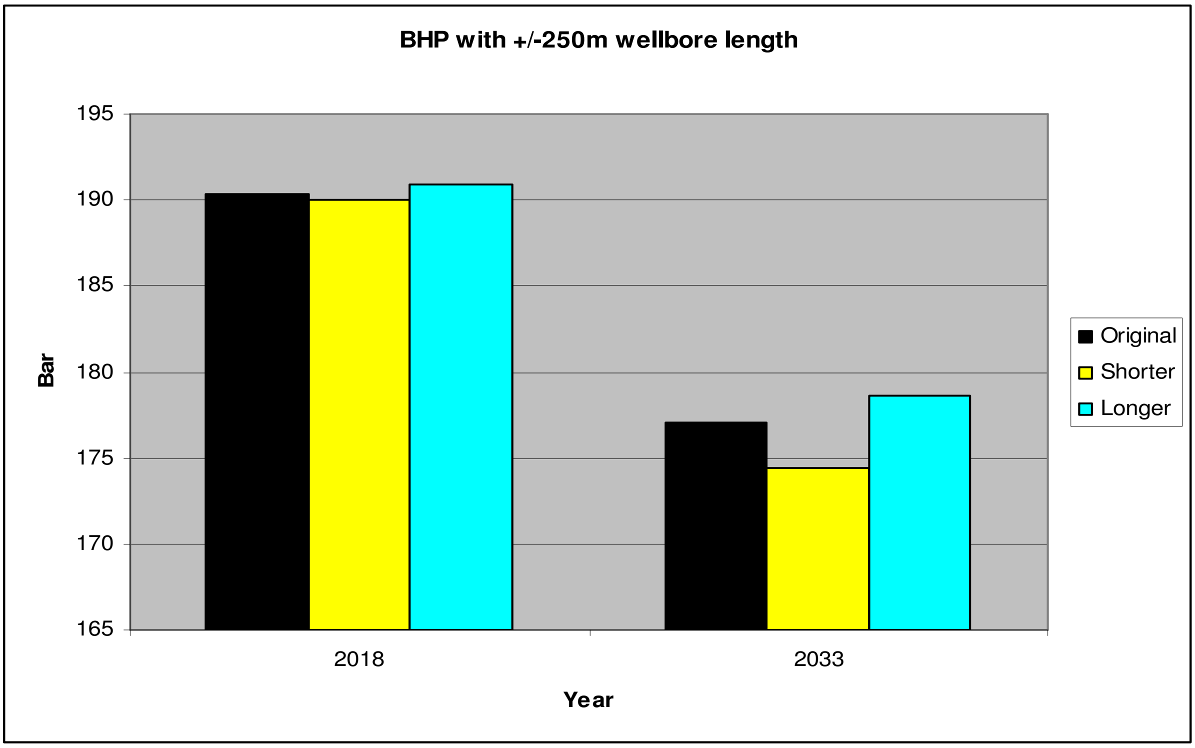

Figure 37 KP7 BHP for the +/-250m change of wellbore

The plot above is showing a higher flowing BHP for a longer well both in the early and late life. The difference is not very large. A shorter well is experiencing a lower flowing BHP in both early and late life, although the effect in early life is almost nonexistent. For late life the difference is more significant and it may have an impact on the total life of the well.

The simulated changes in wellbore length indicate that there might be a benefit in a longer well compared to the original planned wellbore. This can be read from the increase in oil production seen at the early time step and that there is no significant down side for the late life in oil or water production. Meaning the numbers for oil and water production in the late life is practically the same as they are for the original wellbore. In late life a significant increase in oil production and reduction of water production is seen for the shorter wellbore. Though this shorter wellbore will reduce the exposure to the reservoir and that is rarely desired.

3.2.4 Screen Size Sensitivity KP7

A sensitivity on changing the sand screen size from 6 5/8” to 5 ½” has been run. Input data for these sensitivities are the same as for the sensitivity runs when nozzle settings were determined, so reference is made to chapter 3.2.1 for plots with input data. See appendix A.13 and A.27 for more details on the 5 ½” case and appendix A.10 and A.26 for the 6 5/8” case.

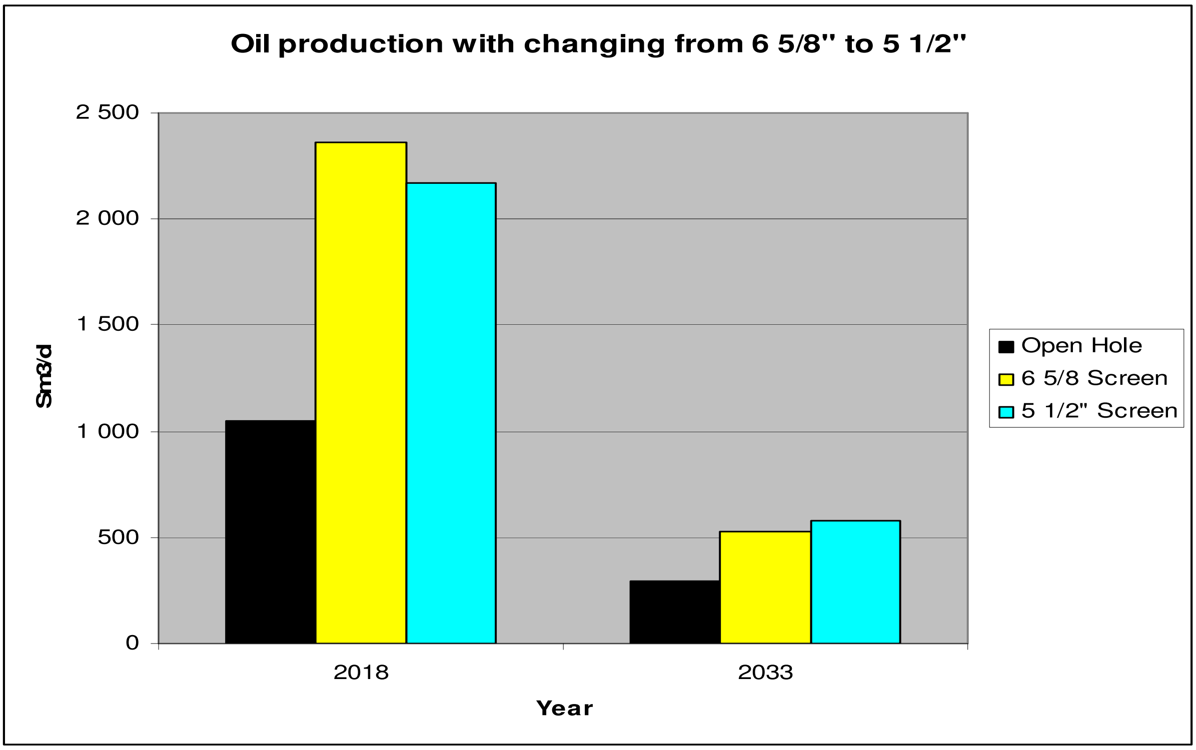

Figure 38 KP7 oil production with changing screen size

Figure 38 is showing oil production with an open hole completion and no ICDs, a 6 5/8” SAS completion with ICDs and a 5 ½” SAS completion with ICDs. The 6 5/8” completion is giving more oil in the early stage of life, whilst a 5 ½” completion is producing more at the end. The reason for this difference is in the ID of the screen size chosen, were a smaller screen will work in the same way as changing to a smaller ID tubing in late life of a well. It is a well known fact that smaller ID tubing can allow for more production from wells in late life. So a 5 ½” screen with ICDs will work in the same way as a smaller tubing, promoting production in the late life. Since the ICDs “force” the flow into the tubing and does not allow for cross flow between the tubing and annulus a different size of ICD screens will have an impact on production. Increase in production in late life of the well is small for the case of changing the screen size.

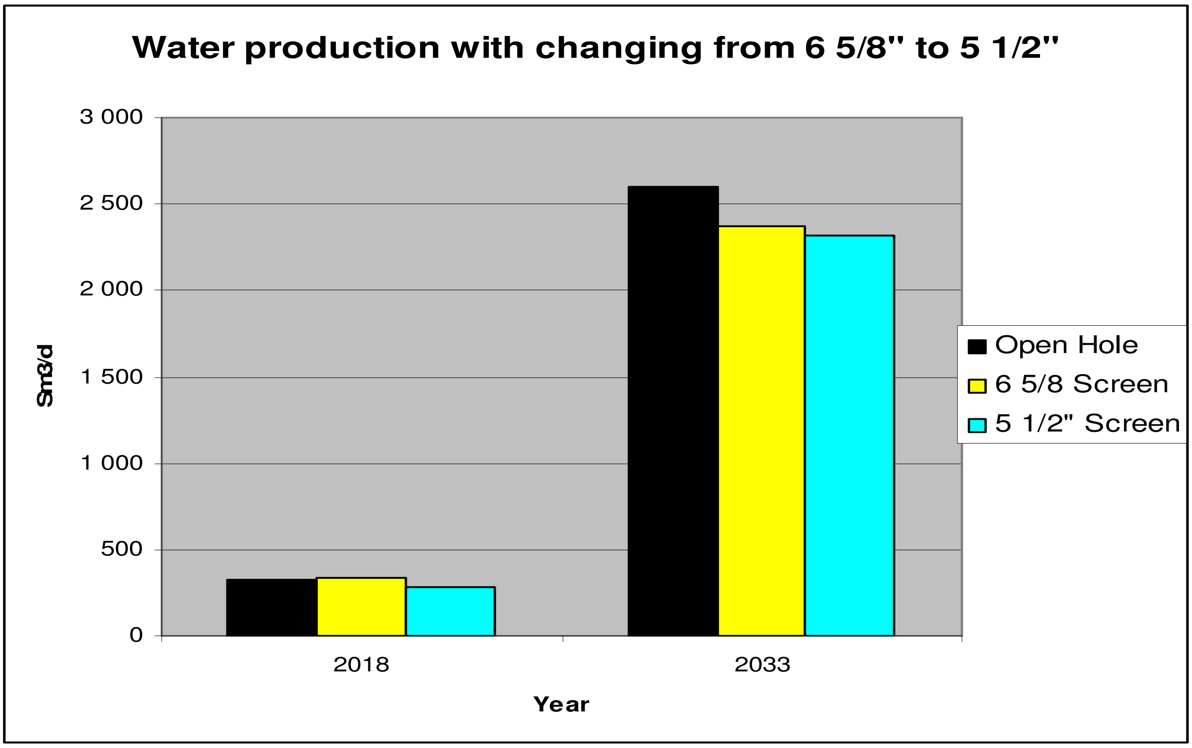

Figure 39 KP7 Water production with changing screen size

The effect from ICDs on water production is clearly seen in figure 39 as the water production is reduced for both cases. A slightly bigger reduction in water production is seen for the 5 ½" case for both time steps.

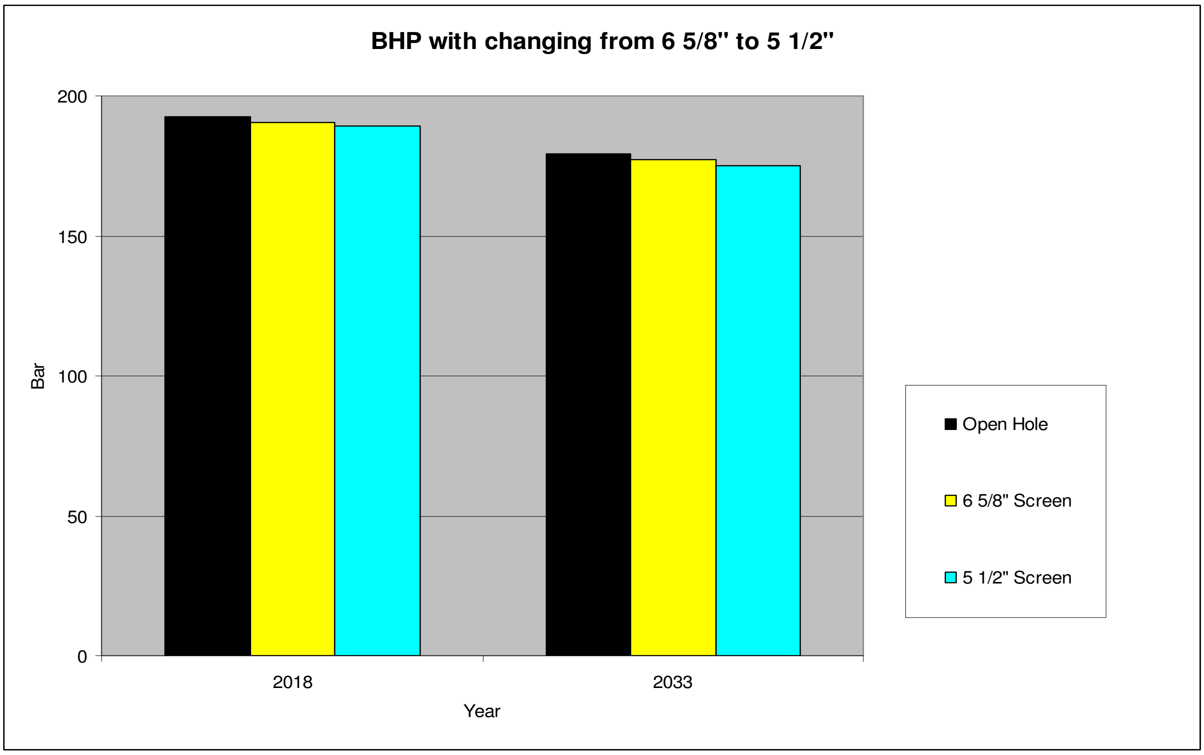

Figure 40 KP7 BHP with changing screen size

The plot above shows flowing BHP for the two cases of screen size compared with an open hole completion with no ICDs. It is clear that a 5 ½" case is choking the well slightly more. The difference in BHP is increasing during life of the well.

3.3 Input data for KP9

Figures below here is showing the most important inputs for KP9 for different time steps. More details on inputs and configuration of the NETool™ model can be found in appendix A.23-A.59

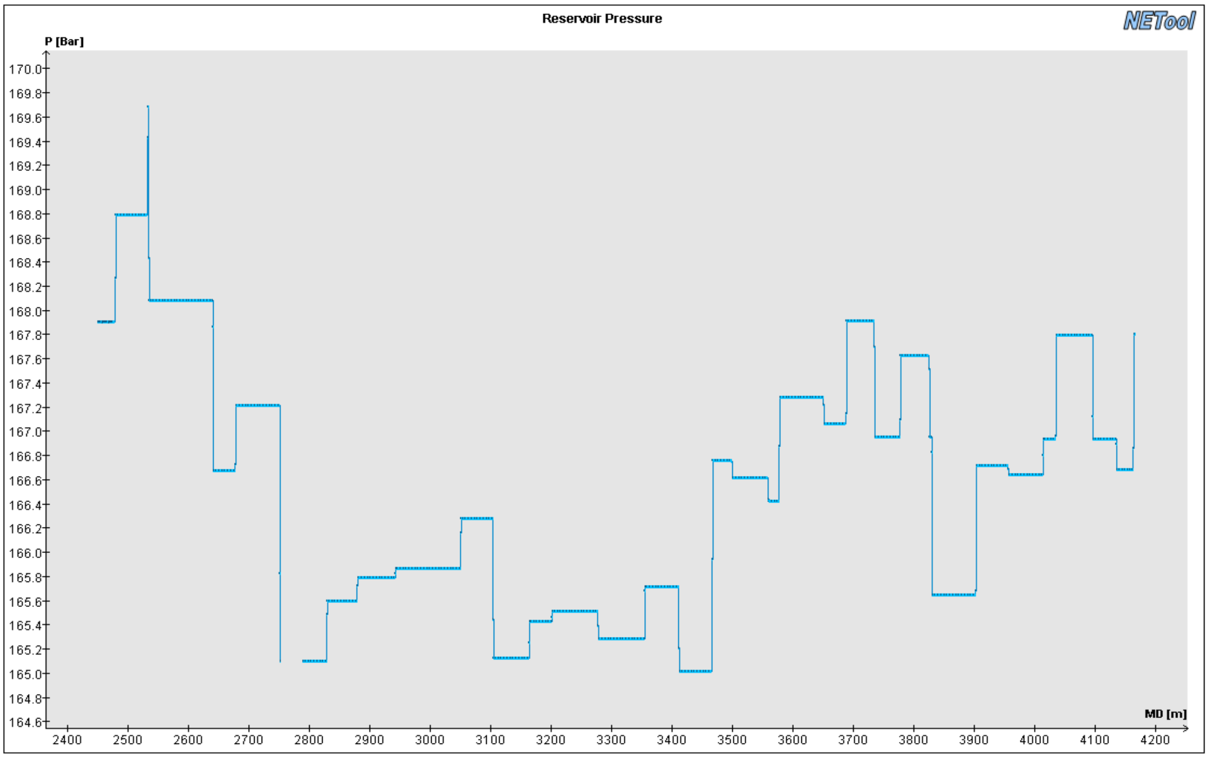

Figure 41 Reservoir pressure along KP9 reservoir section at 730 days, year 2015

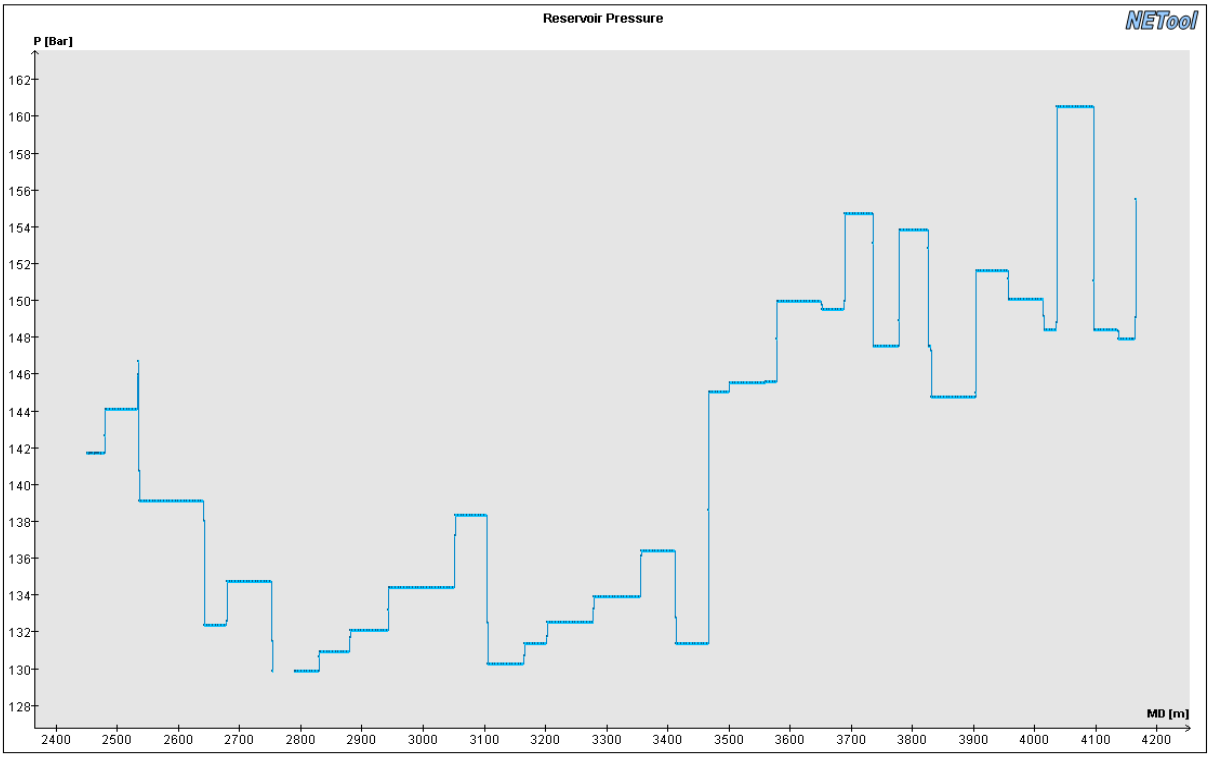

Figure 42 Reservoir pressure along KP9 reservoir section at 1826 days, year 2018

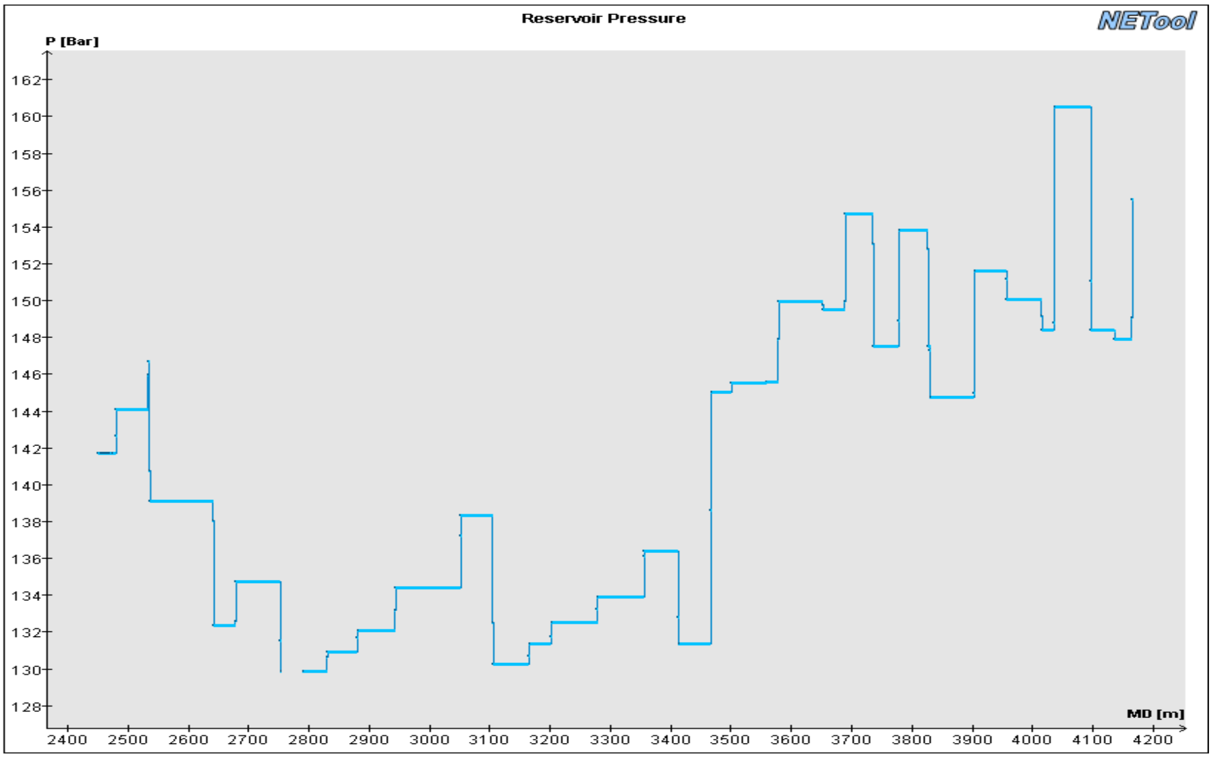

Figure 43 Reservoir pressure along KP9 reservoir section at 2556 days, year 2020

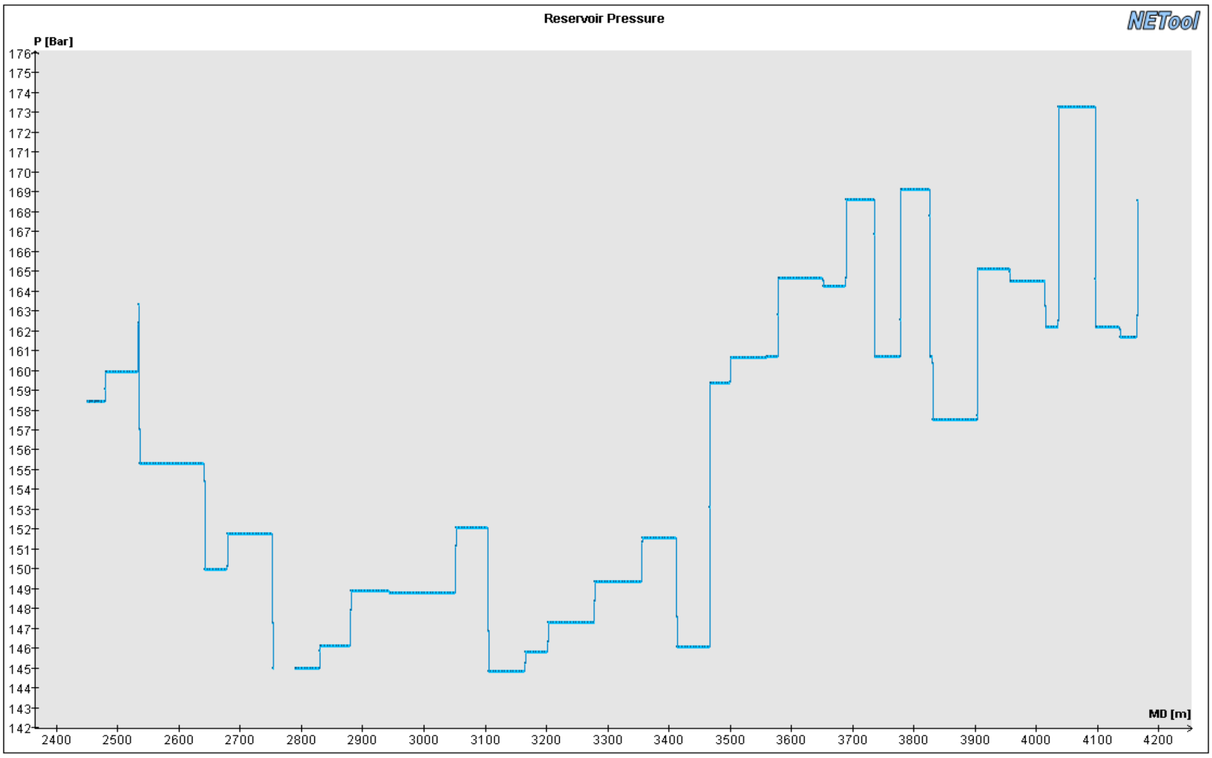

Figure 44 Reservoir pressure along KP9 reservoir section at 4017 days, year 2024

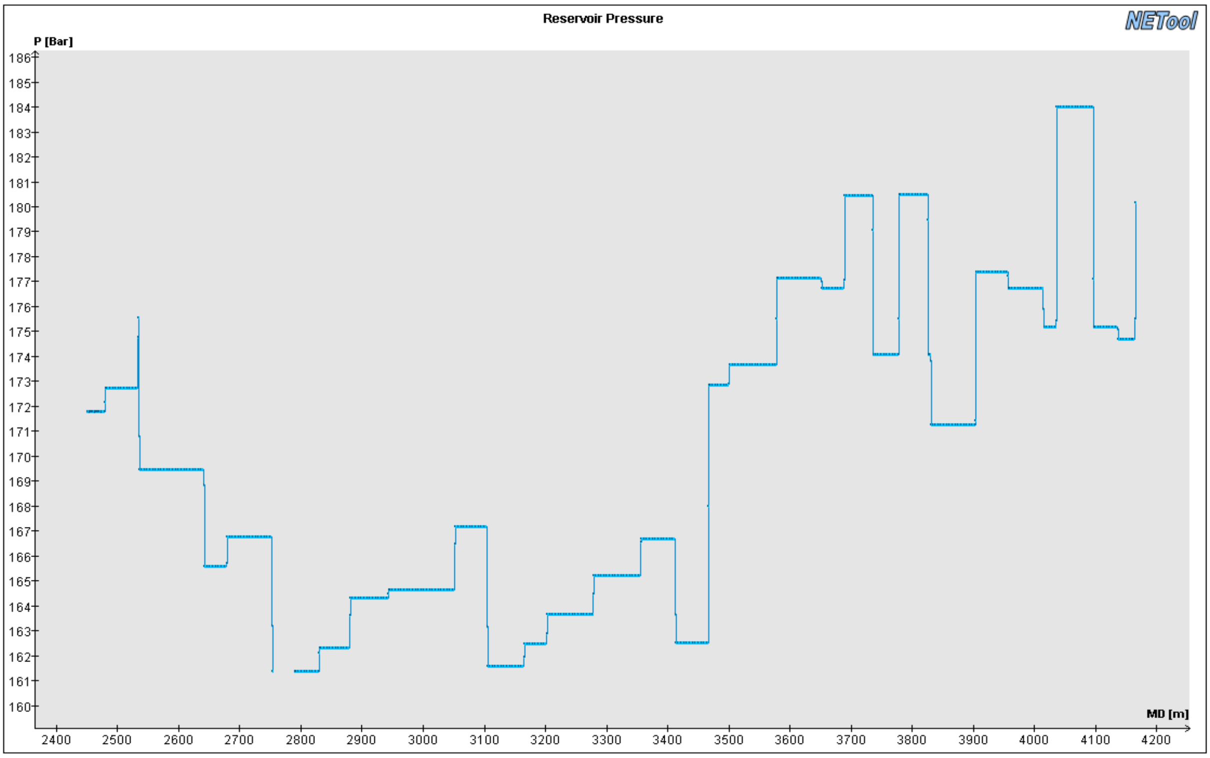

Figure 45 Reservoir pressure along KP9 reservoir section at 5113 days, year 2027

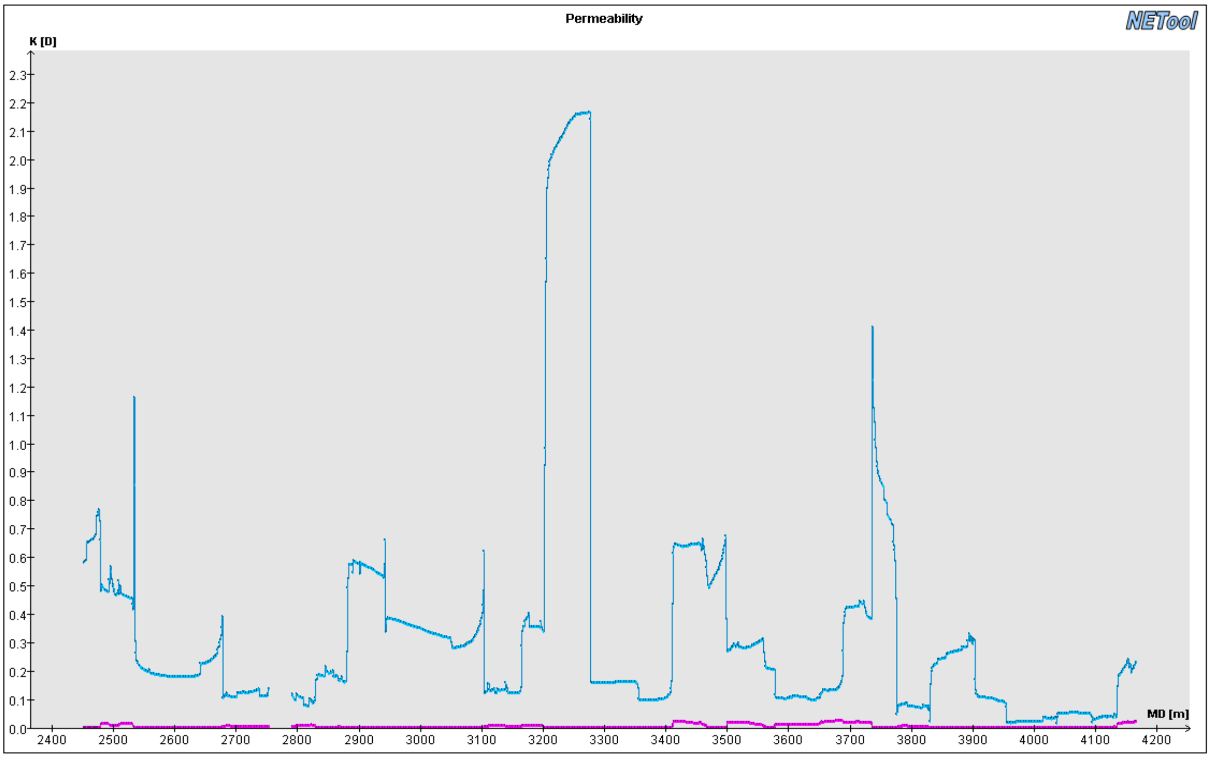

Figure 46 Permeability distribution along KP9 reservoir section, (K_h=blue line, K_v= purple line)

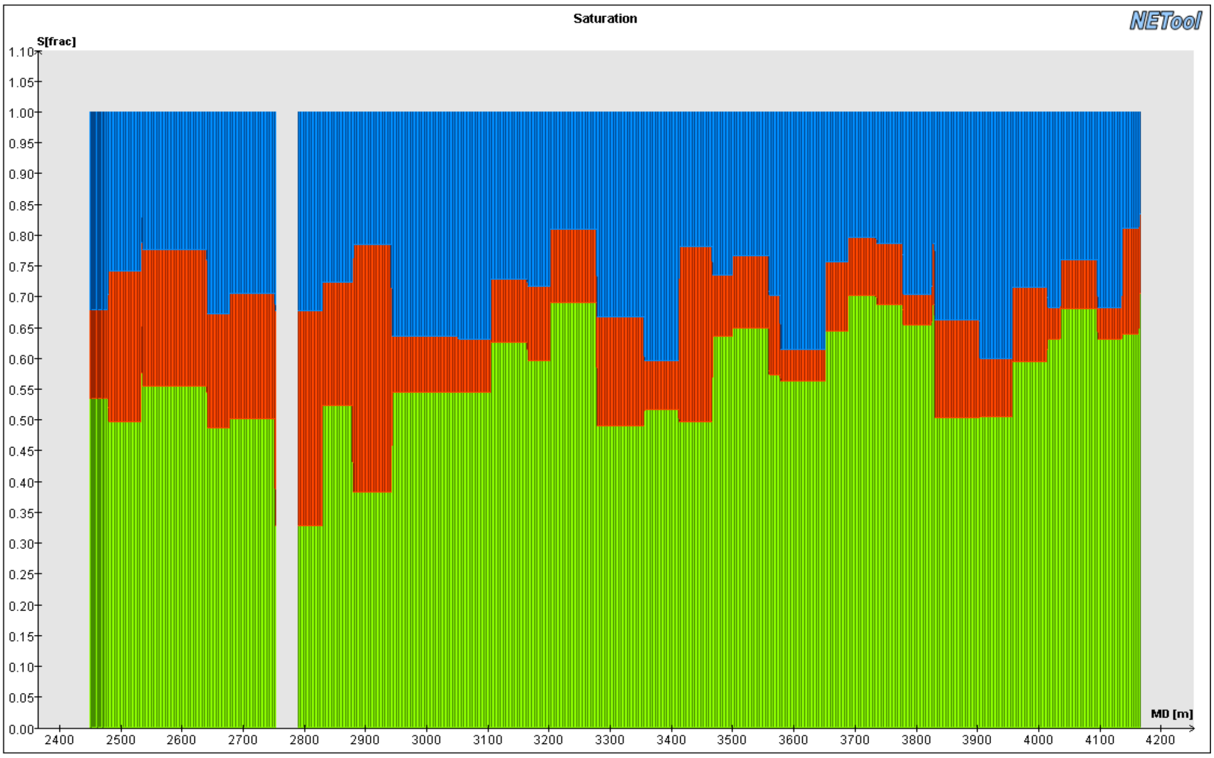

Figure 47 Saturation at 730 days, year 2015 along KP9 reservoir section (Oil= green, Gas= red and Water=blue)

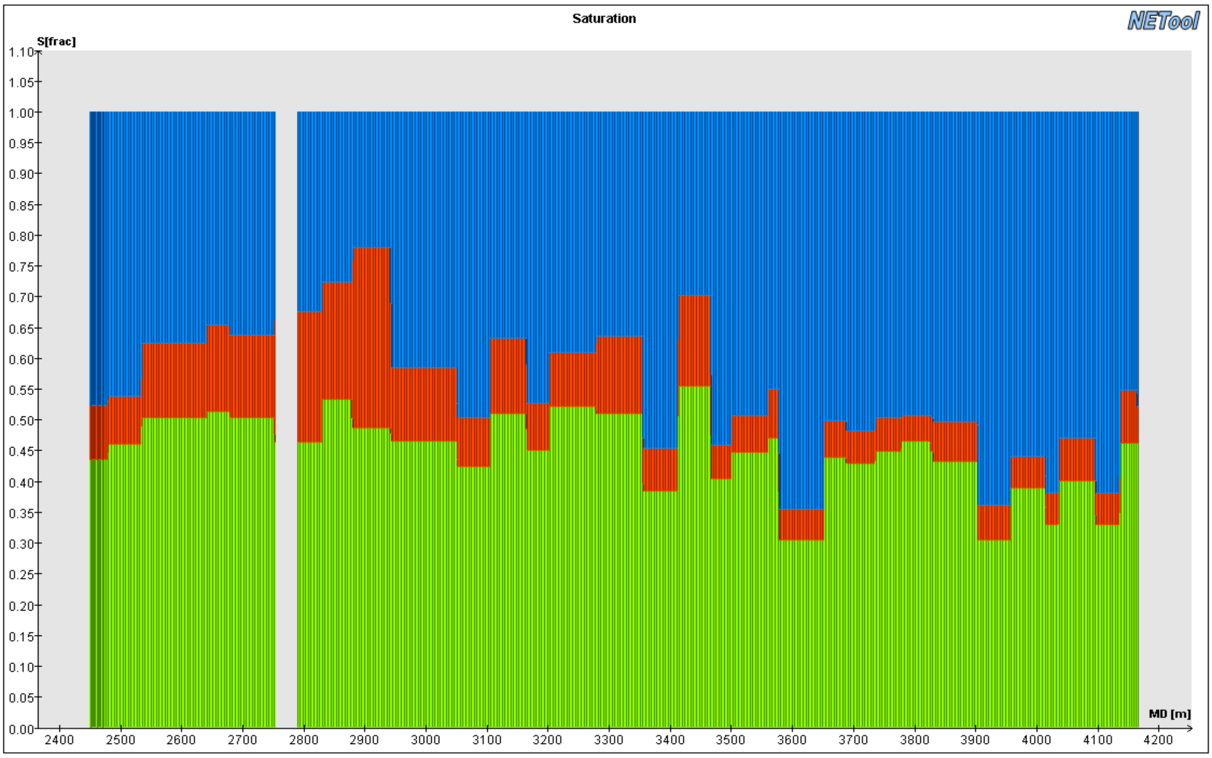

Figure 48 Saturation at 1826 days, year 2018 along KP9 reservoir section (Oil= green, Gas= red and Water=blue)

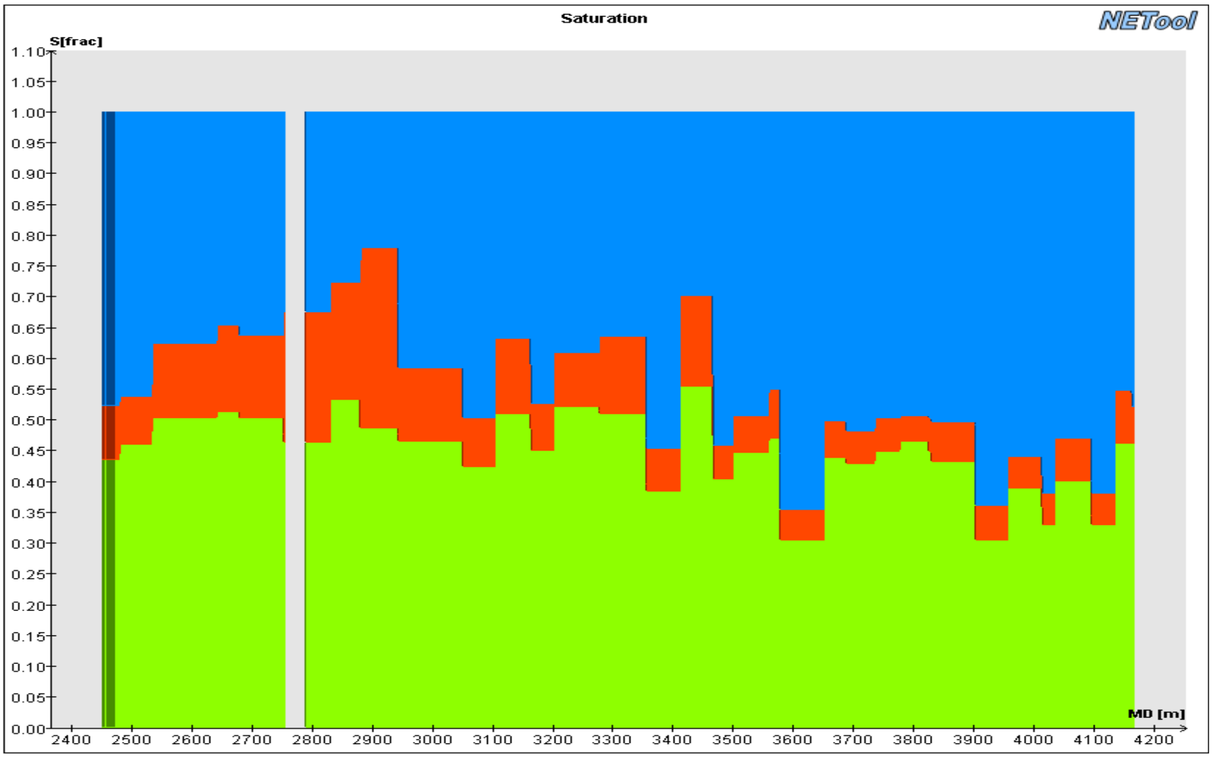

Figure 49 Saturation at 2556 days, year 2020 along KP9 reservoir section (Oil= green, Gas= red and Water=blue)

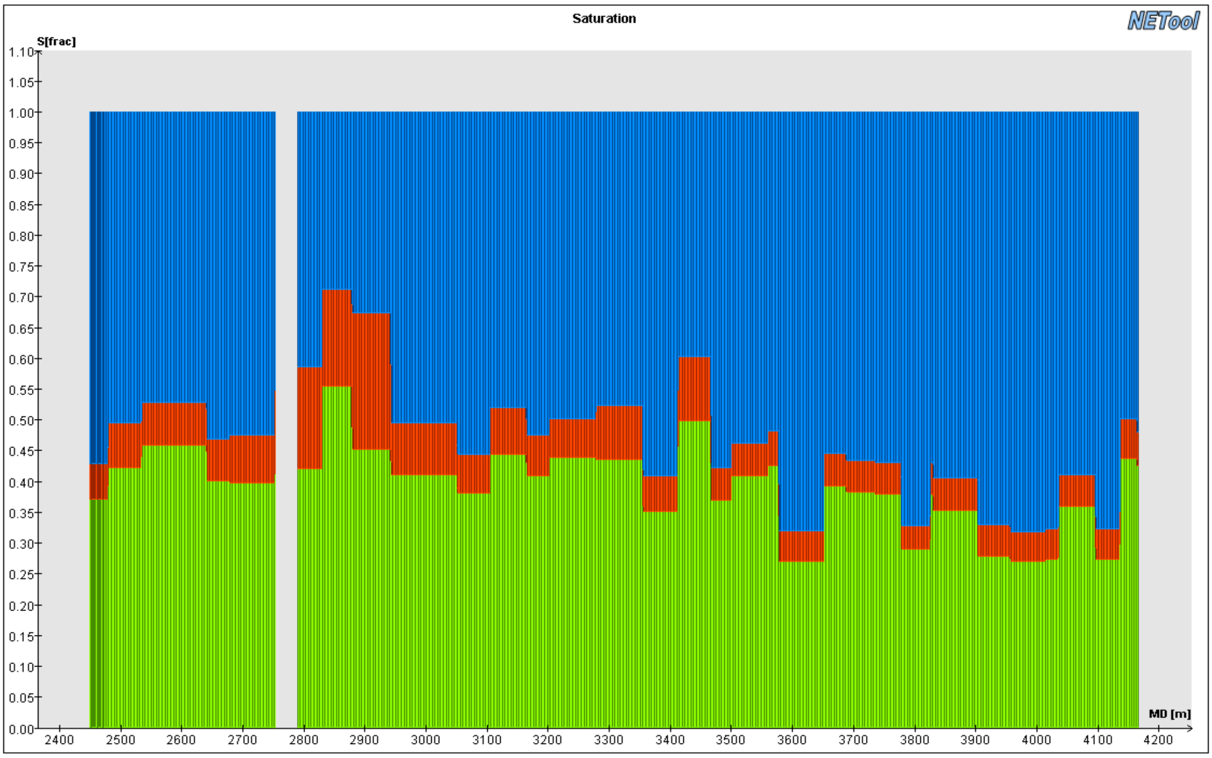

Figure 50 Saturation at 4017 days, year 2024 along KP9 reservoir section (Oil= green, Gas= red and Water=blue)

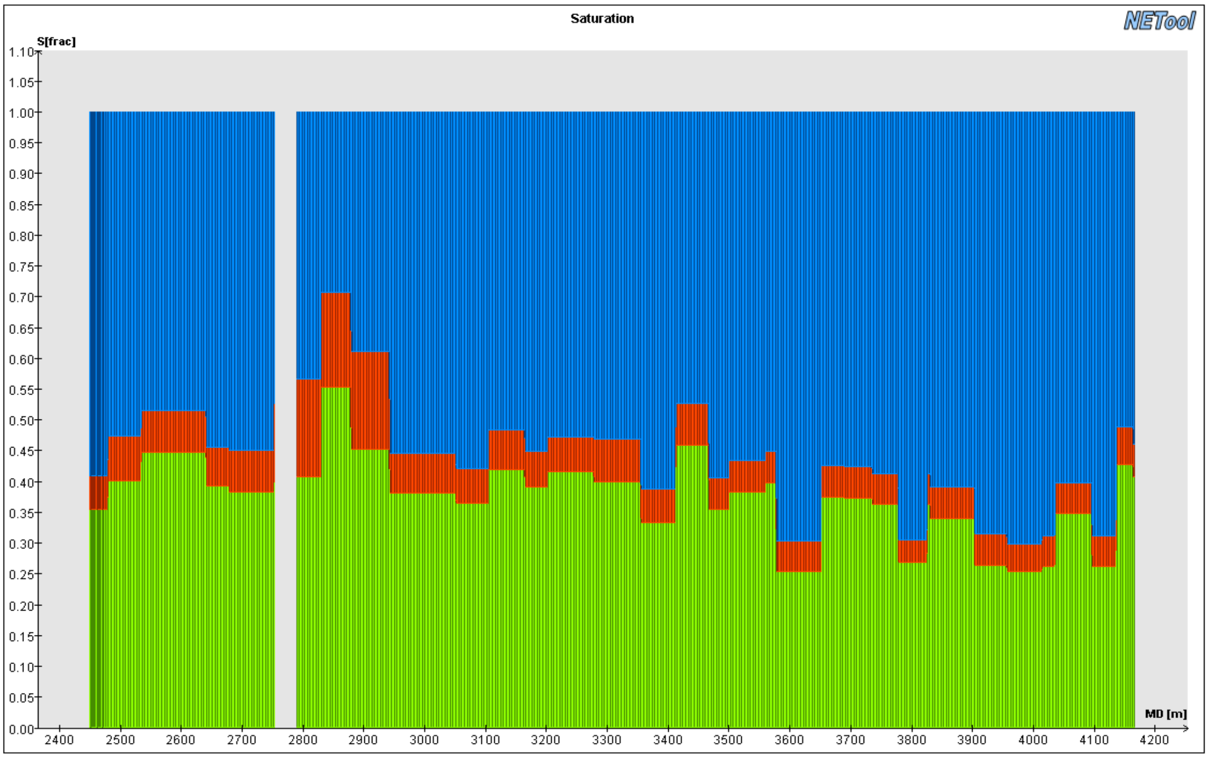

Figure 51 Saturation at 5113 days, year 2027 along KP9 reservoir section (Oil= green, Gas= red and Water=blue)

3.4 Simulations and results for KP9

Case	Days	Name	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT	BHP	Comments	Appendix
1	730	Initial	230	0,17	1	738	0	164	Initial case	A.30
2	1826	Open Hole	949	0,52	10	551	1	123	Reference case	A.31
3	**1826**	**Recommended Tailored ICD**	**948**	**0,69**	**11**	**731**	**1**	**114**	**Simulation run with recommended tailored ICD setting**	**A.32**
4	2556	Open Hole	427	0,11	305	266	42	126	Reference case	A.33
5	2556	2x1.6mm ICD BP Packers	473	0,13	259	270	35	108	First simulation run, with BP and packers installed	A.34
6	2556	2x2,5mm ICD BP Packers	470	0,13	262	273	36	120	Second simulation run, with BP and packers installed	A.35
7	2556	2x4mm ICD BP Packers	474	0,13	258	277	35	124	Third simulation run, with BP and packers installed	A.36
8	2556	4x1.6mm ICD BP packers	470	0,13	262	271	36	119	Fourth simulation run, with BP and packers installed	A.37
9	2556	4x2.5mm ICD BP packers	473	0,13	259	276	35	123	Fifth simulation run, with BP and packers installed	A.38
10	2556	4x4mm ICD BP Packers	475	0,13	257	277	35	124	Sixth simulation run, with BP and packers installed	A.39
11	**2556**	**Recommended Tailored ICD**	**504**	**0,15**	**228**	**307**	**31**	**122**	**Simulation run with recommended tailored ICD setting**	A.40
12	2556	5.5"	504	0,15	228	307	31	121	5.5" case run for showing effect of changing Screen size	A.41
13	2556	ICD practical case	458	0,12	274	270	37	118	Practical case with packer at every 5th joint and same size on all ICDs	A.42
14	2556	WWS case	433	0,12	299	269	41	126	WWS case run for quantifying risk of erosion	A.43
15	2556	OH +25% K_h	465	0,19	267	407	36	129	OH run with +25% K_h	A.44
16	2556	Tailored design +25% K_h	495	0,16	237	324	32	127	Tailored ICD setting run with +25% K_h	A.45
17	2556	OH +50% K_h	439	0,16	293	365	40	130	Open Hole run with +50% K_h	A.46
18	2556	Tailored design +50% K_h	482	0,15	250	302	34	128	Tailored ICD setting run with +50% K_h	A.47
19	2556	OH -25% K_h	527	0,26	205	484	28	126	Open Hole run with -25% K_h	A.48
20	2556	Tailored design -25% K_h	528	0,20	204	376	28	122	Tailored ICD setting run with -25% K_h	A.49
21	2556	Well run with -250m wellbore	537	0,17	195	314	27	120	Tailored ICD completion run with a wellbore 250m shorter	A.50
22	2556	Well run with +250m wellbore	204	0,04	528	181	72	133	Tailored ICD completion run with 250m longer wellbore. ICD and packers every 5th joint.	A.51
23	4017	Open Hole	229	0,06	534	283	70	138	Reference case	A.52
24	**4017**	**Recommended Tailored ICD**	**313**	**0,10**	**450**	**308**	**59**	**133**	**Simulation run with final ICD setting**	**A.53**
25	4017	5.5"	313	0,10	450	308	59	133	5.5" case run for showing effect of changing ICD size	A.54
26	4017	ICD practical	266	0,08	497	289	65	130	Practical case run for showing effect at higher water cut	A.55
27	4017	Well run with -250m wellbore	343	0,11	420	315	55	131	Tailored ICD completion run with a wellbore 250m shorter	A.56
28	4017	Well run with +250m wellbore	97	0,02	666	190	87	147	Tailored ICD completion run with 250m longer wellbore. ICD and packers every 5th joint.	A.57
29	5113	Open Hole	113	0,03	523	296	82	157	Reference case	A.58
30	**5113**	**Recommended Tailored ICD**	**169**	**0,05**	**467**	**322**	**73**	**153**	**Simulation run with final ICD setting**	**A.59**

Table 4 Summary table of all simulations for well KP9

The above table summarises the different cases simulated for KP9 and the results obtained. Numbers in red highlight that the well is constrained by that particular output. When both water and oil rate is coloured red, a total liquid rate constraint has been used.

Open hole cases without ICDs are used as reference cases and the results are compared with these. A number of sensitivities have been run to identify the optimum completion set up. For the KP9 well the most optimal design turned out to be a tailored ICD design. The tailored design contains packers, blank pipe, and variable ICD sizes.

Recommended completion set up was based on balancing oil production, water rate and BHP. The final design has a large amount of blank pipe in the design because parts of the well do not produce oil and to choke down water producing zones. The recommended setting is printed in bold face type and coloured light brown.

3.4.1 Sensitivity on ICD nozzle size, KP9

See appendix A.31-40, A.53 and A.55 for more details on set up and results,

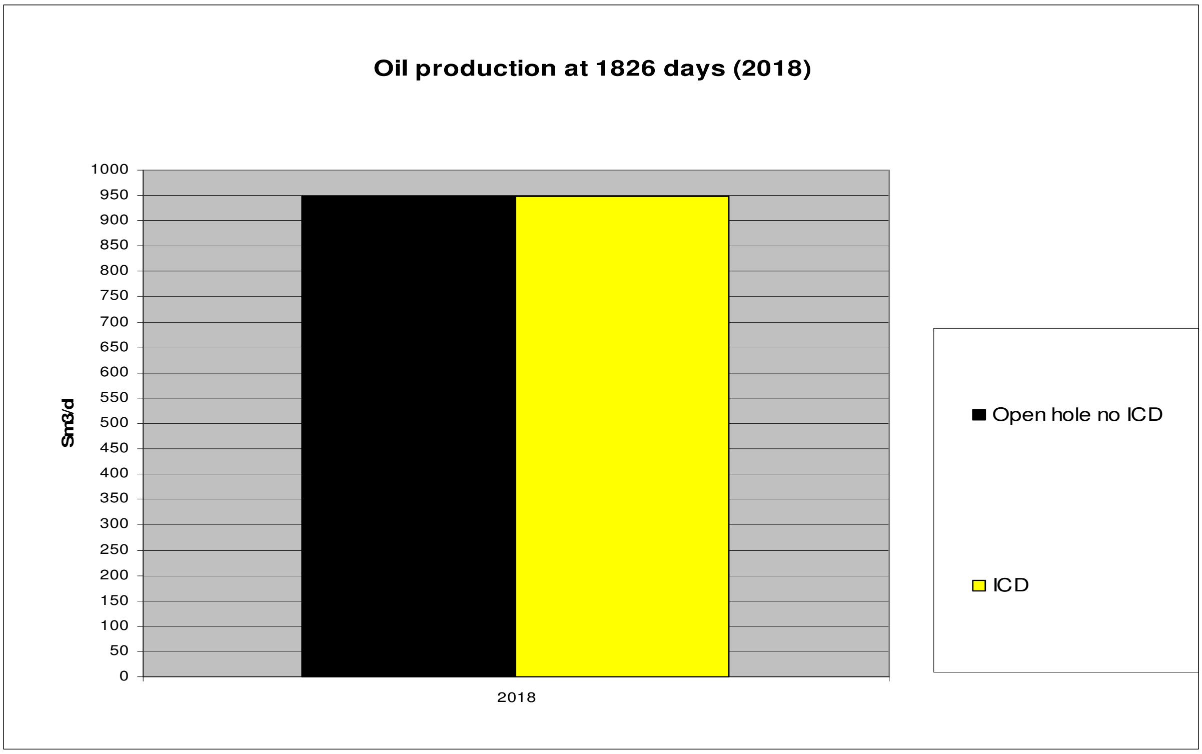

Figure 52 KP9 Oil production at 1826 days (2018)

The figure above illustrates the oil production at 1826 days. It can be seen that there is an insignificant difference between the open hole case and the optimized ICD design.

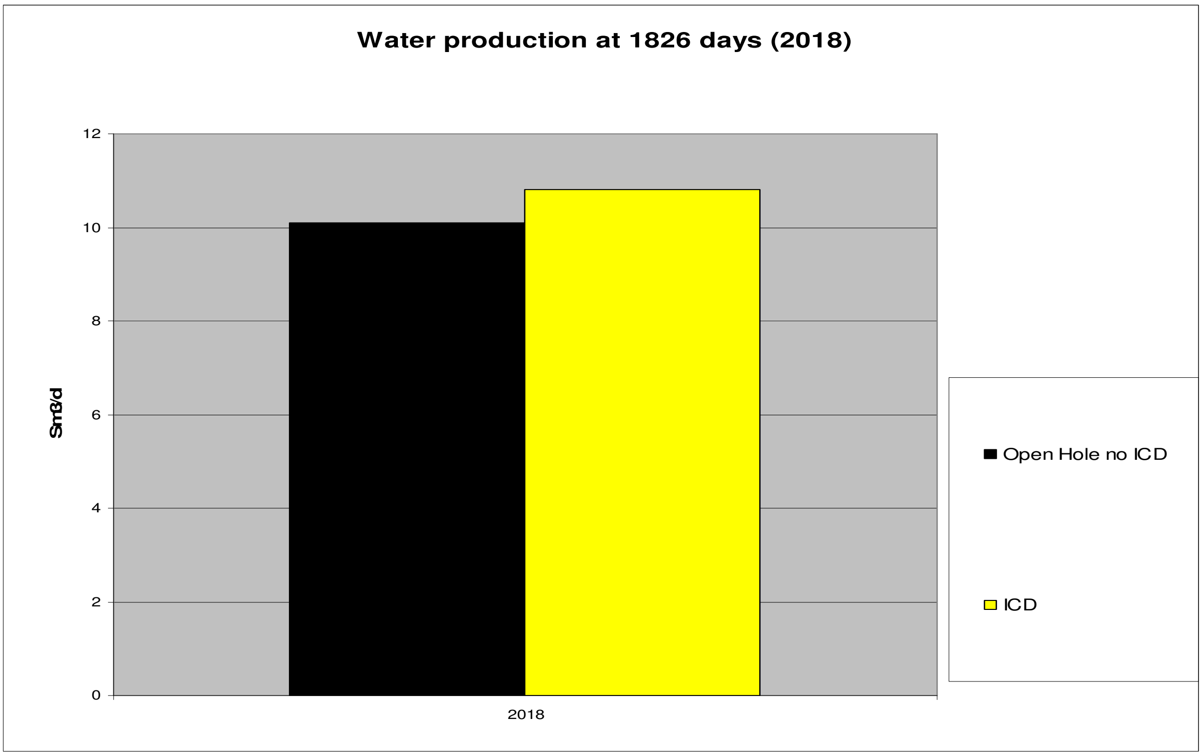

Figure 53 KP9 Water production at 1826 days (2018)

Figure 55 is showing the water production at 1826 days. At this time step the water production is low and the difference between the two cases is insignificant.

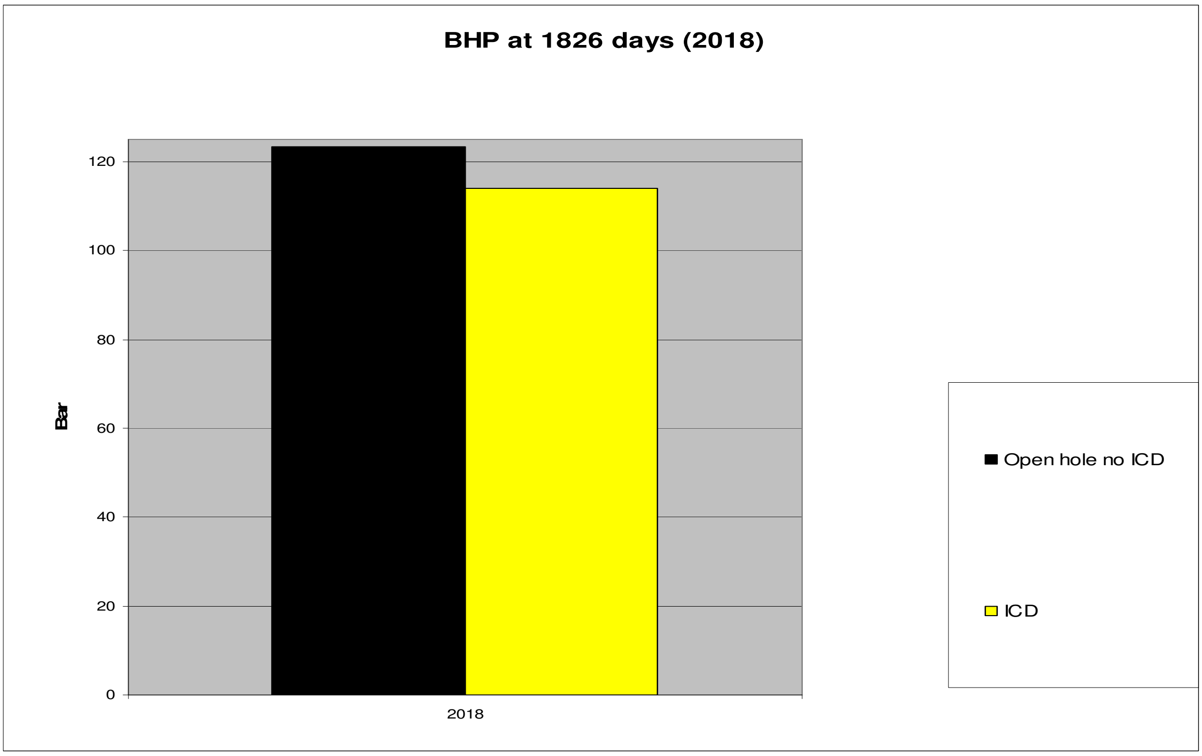

Figure 54 KP9 BHP at 1826 days (2018)

The graph above is illustrating the flowing BHP for the open hole case and the case with the optimized completion. The difference is approx 10 bars and that is due to the choking of the ICDs. Since the optimized ICD choke hard in the early well life, this difference is seen here.

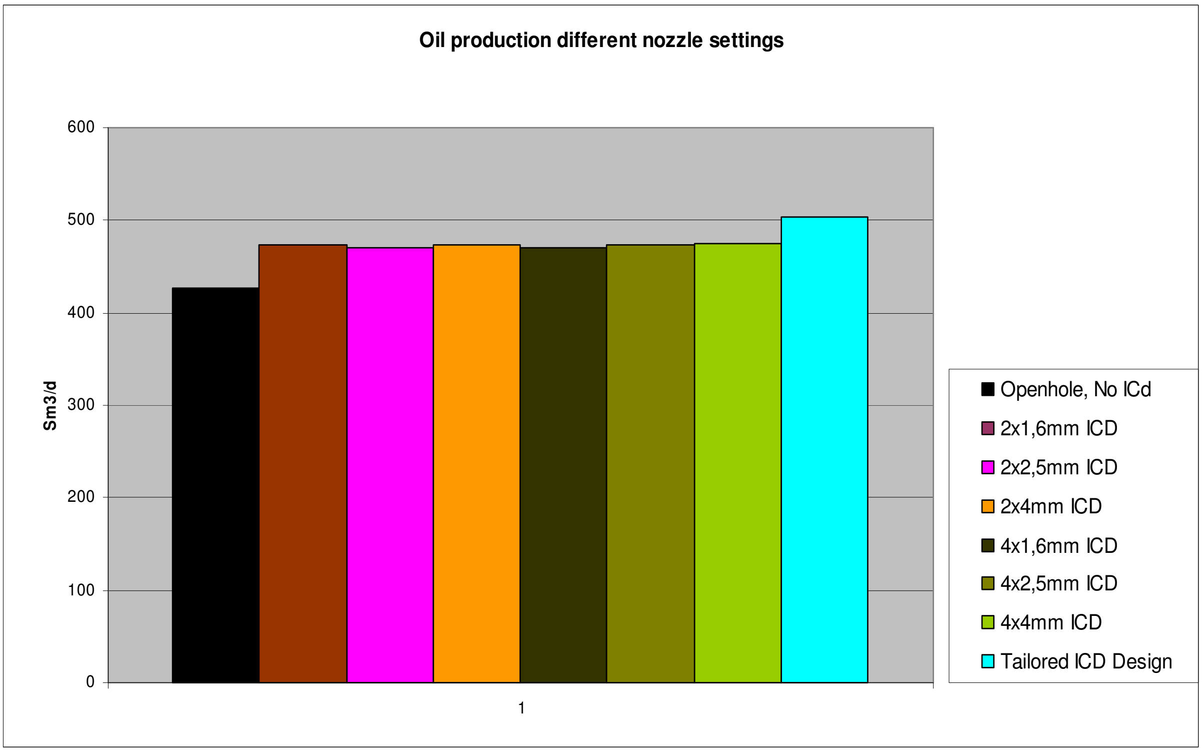

Figure 55 KP9 Oil production for different nozzle settings at 2556 days (2020)

This plot above highlights the oil production at 2556 days with different ICD sizes. It is apparent that the ICDs enhance the oil production significantly compared to the open hole case. When a tailoring the ICD completion to the well an even larger increase in oil production is seen.

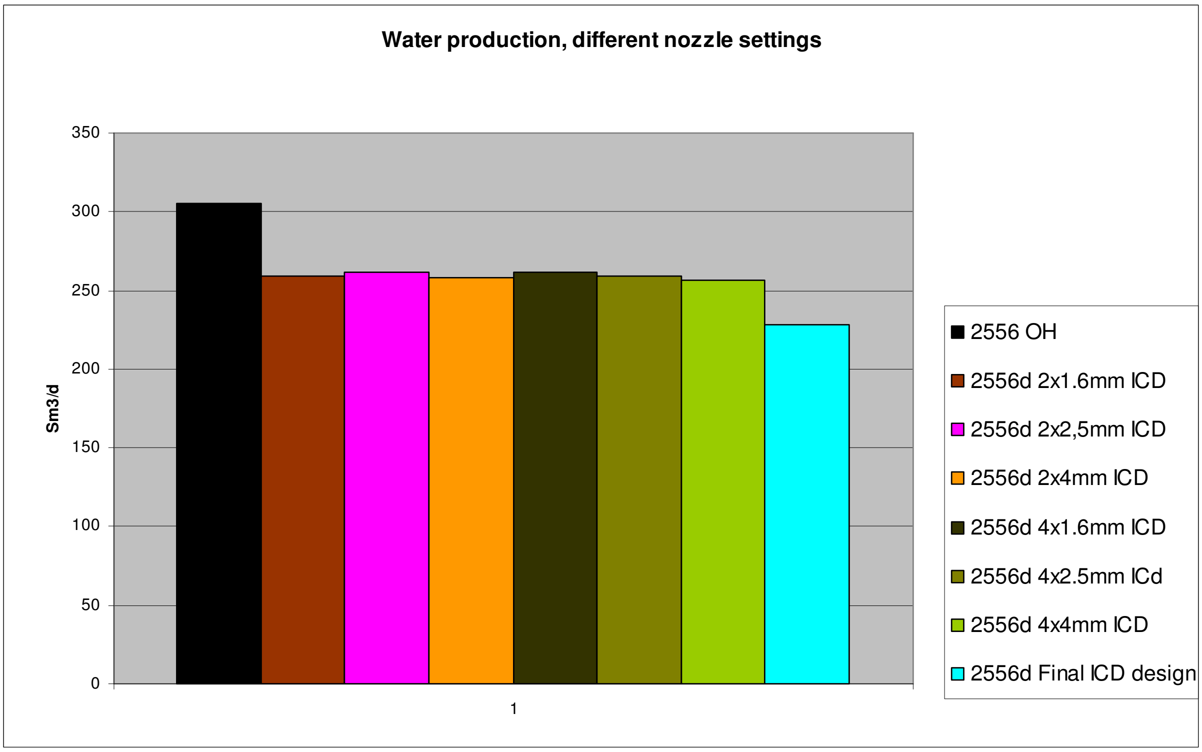

Figure 56 KP9 Water production with different nozzle settings at 2556 days (2020)

From this plot it can be seen that the water production is nearly the same for all the different uniform settings. For the tailored case a larger decrease in water production is expected.

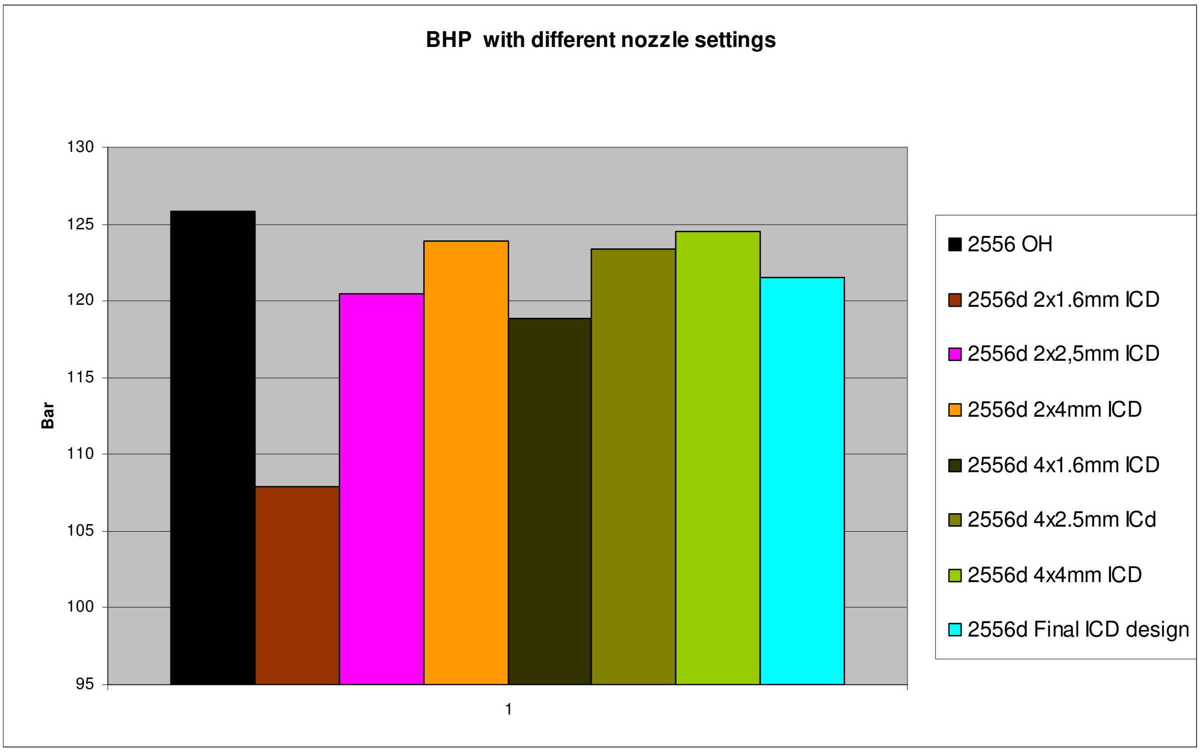

Figure 57 KP9 BHP for the different nozzle settings at 2556 days (2020)

The graph above shows that the smallest ICD setting is choking the well a lot, whilst the other settings vary a bit more. The tailored setting is a "middle way" between a little choking and heavily choking of the well.

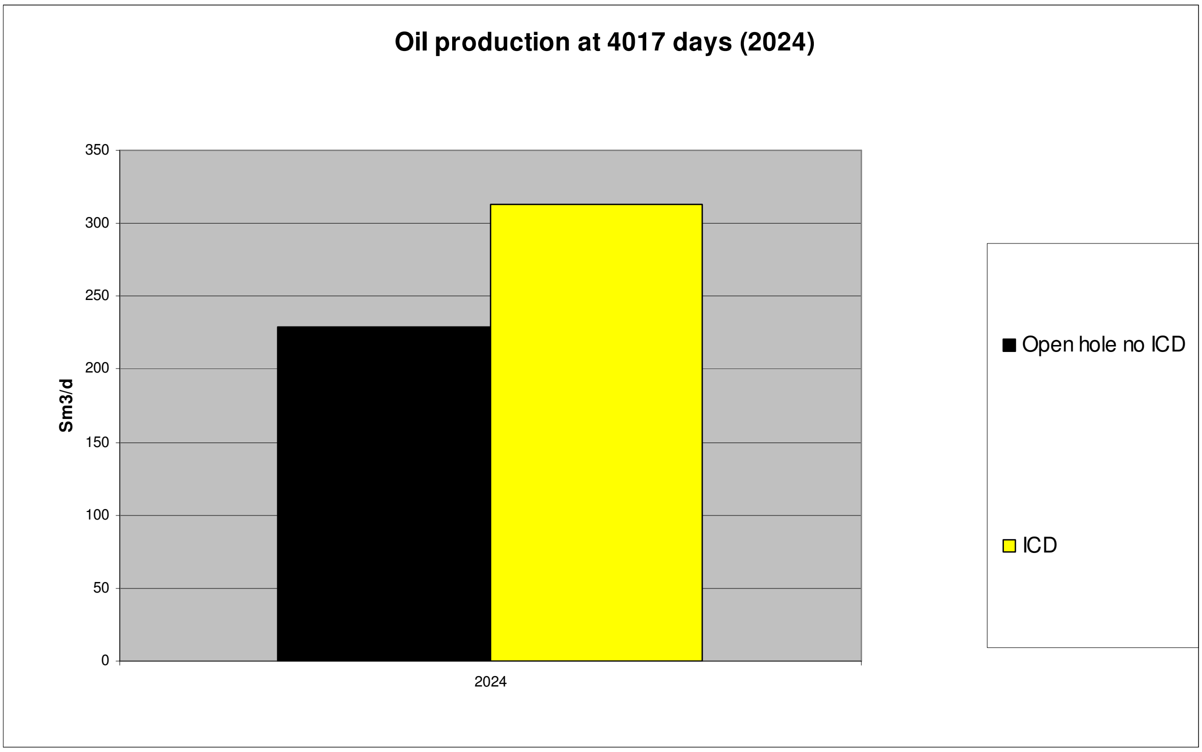

Figure 58 KP9 oil production at 4017 days (2024)

This graph illustrates the oil production at the time step 4017 days (2024). Here the benefit from ICDs is really apparent as the increase in oil production is significant.

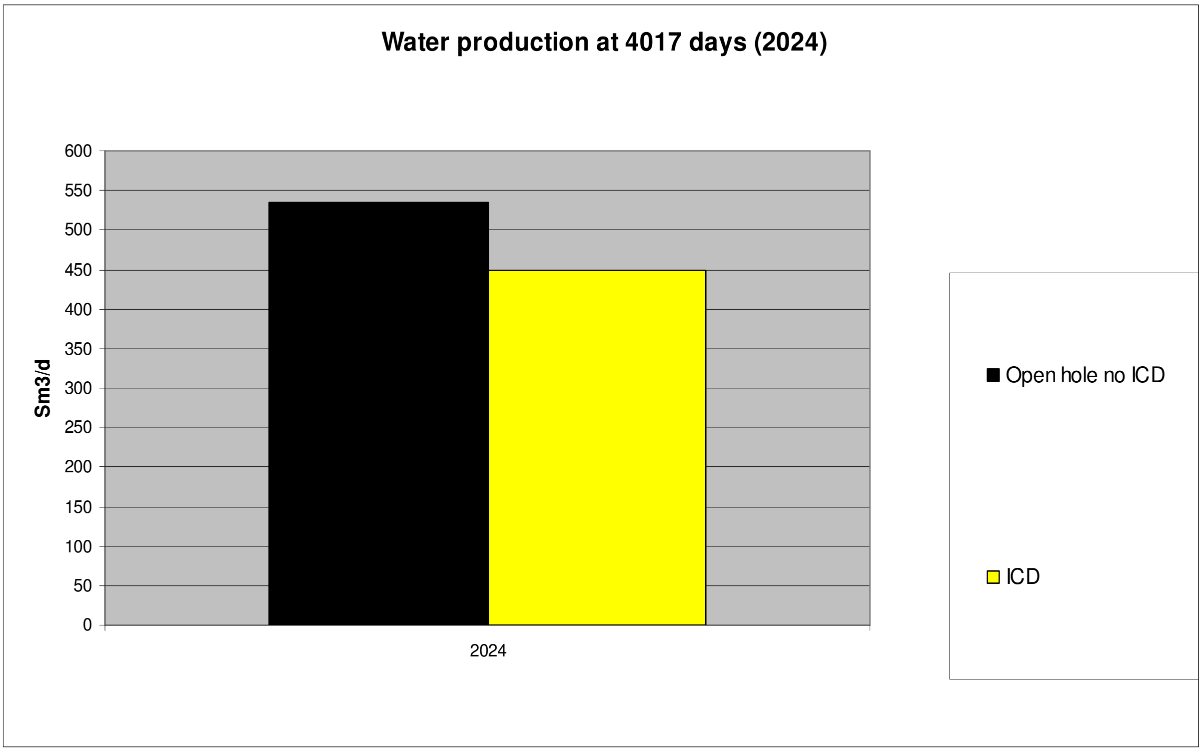

Figure 59 KP9 Water production at 4017 days (2024)

Figure 59 highlights the water production at 4017 days (2024). Water production is reduced significantly compared to the open hole case without ICDs.

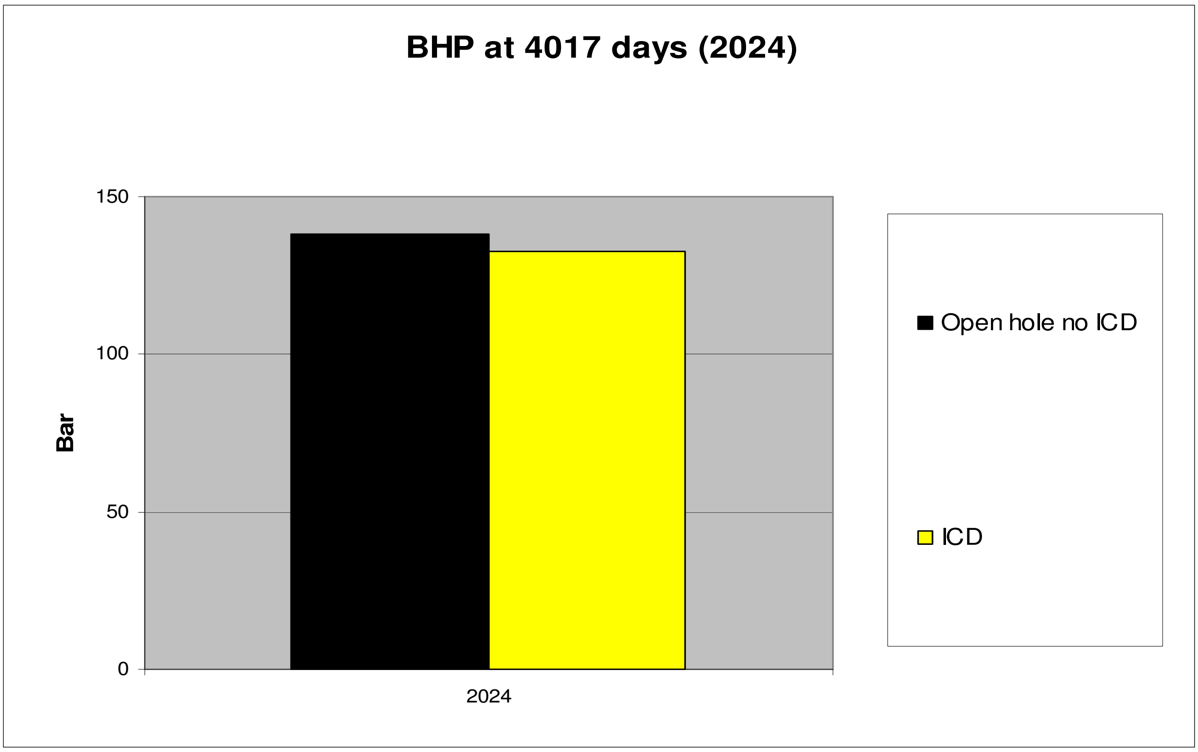

Figure 60 KP9 BHP at 4017 days (2024)

Figure 60 shows that an ICD completion will reduce the flowing BHP somewhat compared to open hole (no ICD). The effect is less than in early life, due to a reduced liquid rate.

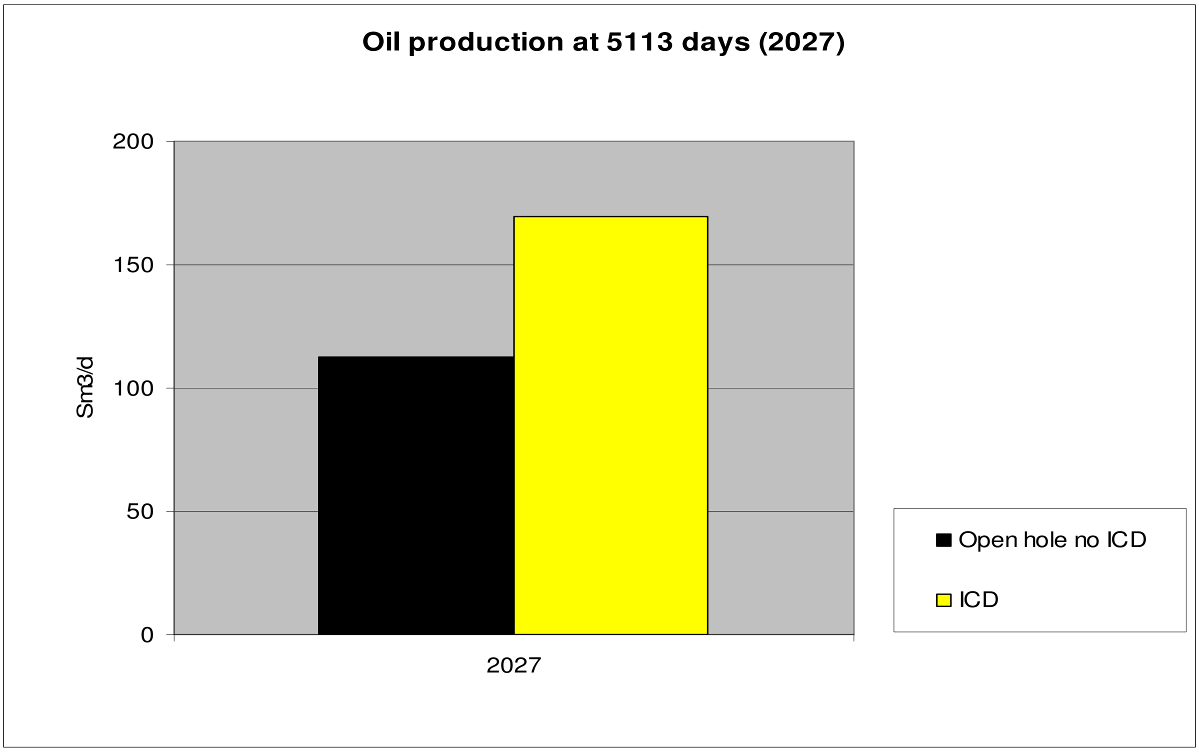

Figure 61 KP9 oil production at 5113 days (2027)

The graph above is illustrating the oil production in late life, 5113 days (2027). A smaller increase in oil production compared to the previous time step is experienced although, the increase is still significant.

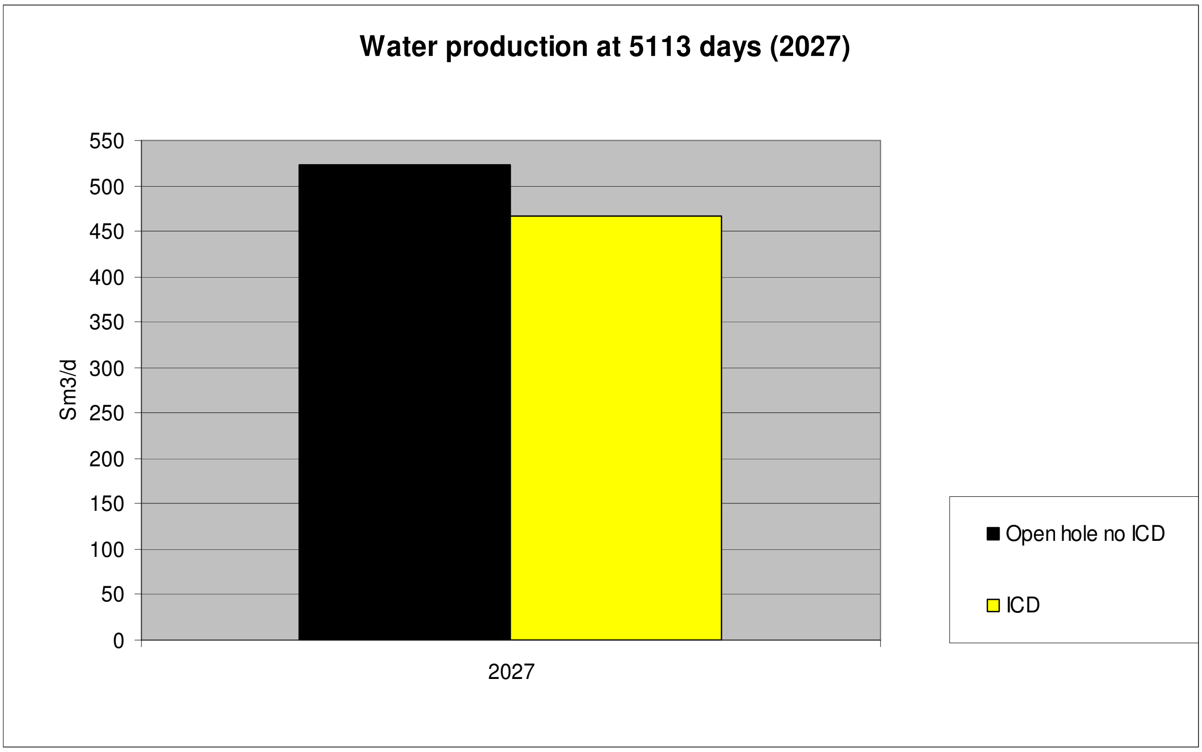

Figure 62 KP9 Water production at 5113 days (2027)

The figure above is highlighting water production at 5113 days (2027). This graph from late life illustrates the reduction in water production from installing ICDs. The reduction in water production allows for more oil to be produced and possible longer life time of the well.

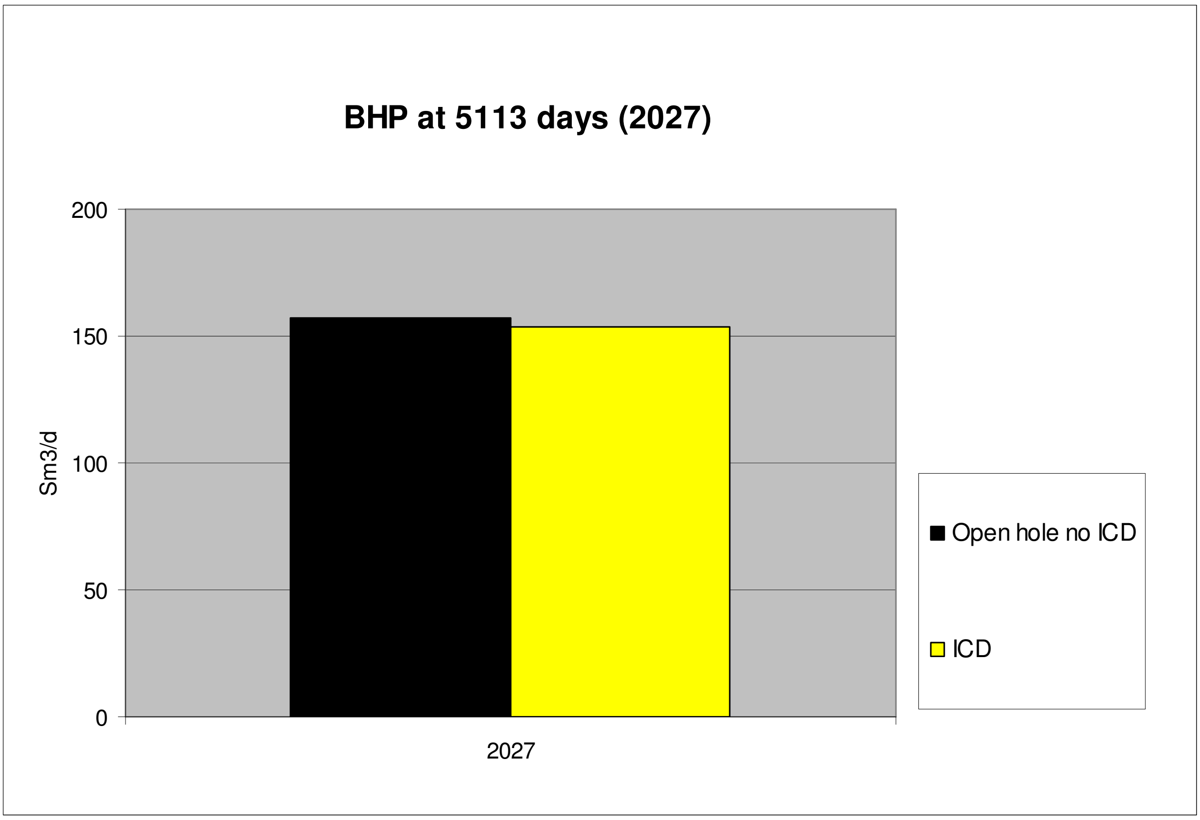

Figure 63 KP9 BHP at 5113 days (2027)

The plot above shows the flowing BHP of the well. A slight reduction in flowing BHP due to the choking of the ICDs is expected.

More discussion on the results can be found in chapter 4.2.1

3.4.2 Permeability sensitivities KP9

In order to investigate the robustness of the selected completion, a simulation was run with altered permeability along the wellbore. An open hole case as reference and a tailored ICD completion to show the effect on the selected completion, was simulated.

New permeability profiles were derived by using a multiplier to achieve a new set of permeabilities. A 25% and 50% increase and a 25% decrease in K_h was used, keeping the K_V/K_h equal to 0,1. By using the same multiplier throughout the length of the well, geology in the model is not changed; only the permeability of the geology. This is important since changing only parts of the well would mean a change in the geology. The change in permeability was done for the 2556 days time step (year 2020).

See appendix A.44-A.49 for more details on input, permeability profiles and results from simulations. See chapter 4.2.4 for more discussion on results.

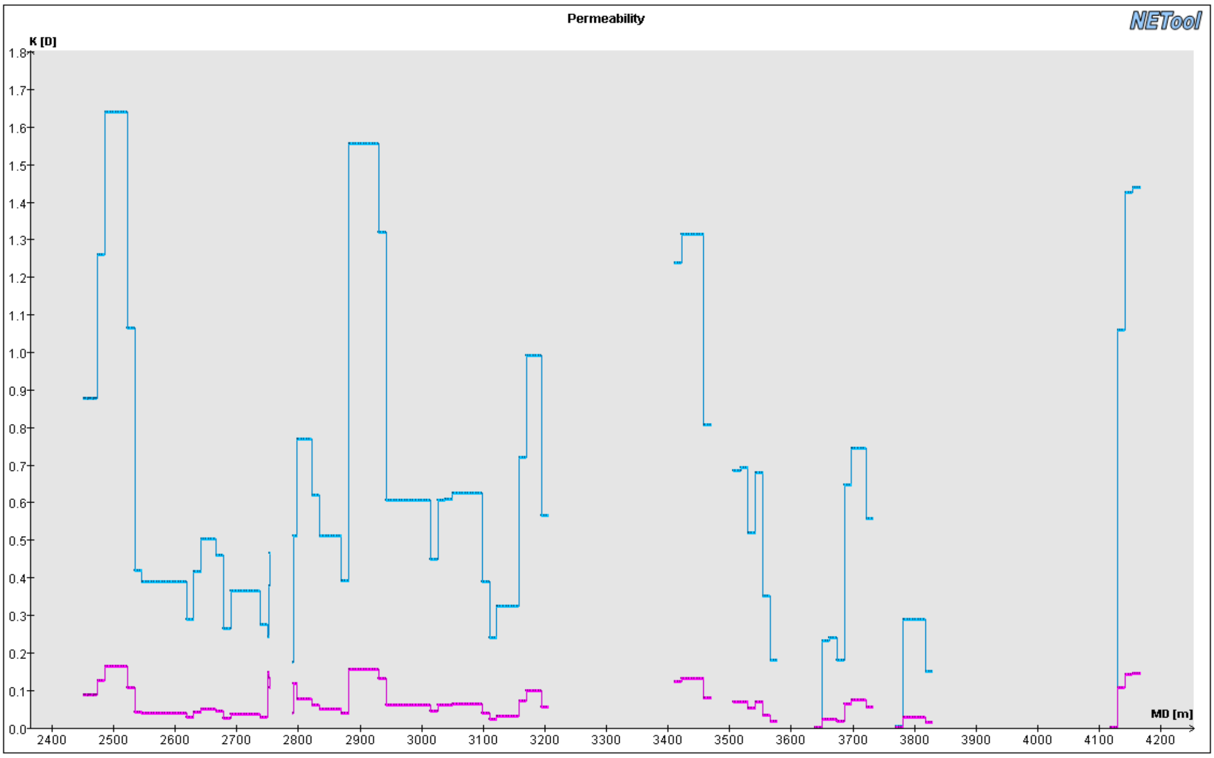

Figure 64 Permeability plot for a 25% increase in K_h, at 2556 days (2020) for KP9 (K_h=blue line, K_v= purple line)

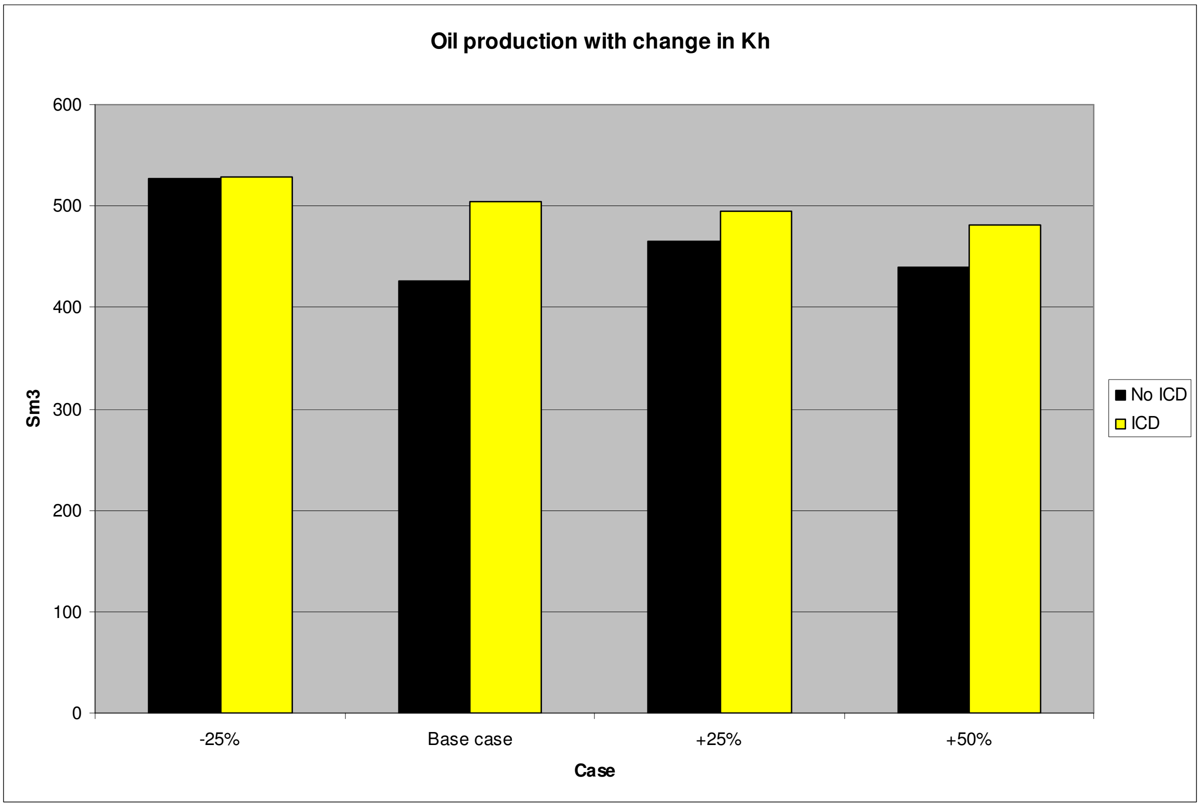

Figure 65 KP9 oil production with changed permeability, 2556 days (2020)

Figure 65 illustrates oil production variations with changes in permeability. If the permeability increases with 25 or 50 % the recommended ICD design still works ok. However if the permeability is reduced by 25%, the recommended ICD design gives no increased production.

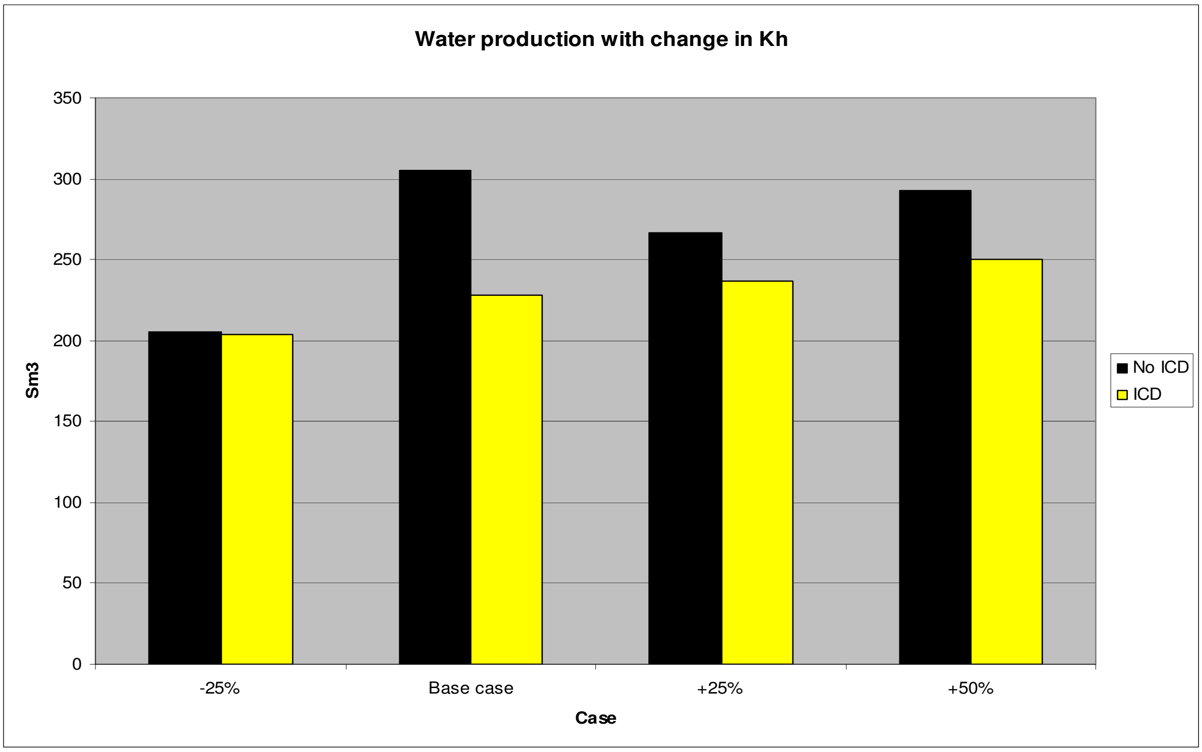

Figure 66 KP9 Water production with changed permeability, 2556 days (2020)

Figure 66 illustrates the same trend case as for the oil production. The ICD design works with an increase of 25 and 50% in permeability, but it does not work for the lower permeability case.

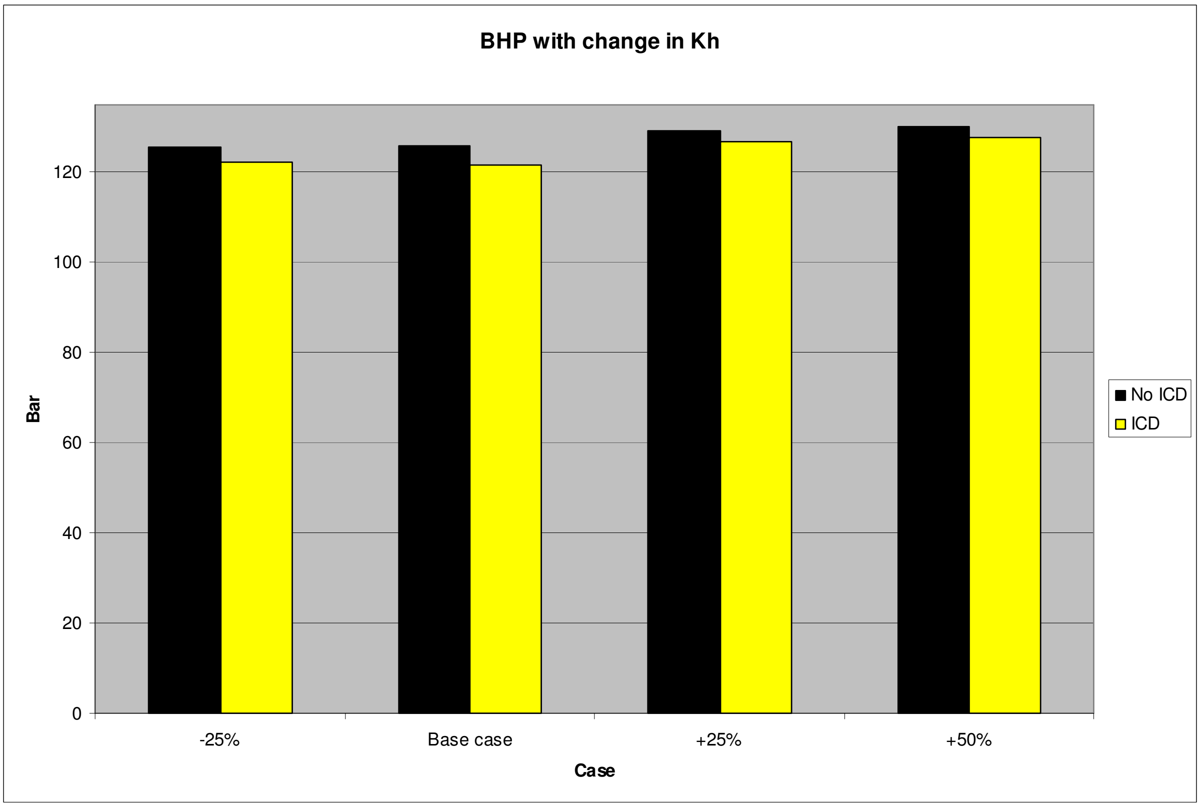

Figure 67 KP9 BHP with changed permeability, 2556 days (2020)

From the figure above it is apparent that the well is choked by the ICDs, and that the largest reduction in flowing BHP is if the permeability is reduced.

3.4.3 Sensitivity on well length KP9

Another sensitivity studied was a +/-250m length change. For having a shorter well the reservoir connection was removed for the last 250m of the well. A longer well was laid in reservoir layers with the highest oil saturation. A target when placing the additional wellbore in KP9 was to have the same direction as the original wellbore and not deviate too much. The length change case was run for 2556 and 4017 days, for studying the effect in early and late life of the well.

The main observation is that the longer part of the well crosses into a higher pressure zone. This higher pressure zone is causing cross flow down hole and a big loss in production is seen as a result of this. Also a shorter well may give more oil.

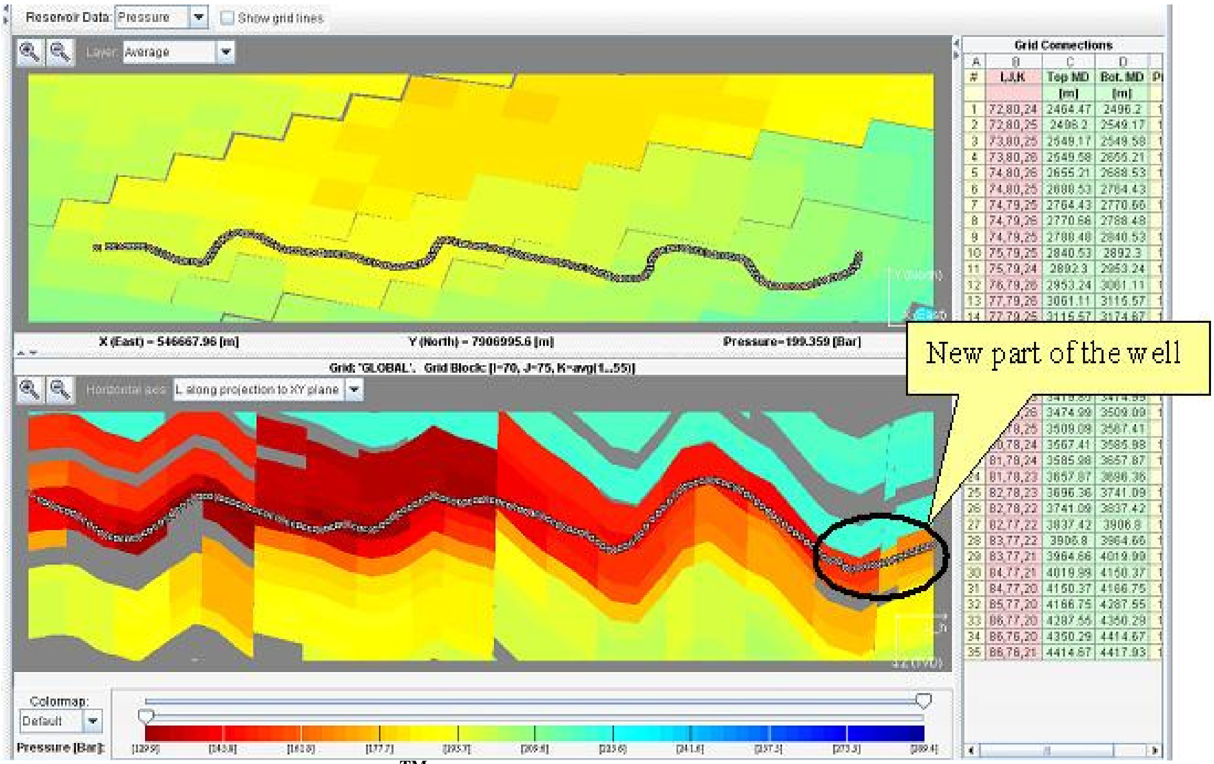

Figure 68 Screenshot from NETool^{TM} 250m longer well for KP9

Above is a screenshot from NETool^{TM} showing the new part of the well. It is pressure that is displayed in the screenshot, with red being low pressure (129 bar roughly) and blue being high pressure (290 bar roughly). From the screenshot it is apparent that the new part of the well has a much higher pressure than rest of the well and this is causing the crossflow. Fluid will flow from the higher pressure zone and into a lower pressure zone higher up the well.

See appendix A.50-51 and A.56-57 for more details on input and results from simulations.

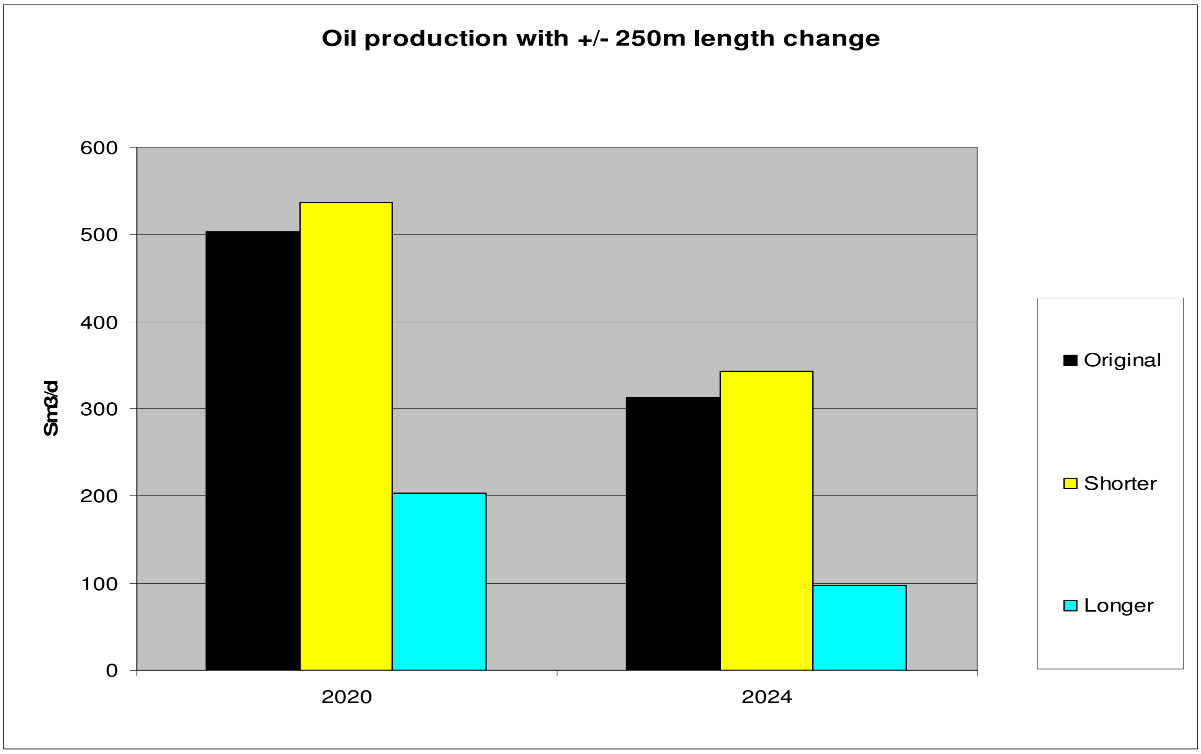

Figure 69 Oil production with +/-250m length change in KP9

Figure 69 highlights the oil production for the +/- 250m case. A shorter well is producing more oil for both time steps, while the longer case experiences a substantive loss in production. This big loss is due to crossflow from a higher pressure to lower pressures.

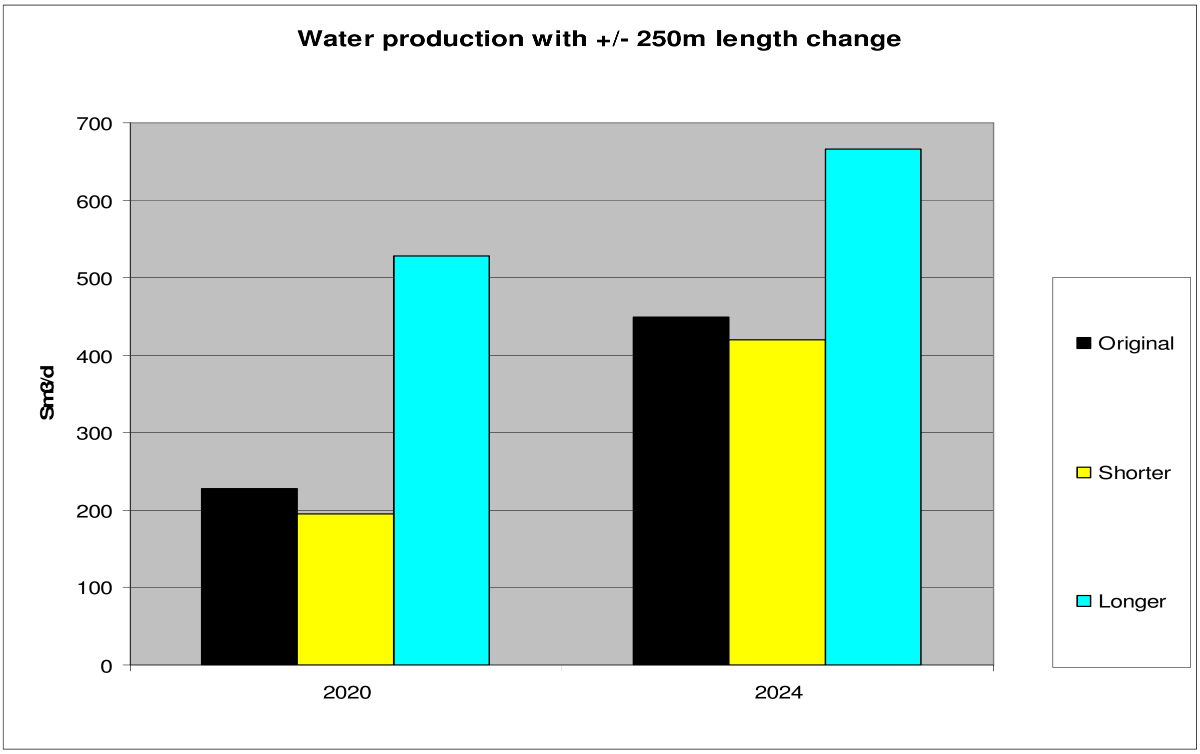

Figure 70 Water production with +/-250m length change in KP9

As we can see from the plot above water production increase dramatically for the longer wellbore compared to the planned and shorter well. This is caused by the high pressure zone which creates crossflow. Production in the rest of the well is enhanced and that causes more water to be produced. For the shorter wellbore, water production is reduced slightly for both time steps.

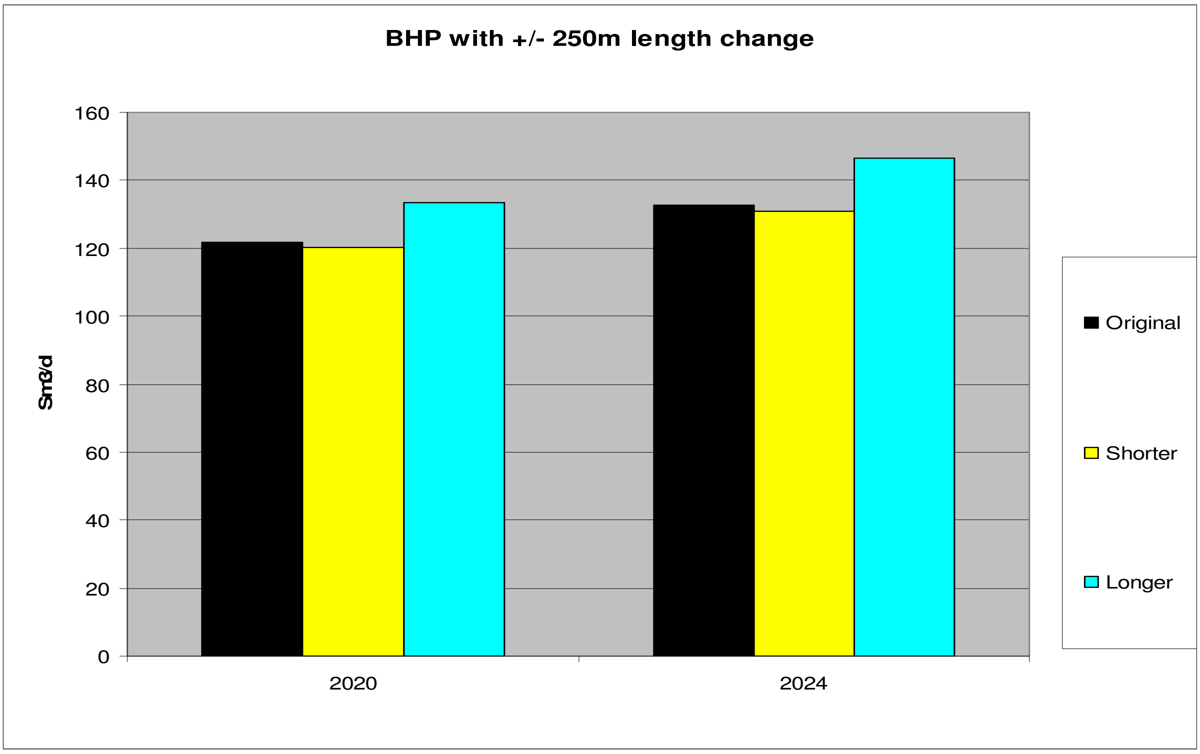

Figure 71 BHP with +/-250m length change in the well

It can be seen from the above figure that the longer well gives a higher flowing BHP in the well. This is also due to the higher pressure zone that the well enters. The difference in flowing BHP for a shorter well is insignificant.

3.4.4 Screen Size Sensitivity KP9

As for KP7 a sensitivity on screen size was also done for KP9. The objective of investigating screen size was to see if any benefits existed for a smaller screen size. Completion set up for both cases is the same as the tailored design found in earlier sensitivities and the input data is the same. Reference is made to chapter 3.3 for input data and appendix A.40 for completion set up. Changing of screen size was run for both an early time step and a late life time step. Open hole is included as a reference case.

From the sensitivities no apparent benefits were found when changing the screen size.

See appendix A.40-41 and A.53-54 for more details on set up and simulation results.

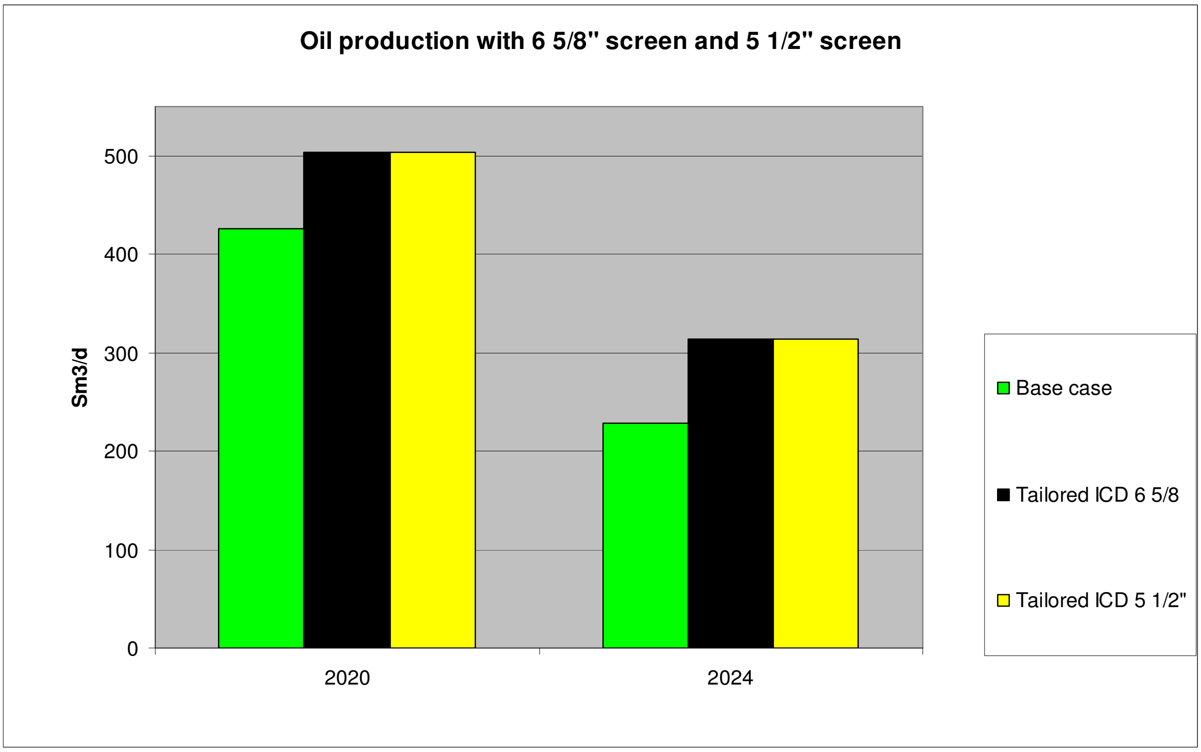

Figure 72 Oil production with changing from 6 5/8” to 5 ½” screen

Seen above is the oil production for the two different screen sizes at the year 2020 and 2024. There is no benefit on oil production by choosing a 5 ½” screen size over a 6 5/8” screen size.

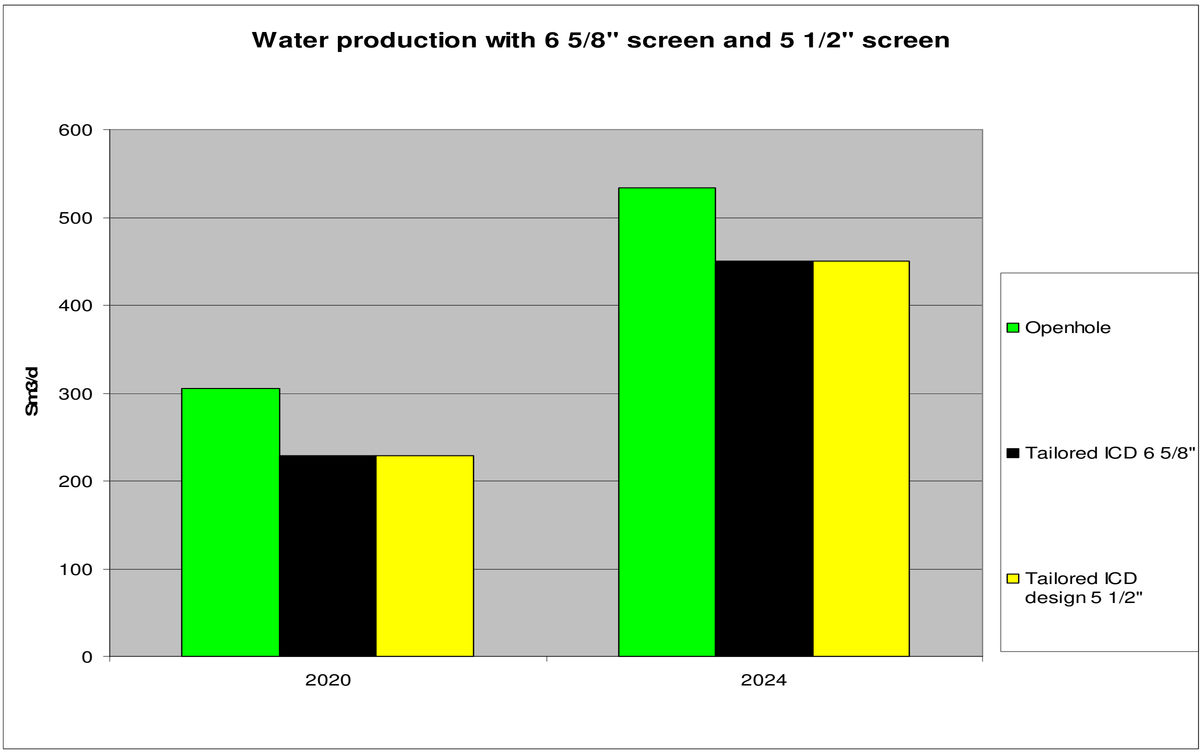

Figure 73 Water production with changing from 6 5/8" to 5 ½" screen

Figure 73 shows that there is no effect by changing the screen size on water production

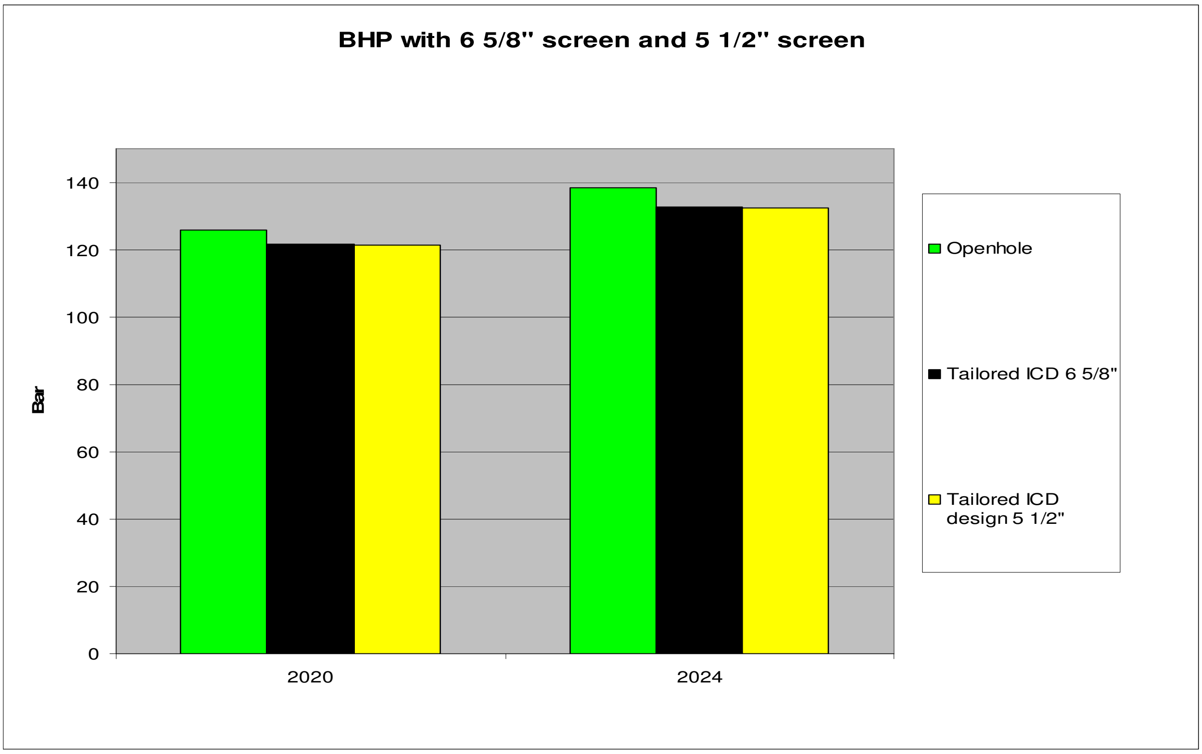

Figure 74 BHP with changing from 6 5/8” to 5 ½” screen

The above graph shows no that there is no effect on flowing BHP by changing screen size

3.5 Result from Eclipse simulations

Subsequent to the NETool^{TM} simulations, the results were implemented into the Goliat Eclipse^{TM} model. Simulations in Eclipse^{TM} were run on some of the nozzle settings used in NETool^{TM}. Simulations in Eclipse^{TM} was over life of the field, but due to great uncertainty in results obtained for the years after 2028 only the results up to 2028 are used in the thesis.

The recommended solution for both wells is hard to simulate accurately in Eclipse^{TM}, due to the complexity of the completion from NETool^{TM}. This is due to the way Eclipse^{TM} simulates a well and its limited possibility to set up such a detailed completion. When simulating in Eclipse^{TM} only one ICD can be used for each segment in the well. NETool^{TM} does not have this limitation. With only one ICD per segment in Eclipse^{TM}, the corresponding ICD area in NETool^{TM} must be calculated from the ICD completion design. That area is then entered into the Eclipse^{TM} model and the simulation is run.

Due to this difference it was decided to simulate the well with a uniform ICD setting and a fixed packer spacing of 120m. This was then converted into useable input data for Eclipse^{TM}. The Eclipse^{TM} input can be seen in table 5.

Refer to chapter 4.4 and 4.4.1 for more discussions on the results and Eclipse^{TM} input. More details about result from Eclipse^{TM} simulations can be found in Appendix A.56

Cases run in Eclipse^{TM}:

- Kobbe_CE_15_J: Open hole Case
- Kobbe_CE_31_D: Case with ICD 4x4mm
- Kobbe_CE_31_E: Case with ICD 2x4mm
- Kobbe_CE_31_F: Case with ICD 2x2,5mm

Input for Eclipse^{TM} simulations		
	Settings from NETool^{TM}	**Eclipse^{TM} Settings**
Packers spacing	60m	120m
ICD spacing	12m	60m
Nozzle settings	Extracted from NETool^{TM} results	Calculated to be equivalent to the NETool^{TM} settings

Table 5 Input for Eclipse^{TM} simulations

Well KP7 was simulated with three different uniform nozzle settings, 2x2,5mm, 2x4mm and 4x4mm. Additional simulations of different nozzle settings could not be done within the available time frame. The results obtained were compared with the previous Eclipse^{TM} results from the PDO phase.

For KP9 the Eclipse^{TM} simulations were unstable and no valid results could be obtained. Problems occurred in the model with convergence of equations. The reason for not being able to simulate well KP9 with ICDs is currently being investigated. The result of the investigation is not ready at the time of writing the thesis.

In the following section only Eclipse^{TM} data for KP7 will be presented.

In table 6 below the cumulative production of oil, gas and water derived from Eclipse™ is shown. The ICD cases have a similar total oil production, although it increases with larger nozzle size. A sizeable difference in total water production is experienced for the ICD settings simulated. The largest nozzle size produces the least amount of water. For gas production the smallest nozzle size produces the least amount of gas, due to heavier choking of the well. These results are consistent with the results obtained from NETool™.

KP7 production data from Eclipse				
	Oil [Sm^3]	**Water [Sm^3]**	**Gas [Sm^3]**	**WCUT**
Openhole	3 666 317	599 696	3 443 158 800	14 %
2x2,5mm	3 707 633	1 676 795	3 374 858 500	31 %
2x4mm	3 728 115	1 531 464	3 423 153 200	29 %
4x4mm	3 747 826	1 314 746	3 429 116 700	26 %

Table 6 Production data from Eclipse

Recoverable volumes from PDO			
Well KP7	**OIIP**	15 250 000	Sm3
	GIIP dissolved	2 927 000 000	Sm3
Segment M0 in reservoir model	**GIIP free**	998 000 000	Sm3
	GIIP total	3 925 000 000	Sm3

Table 7 Recoverable volumes from submitted PDO

Table 8 below summarizes the recovery factor for each of the simulated nozzle settings compared to the OIIP and GIIP stated in the Goliat PDO document , see table 7. A uniform nozzle setting has been assumed and the ICD and packer spacing used can be found in table 5. Table 8 shows that the recovery of oil is low for well KP7, although in the segment M0 there is another oil producer. The second well will contribute to a higher recovery from this segment. Recovery for gas in segment M0 is high and the variation between different ICD settings is low. The largest difference is compared to the open hole case. A possible reason for such a high gas recovery is gas injection in segment M0 and internal communication between segments causing gas to move into well KP7. [1]

KP7 Recovery data					
	Oil Cumulative	Oil recovery factor (compared to PDO)		Gas Cumulative	Gas recovery factor (compared to PDO)
Openhole	3 666 317	24,04 %		3 443 158 800	87,72 %
2x2,5mm	3 707 633	24,31 %		3 374 858 500	85,98 %
2x4mm	3 728 115	24,45 %		3 423 153 200	87,21 %
4x4mm	3 747 826	24,58 %		3 429 116 700	87,37 %

Table 8 Recovery factor for Oil and gas, compared with submitted Goliat PDO data

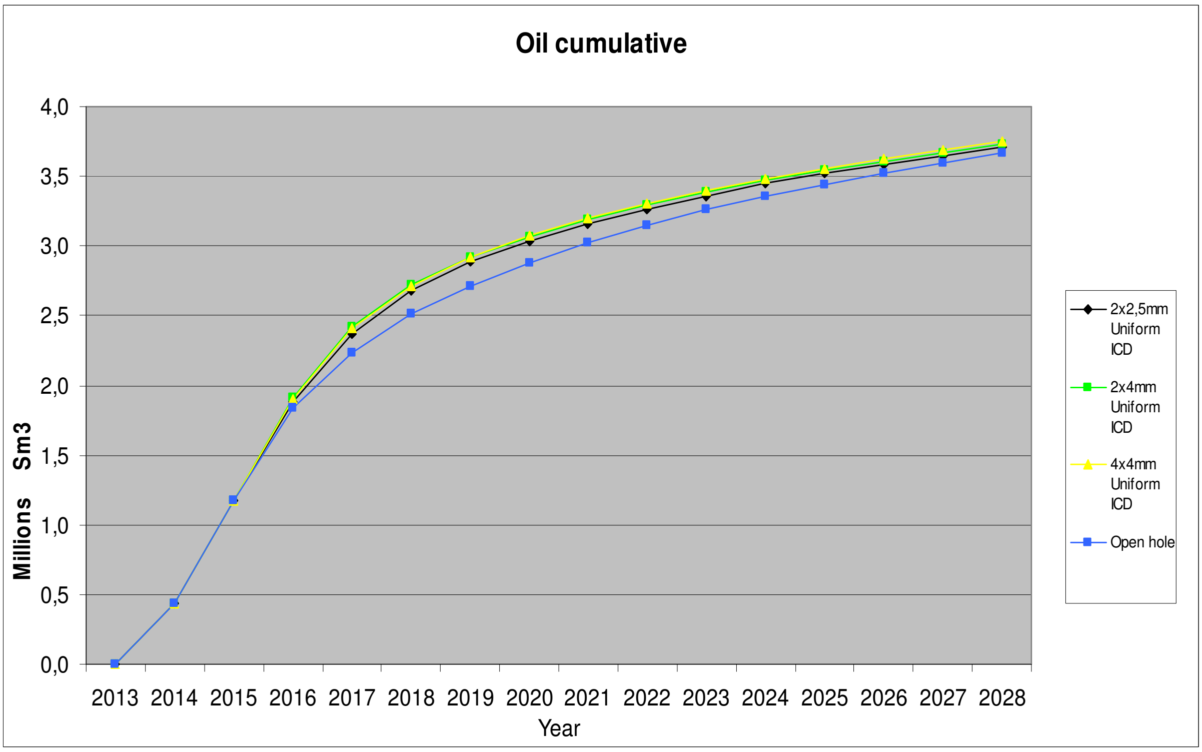

Figure 75 Oil cumulative production for KP7, simulated in Eclipse

Figure 75 visualize the cumulative oil production for well KP7. The difference in total oil produced is not large. A small difference is present during the field life, especially between open hole and an ICD completion. The ICD completions produce more oil early and in the middle of the fields life than what the open hole case without ICD does.

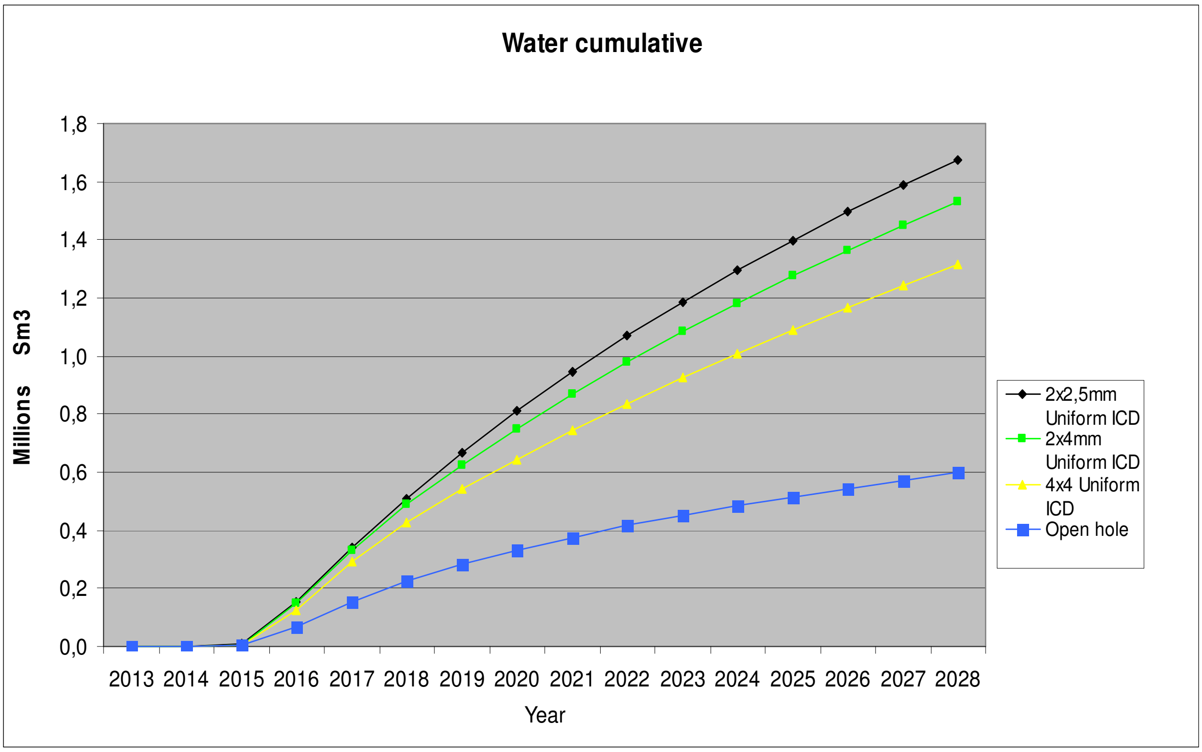

Figure 76 Water cumulative production in KP7, simulated in Eclipse

Figure 76 above is showing the total amount of water produced in the well KP7. A better illustration of the effect of ICDs is seen. It is clear that the 4x4mm ICD solution gives the lowest total water production of the ICD solutions. It can also be seen that the open hole case produces the least amount of water for the well, this will be further discussed in chapter 4.4. Water breakthrough is seen in 2016 for the KP7 well.

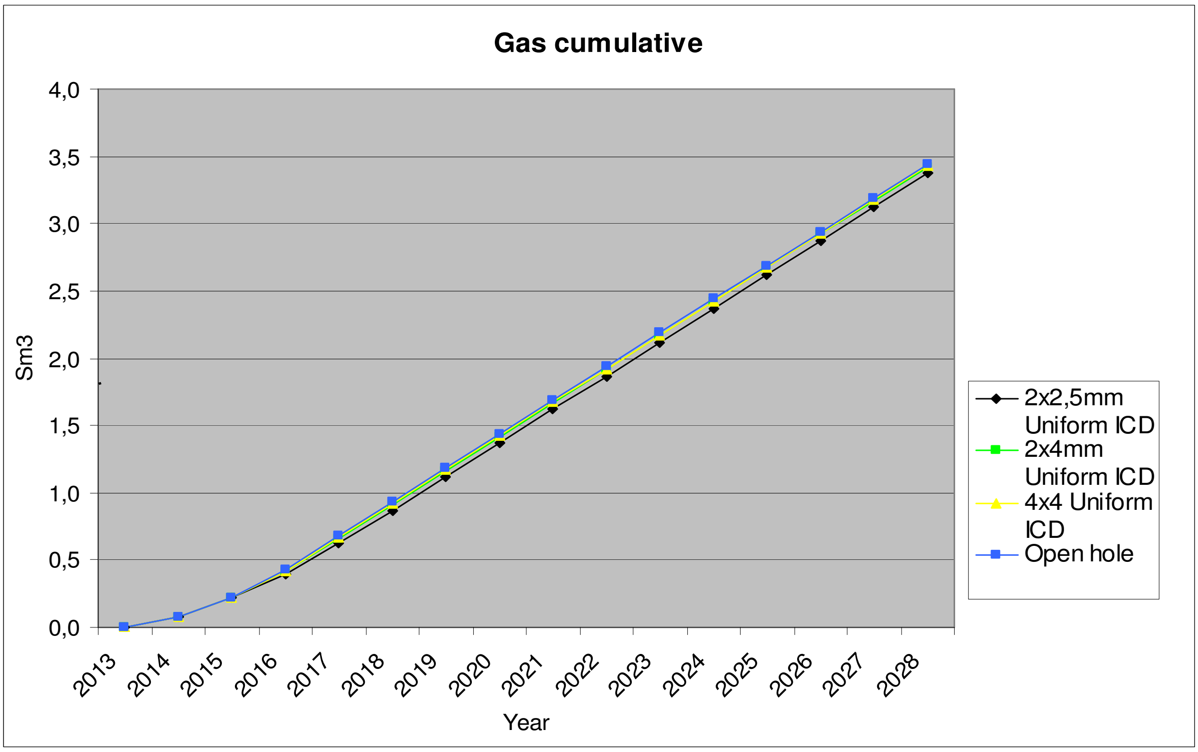

Figure 77 Gas cumulative production for KP7

Figure 77 above is showing the total amount of gas being produced for the well KP7. A small difference in total amount of gas produced is experienced. The 2x2,5mm ICD solution has the least amount of gas production.

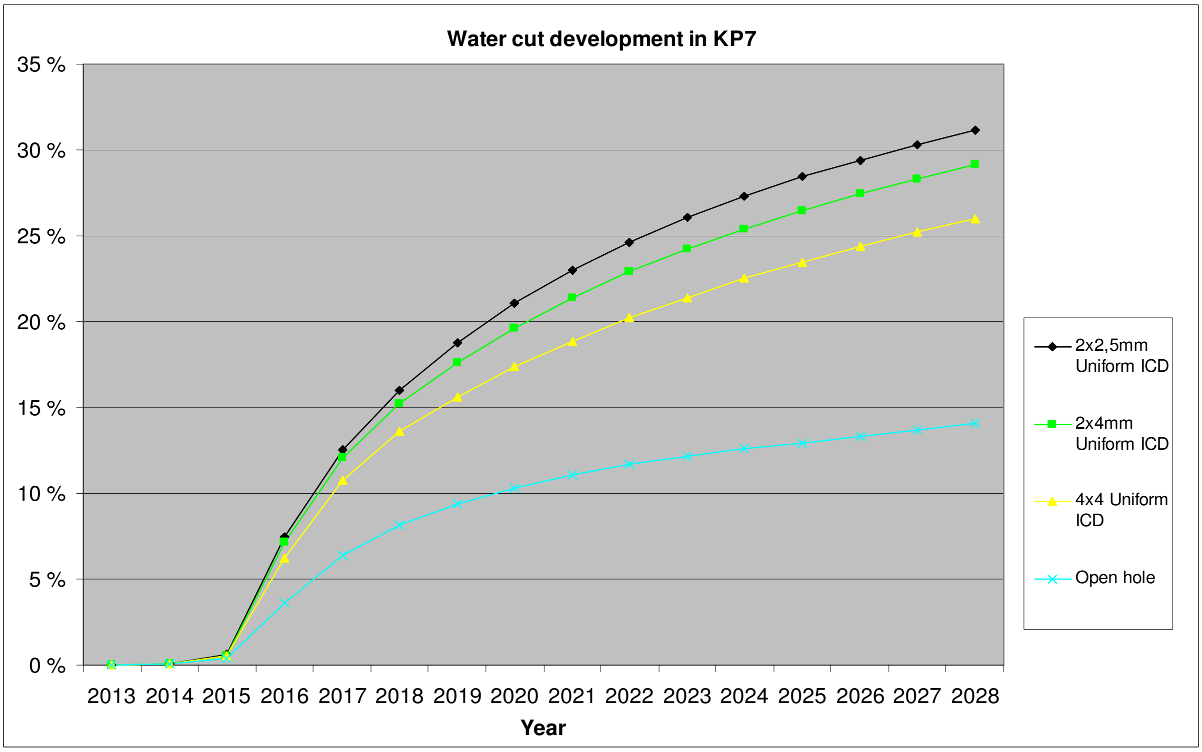

Figure 78 Water cut development for the different nozzle settings simulated

This plot above illustrates how the water cut is developing with time. The smallest nozzle size simulated is having the most rapid increase in water cut. The largest nozzle size, 4x4mm, is having a slower increase in water cut. The open hole case has a slower development of the water cut than the ICD completion.

Chapter 4 Discussion

4.1 Discussion of results KP7

4.1.1 Selection of a uniform vs. a tailored ICD design

When designing an ICD completion, one of the biggest challenges is to decide on a uniform ICD setting for the well or a tailor made design with varying nozzles. The simplest option is to go for a uniform setting, since that is the least sensitive to human errors and to placement of the completion. A tailor made design can prove to be beneficial in some applications where the permeability varies a lot and reservoir properties are very diverse. The reason is that the different zones will have so different properties that one type of ICD setting is not enough. The properties of the reservoir zone exceed the "working window" (work window being defined as the range of reservoir properties where there is some benefit in oil, gas or water production from installing ICDs) of that ICD setting and a different setting has to be chosen. Since the different ICD settings will function well under some conditions and poor under other conditions, it is for a tailored design crucial to place the right ICD setting in the right zone. The best way to understand which completion to select is to model it in NETool^{TM} and thereafter run the result from NETool^{TM} in Eclipse^{TM} to investigate the effect over the life of the well. However if there are large differences in the reservoir properties along the wellbore, a tailored solution may prove the best option.

The ICD choke setting to be used in the completion is dependent on the main reason for selecting ICDs. If it is to control gas production, a small and hard choking nozzle is beneficial. That can be seen in table 8, where the smallest nozzle size is producing the least amount of gas. If control over water production is the objective, a bigger ICD choke setting must be selected. This is clearly shown in table 8, where the biggest choke setting is producing the least amount of water. The effect on oil and water production can be seen in figures 23 and 24. From previous ICD studies done for Goliat, small nozzle settings have been recommended. These small settings where recommended for the high GOR wells KP1, KP4 and KP6. Well KP7 is not a high rate gas well, but some production of gas will occur. Therefore, a different ICD choke setting is ideal for KP7, compared to the high GOR wells. The backside with small nozzle sizes is the high velocity through the nozzles. A too high velocity may cause erosion of the nozzles. To mitigate this, a larger nozzle size must be selected. Refer to chapter 4.1.3 for more discussion on erosion risk and velocity through nozzles. From simulation work in this thesis a 4x4mm uniform ICD solution has been recommended. This solution differs from what has been found previously, but it offers more oil production and reduced water production. [53]

For the KP7 well a uniform solution appears as the best option. One reason for that can be found in the permeability profile, where KP7 has a more homogeneous profile compared to KP9, see figure 19 and figure 46. In a more homogeneous reservoir the properties along the wellbore do not change too much and this favours a uniform setting.

An example can be zones were the oil/water contact is close and a little choking by the ICD is needed in order to delay water breakthrough in that zone. If the nozzle setting used in that zone creates too high drawdown, earlier water breakthrough can be experienced. The same can be said for a case with the gas/oil contact close to the well, but in this case hard choking is needed to keep the gas away.

From the numbers in table 9, it is clear that a tailored (case 11) design gives a lower oil rate than the recommended solution (case 10). The difference in oil rate is roughly 100 Sm^3/d in 2018. The same difference is not seen for the last time step. There is also higher water production from the tailored design; roughly 40 Sm^3/d. This difference in production gives a clear indication that a uniform setting is the best choice in the KP7 well. There is also no benefit from a tailored ICD design (case 24) in the last time step, 7305 days.

One could expect that a tailored ICD design would give more oil over the whole life of the well. Zones that are choked hard will produce for a longer time and keep the overall oil production higher. This is clearly not the case for the KP7 well. Here the uniform 4x4mm ICD setting (case 25) proves a higher oil production in the early stage and roughly the same amount in late life (7305 days). The difference in oil and water production for the open hole, tailor made and recommended cases can easily be seen in figure 83 and 84.

Case	Days	Name	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT	BHP	Comments	Appendix
4	1826	2x1.6 mm ICD	2 843	**0,75**	777	264	21,5	77	First simulated ICD setting, ruled out because of low BHP	A.4
5	1826	2x2.5 mm ICD	2 808	**0,75**	729	267	20,6	171	Second ICD setting, ruled out because of low BHP	A.5
6	1826	2x4 mm ICD	2 635	**0,75**	565	285	17,7	188	Ruled out because of high water rate	A.6
7	1826	4x1.6 mm ICD	2 823	**0,75**	746	266	20,9	162	Fourth ICD setting, ruled out because of low BHP	A.7
8	1826	4x2.5 mm ICD	2 702	**0,75**	620	278	18,7	186	Ruled out because of high water rate	A.8
9	1826	4x4 mm ICD	2 359	**0,75**	439	318	15,7	190	ICD setting selected, before final blank pipe set up	
10	**1826**	**ICD Recommended**	**2 364**	**0,75**	**337**	**317**	**12,5**	**190**	**Final recommended setting for the well**	
11	1826	ICD Tailored	2 267	**0,75**	373	331	14,1	190	Tailored ICD completion.	
24	7305	ICD Tailored	**529**	0,14	**2 370**	258	81,7	177	Simulated for showing potential in Tailored completion setting	
25	**7305**	**ICD Recommended**	**531**	**0,14**	**2 368**	**258**	**81,7**	**177**	**Final recommended setting for the well**	

Table 9 Excerpt from table2, possible ICD designs for KP7

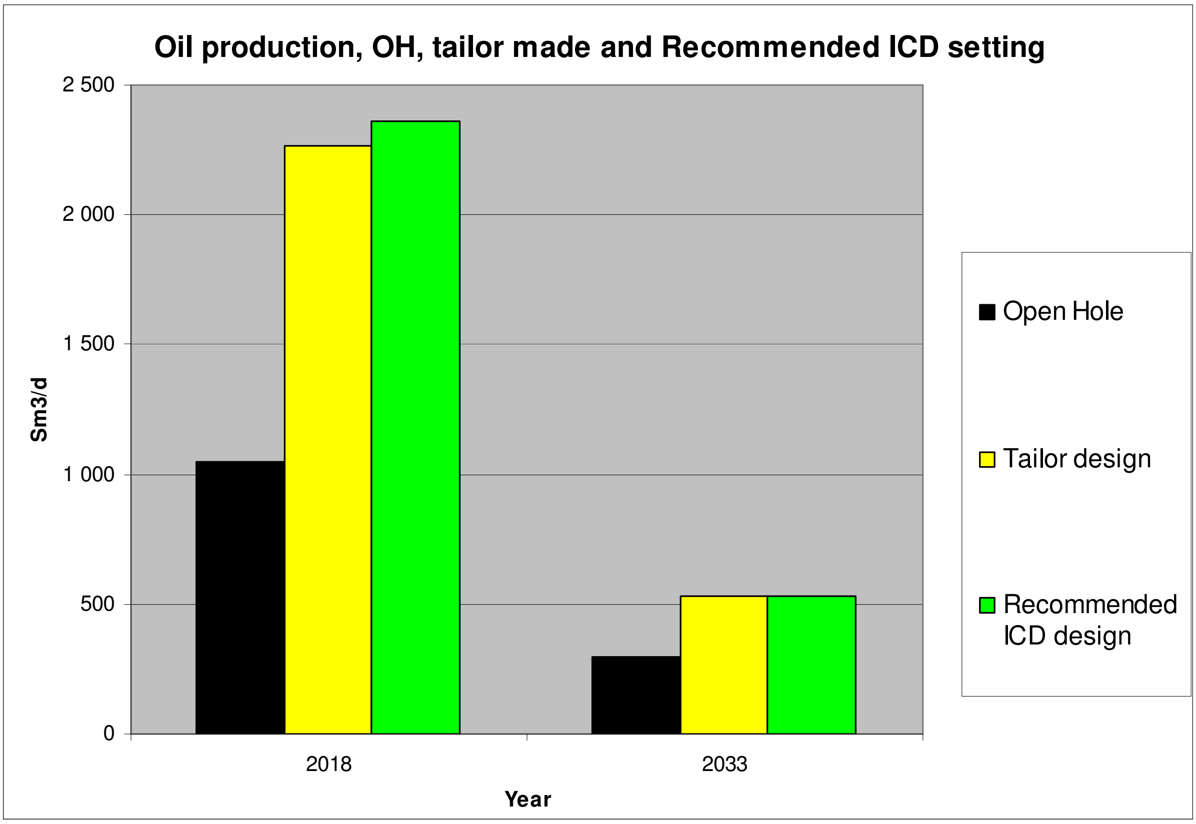

Figure 79 Oil production for open hole (no ICD), recommended ICD set up and tailor made ICD design

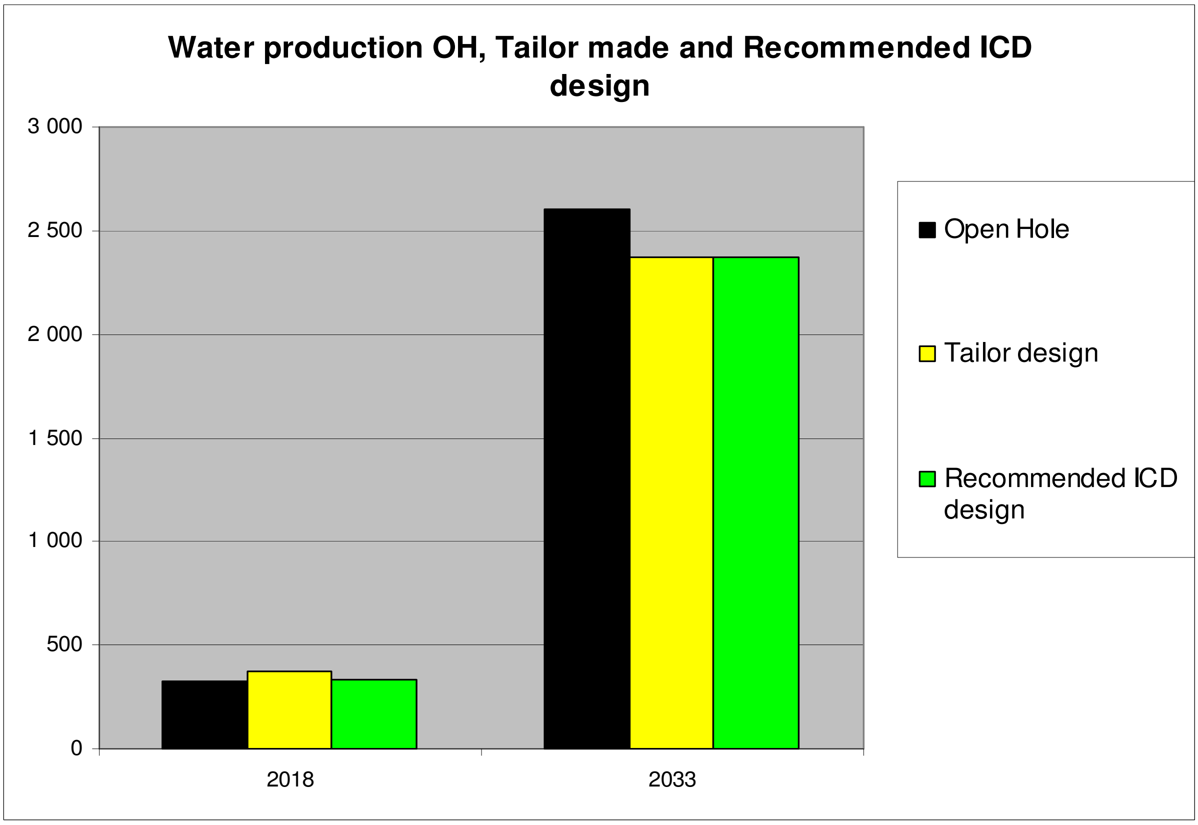

Figure 80 Water production for open hole (no ICD), tailor made and the recommended ICD design

There is also a practical side of the decision on which ICD design to use. This is related to the practicality of running the chosen completion into the well and place it at the right depth. Quite commonly it is not possible to get down to TD with the completion. This represents another challenge when deciding which ICD setting to use. From simulations prior to the final ICD selection, it will be apparent if a uniform or a tailor made setting is the best option. If a tailor made setting comes out as the best, one must evaluate how many variations there are in the ICDs setting. In the case of a very detailed completion set up, i.e. several different settings used and spread out along the entire length of the reservoir section. It will then be very difficult to run the completion and be sure that the right setting is in the right place. In that case, the possibility of running a fewer nozzle settings or a uniform setting should be evaluated.

4.1.2 Compartmentalisation and annular flow

In the reviewed literature, the importance of compartmentalisation in an ICD completion has been stated several times. The compartmentalisation does not only ensure good functionality of the ICDs but it also helps in preventing sand production and reducing erosion risk, by reducing annular flow. This section will deal with creating compartments and reducing the annular flow for KP7 & KP9.

Normally in SAS or ICD completions open hole packers are used to isolate the annulus and forcing the hydrocarbon flow into the tubing. These packers are often made of swelling elastomeric compounds that react with hydrocarbon or water and swells to seal off the annulus. See figure 83 for a picture of a slip-on type open hole packer. Placement of the packers in the well can as for the ICD design be a uniform spacing or varying pacing between packers, see figure 81 below for an example on "variable packer spacing for KP7. For KP7 a uniform spacing for the packers, means installing an open hole packer every 5th joint of pipe RIH, see figure 82 below. A variable spacing is placing the packers were high annular flow rates are seen, starting at the heel and moving towards the toe. In the recommended completion design a variable spacing is used.

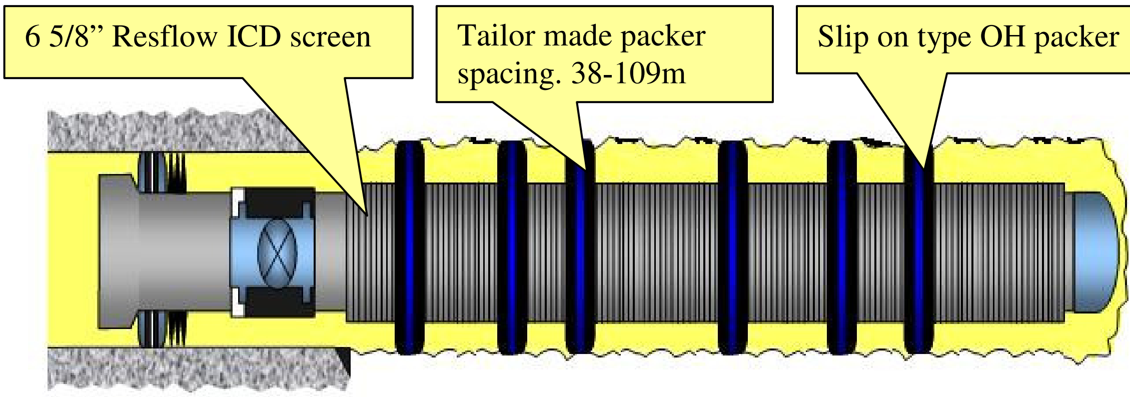

Figure 81 Variable packer spacing in KP7 with ICD

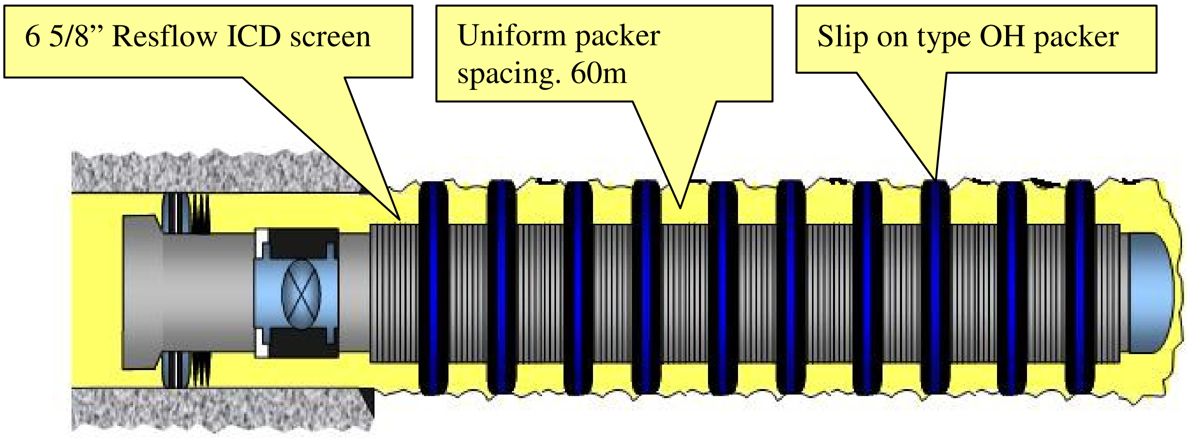

Figure 82 example on a uniform packer spacing in a well, used for practical reasons

Figure 83 Example of slip-on type open hole packers [53]

The difference between a variable packer spacing and a uniform spacing in terms of annular flow is low. In fact the uniform setting may reduce the annular flow even further. In terms of production there can be both a slight reduction and increase in oil production, dependent on the initial packer design. If the initial design was a variable spacing a reduction can be seen. From table 10 below it is clear that a practical case (case 11) with 4x4mm ICDs and packers very 5th joint gives less oil and water in time step 1826 days compared to the variable packer spacing in case 9. Though for the later time step at 7305 days, case number 24, it is observed an increase in oil and a reduction in water production compared to case number 23.

Case	Days	Name	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT [%]	BHP [Bar]	Comments	Appendix
9	**1826**	**ICD Recommended**	**2 364**	**0,75**	**337**	**317**	**12,5**	**190**	**Final recommended setting for the well**	
11	1826	Practical case	2 303	**0,75**	290	326	11	191	4x4mm ICD and packer every 5th joint	
23	**7305**	**ICD Recommended**	**531**	**0,14**	**2 368**	**258**	**81,7**	**177**	**Final recommended setting for the well**	
24	7305	Practical case	**562**	0,14	**2 337**	257	81	177	4x4mm ICD and packer every 5th joint	

Table 10 Excerpt from table 2

Figure 84 shows the effect from installing open hole packers on annular flow, showing oil and water flow in the annulus for KP7 at 1826 days. The blue curve is showing the annular flow in the well when no open hole packers are installed. The purple curve shows the annular flow when a variable packer spacing is used (same setting as in the recommended completion set up). For the annular oil flow rate, the reduction is 88% by installing open hole packers. That is a great reduction and the annular flow rate of oil is almost eliminated. The water at this time step flows in a small part of the well. Reducing a large water flow in that area is important for limiting sand production and resulting erosion risk. The benefit from installing open hole packers on the annulus water flow rate is a reduction of 75%. The reduction is a bit smaller than for the oil flow, but equally important as it takes place over a smaller area.

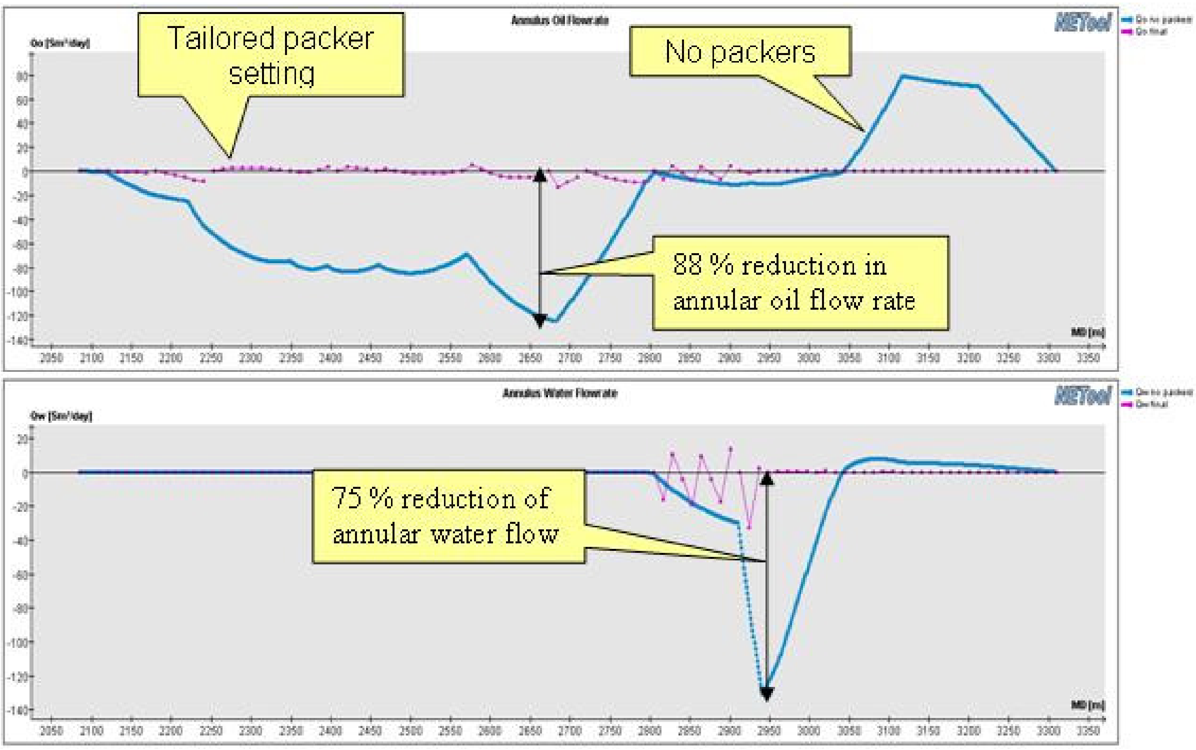

Figure 84 Reduction in annular flow from installing open hole packers in KP7.

4.1.3 Erosion risks

As previous mentioned (section 2.4-2.5) there exists a concern for erosion of the nozzles in a nozzle type ICD. But testing of the nozzle erosion resistance by Reslink, it was found no erosion up to a ΔP of 80 bars. The test was ended at 80 bars ΔP. For Goliat conditions, this ΔP will equal the following velocity through the nozzles [34]:

$$\Delta P = \frac{1}{2} K \rho v^2$$

$$\Delta P = 80 bar$$

$$\rho = 652{,}5 \, {}^{kg}\!/_{m^3}$$

$$K = 0{,}953$$

$$v = \sqrt{\frac{2 \cdot \Delta P}{K \cdot \rho}} = \sqrt{\frac{2 \cdot \left(80 \cdot 10^5\right)}{0{,}953 \cdot 652{,}5}} = \underline{\underline{160{,}4 \, {}^{m}\!/_{s}}}$$

To avoid nozzle erosion on the Goliat oil producer wells the velocity through the nozzles should be less than 160 m/s. Figures 85 and 86 are showing the velocity through the nozzles with the smallest and largest nozzle settings.

Figure 85 is showing the velocity through the ICDs with a uniform setting of 2x1,6mm nozzles. The velocity in almost the entire reservoir section is above the erosion limit (160 m/s). Also the heel part of the well has almost sonic velocity through the nozzles. This setting cannot be used due to the high risk of eroding the nozzles. The red line in the figure is showing the erosion limit from the erosion testing of the Resflow^{TM} ICD. The high velocity in the heel part of the well is due to gas boiling off across the ICD nozzles. This is due to the big pressure drop introduced by the small ICD setting

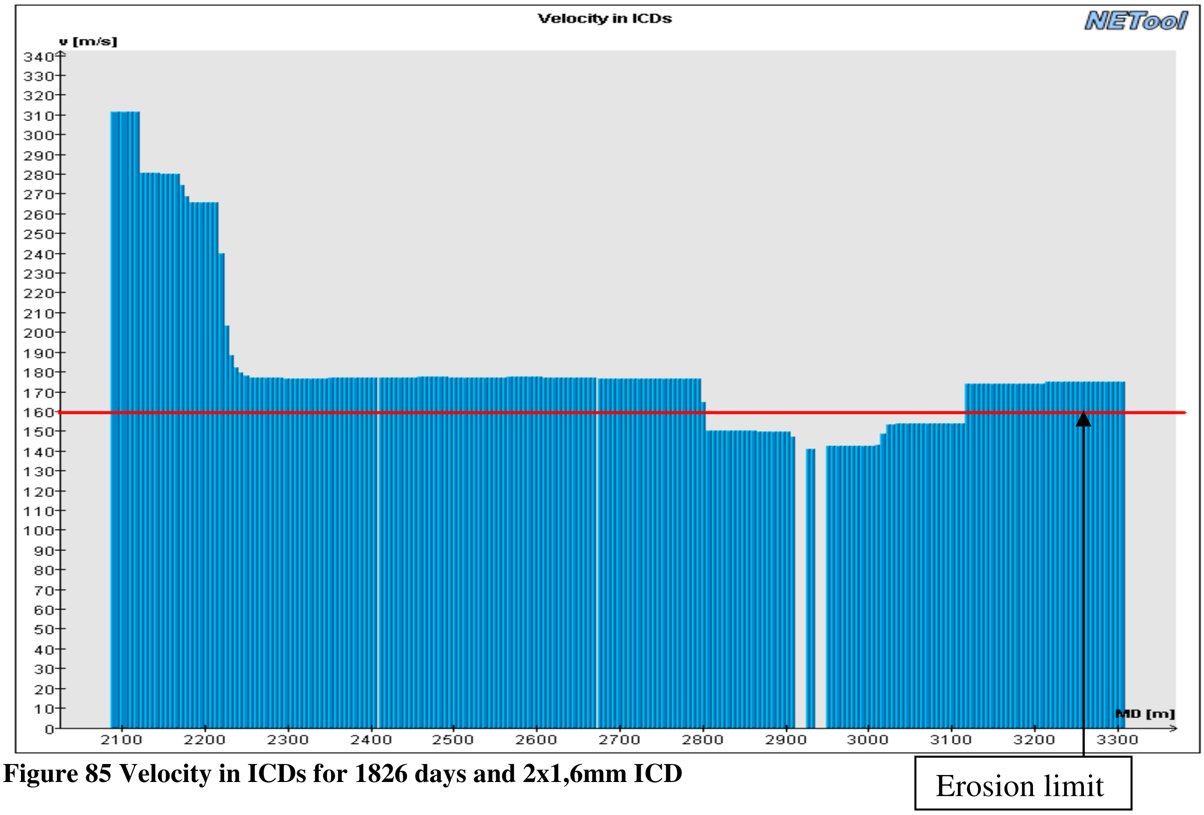

Figure 85 Velocity in ICDs for 1826 days and 2x1,6mm ICD

In figure 86, the velocity through the nozzles for the recommended ICD setting is shown. The velocity is lower for the entire well compared to the previous example. There are now more nozzles with larger diameter nozzles. The 4x4mm recommended setting has 12,5 times larger flow area than the smallest size, see table 11 below for flow area for different nozzle settings. The increase in flow area is the main contributor to a lower velocity through the nozzles; refer equation (2). With a maximum velocity of 53 m/s, erosion risk for the nozzles is low for the recommended ICD setting.

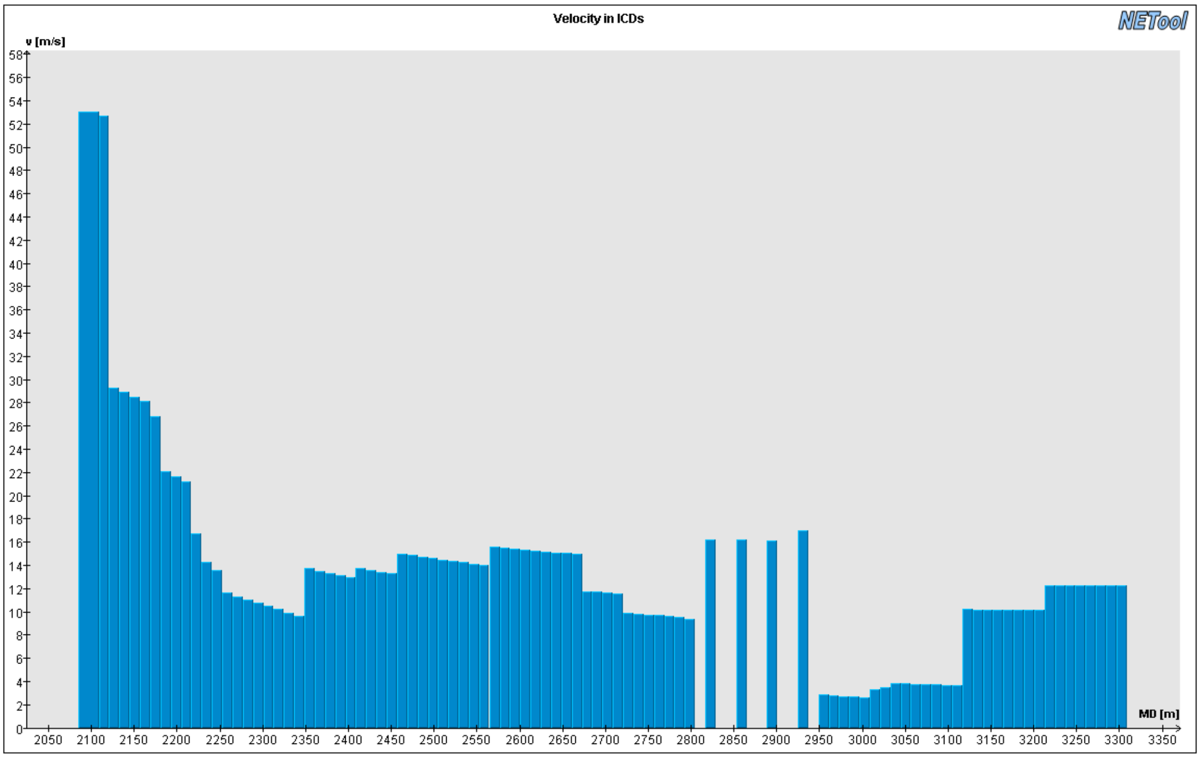

Figure 86 Velocity in ICDs for the recommended ICD design

Nozzles	Diameter	Radius	Area nozzle	Area total ICD	Size compared to the smallest ICD
#	[mm]	[mm]	[mm^2]	[mm^2]	-
2	1,6	0,8	2,0	4,02	1,0
2	2,5	1,25	4,9	9,82	2,4
2	4	2	12,6	25,13	6,3
4	1,6	0,8	2,0	8,04	2,0
4	2,5	1,25	4,9	19,63	4,9
4	4	2	12,6	50,27	12,5

Table 11 Overview of nozzle sizes and area of nozzles and total ICD area

For an ICD completion erosion of the nozzles is not the only concern. Erosion of the screen is also an important issue. A failed screen will allow sand to be produced through the nozzles and up in the tubing. If the screen fails the risk of eroding the nozzle increases significantly.

To prevent screen erosion the annular flow velocity must be reduced as much as possible. This can be done by installing open hole packers in the well, see figure 83. The ICD itself will also prevent erosion of the screens, by lowering the pressure inside the tubing and not allowing flow from the tubing to the annulus. Preventing this cross flow reduces the risk of screen erosion significantly. In a normal SAS completion there can be severe cross flow between the tubing and annulus, because of low ΔP between the annulus and the tubing. This cross flow will increase its velocity towards the heel. When it then culminates in the uppermost screen section the fluid velocity may cause erosion on the screen assembly. This effect is not seen in an ICD completion with packers. Even in an ICD completion without packers this effect is reduced significantly.

In order to investigate the risk of sand screen erosion the equation published by BP will be used to determine the risk of screen erosion; SPE 95294: Application of flux-Based Sand-Control Guidelines to the Na Kika Deepwater Fields. The equation is [54]:

$$C = V_p \cdot \sqrt{\rho_m} \qquad (4)$$

Where the C-factor is calculated based on velocity in the annulus V_p [ft/s] and down hole fluid mixture density ρ_m [lb/ft^3]. The C-factor ranges for risk of erosion is as follows:

- C<30: low risk of erosion
- 30<C<60: medium risk of erosion
- C>60: high risk of erosion.

When the C-factor was calculated a simulated WWS with no packers for KP7 was used and compared with the recommended ICD set up at 1826 days. In the table below the input and resulting C-factor can be seen. From the table it is clear that the WWS completion have a medium high risk of erosion on the screen. This high risk is undesirable in a completion as it may lead to erosion of the screen and loss of sand control. We also see that the ICD completion has a very low risk of erosion and that it is unlikely to have erosion of the screens in that case.

	m/s	ft/s	**C-Factor**
Annular velocity WWS completion	2,6	8,53	**54,43**
Annular velocity recommended ICD	0,1	0,32	**2,093**
ρ_{oil}	652,5 kg/m^3	35,31 lb/ft^3	

Table 12 Calculation of C-factor for KP7, 1826 days(2018)

In the two figures following the annular velocity for WWS case with no packers and the recommended ICD completion is shown. Figure 87 illustrates that the annular velocity increases towards the heel and that it peaks at the last screen section. One reason for such a high velocity is due to the total amount of liquid being produced. Another reason is the amount of free gas flowing through the screen at this point. A high gas rate will give high velocities through any completion type.

If we look at figure 88 we see that the annular velocity with the recommended ICD completion is much lower than for the WWS case. This clearly shows the effect from installing ICDs and packers on the annular velocity. One reason for the reduction is that an ICD completion forces the fluid to flow inside the tubing due to the difference in pressure between the annulus and the tubing.

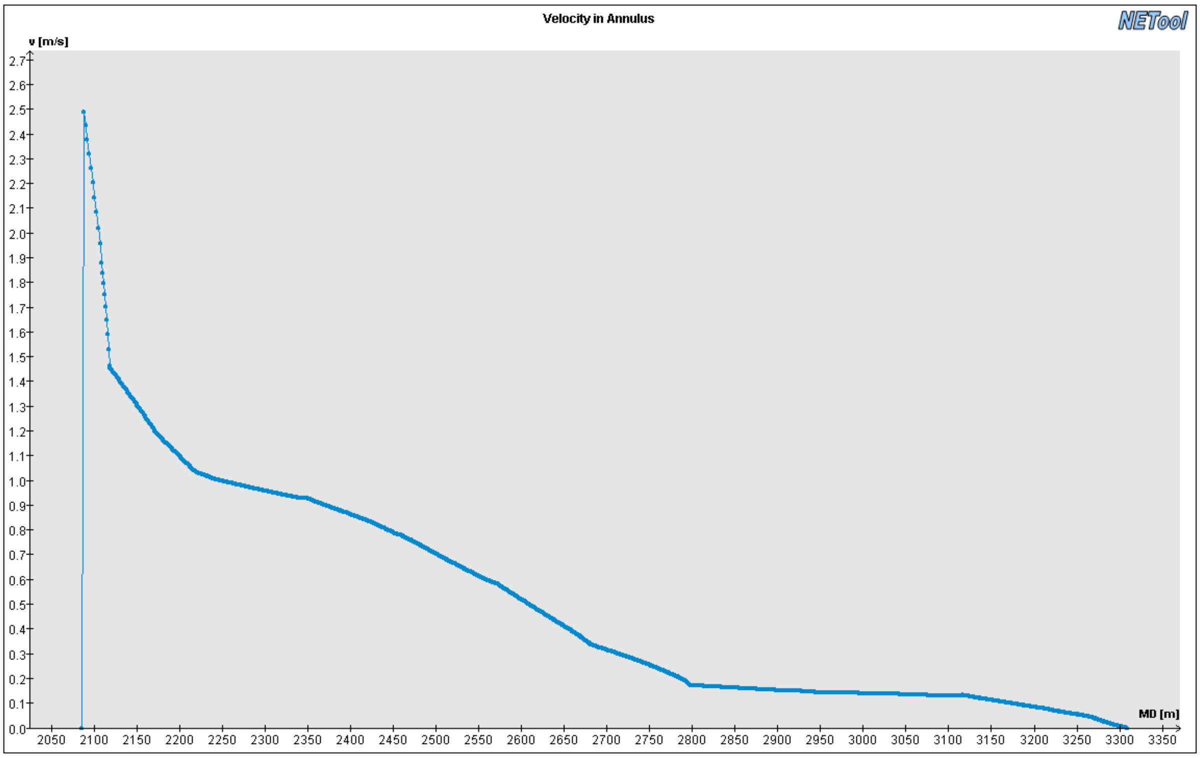

Figure 87 Velocity in annulus WWS completion no packers, 1826 days

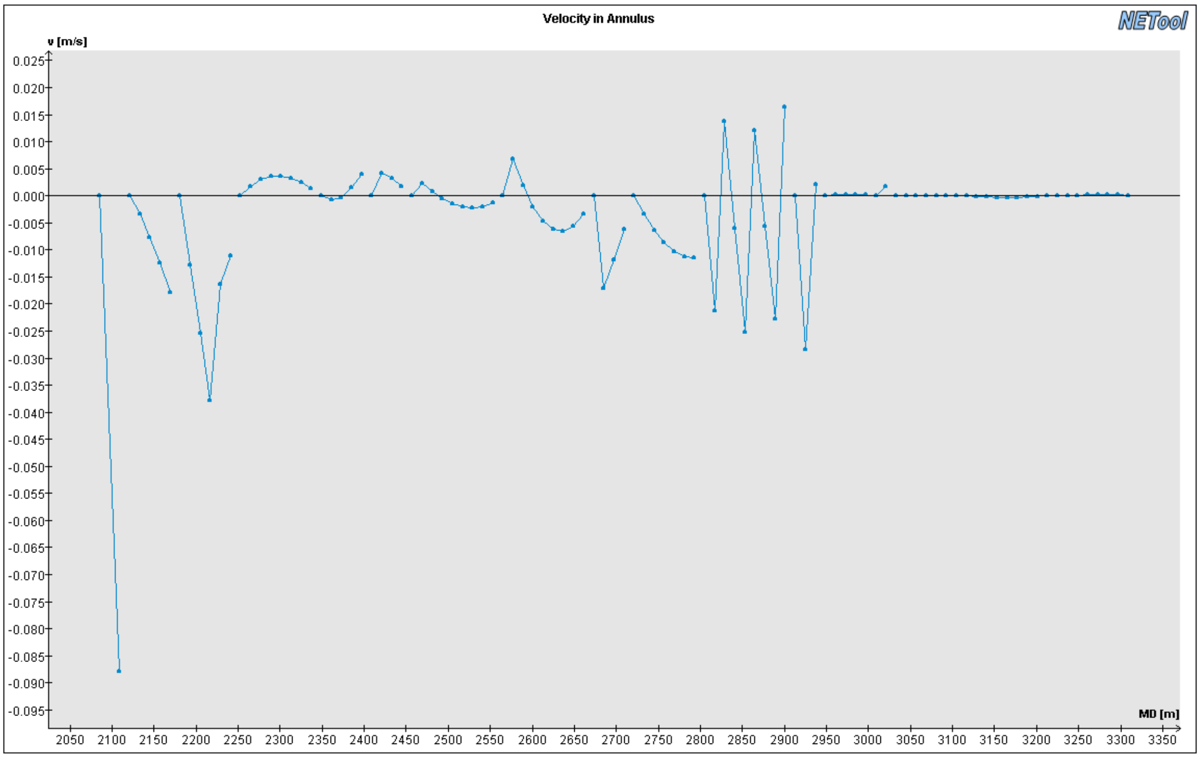

Figure 88 Velocity in annulus, recommended ICD completion. 1826 days

4.1.4 Impact from changes in permeability

When the work scope was decided for the thesis it was desired to also investigate the impact of changing the permeability. These permeability sensitivities were done in NETool^{TM} by extracting the present permeability in the model and changing it by a multiplier. The new permeability was modelled with a 25% and 50% increase and a 25% reduction in K_h. The ratio between K_v/K_h was kept constant. The simulations were run with a flowing BHP constraint (190 bar) for all altered permeability cases.

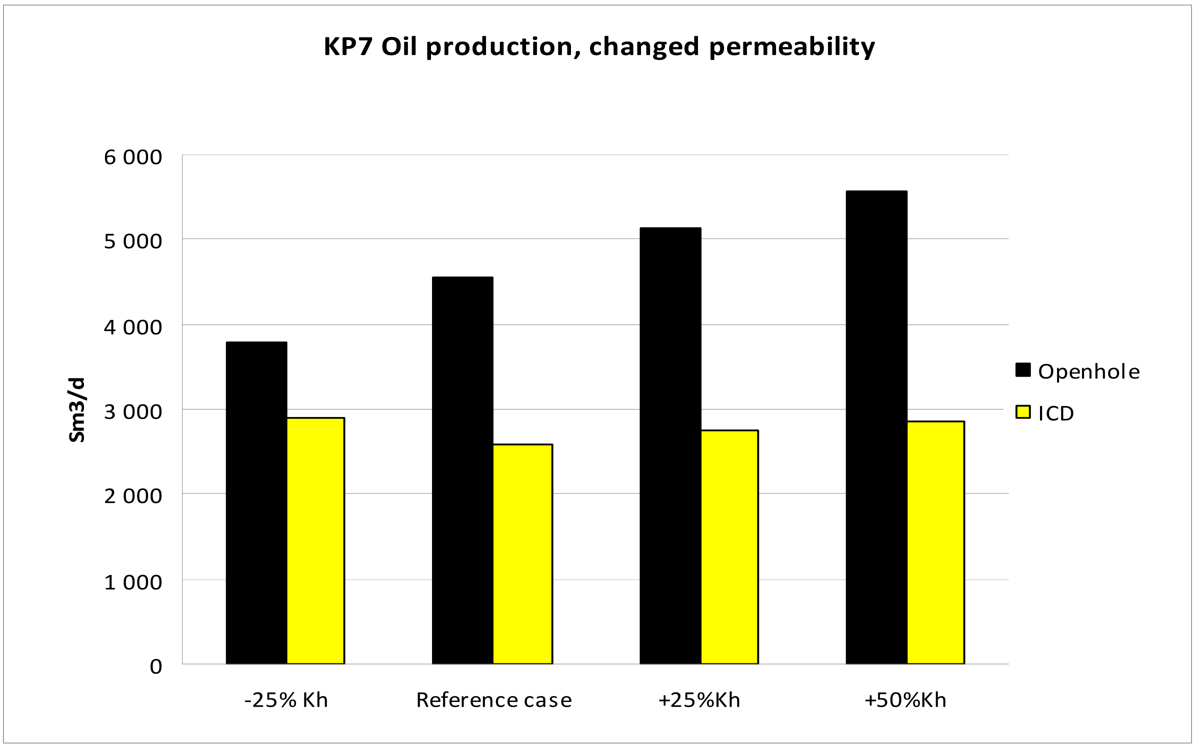

Figure 89 KP7 oil production with changed permeability

Figure 89 illustrates, production of oil for the open hole and ICD completion. From figure 89 it is apparent that open hole oil production is increasing with higher permeability. This is due to better communication downhole and easier flow of fluids. Another reason is the amount of gas produced. Since the well now is simulated with a constant flowing BHP there is no restriction on gas production. Without this restriction, gas production increases greatly and thus increases production of oil. The restriction on gas production was not used, as it would mask the possible benefits and downsides from an altered permeability.

For the ICD completion the same effect as the openhole case is not seen. Although there is an increase in oil production for all the altered permeability cases compared to the reference case. The highest oil production is seen for the case with 25% lower permeability. This is due to the ICDs generally functioning better with a tighter reservoir. Variation in oil production for the ICD completions is not as large as for the openhole cases, since the ICDs choke the well and restricts the flow of hydrocarbons. Since the ICDs chokes the well, production of oil, gas and water is reduced compared to the open hole case. If only looking at the oil production for the two completion concepts, it may seem irrational not to choose the openhole completion.

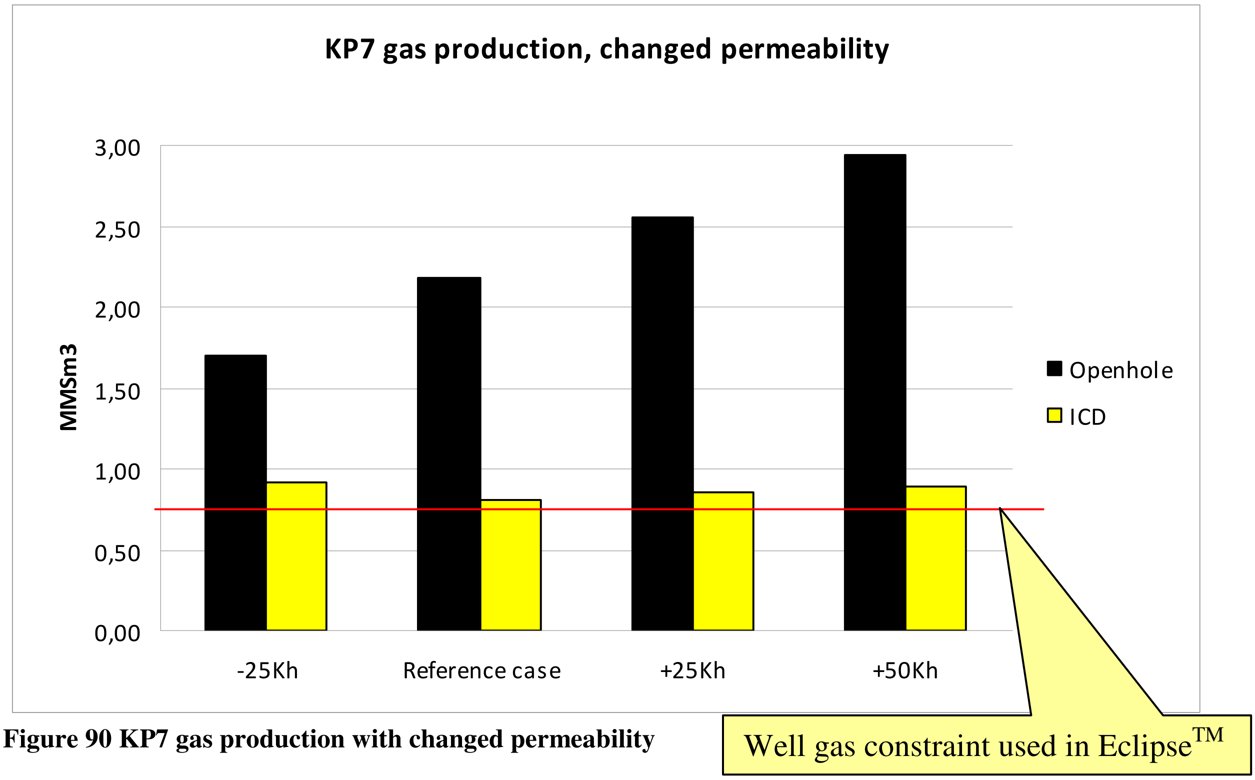

Figure 90 KP7 gas production with changed permeability

In the above graph the gas production is highlighted for the altered permeability cases, along with the gas production constraint used in Eclipse™ (0,75 $MMSm^3$). It is apparent that the open hole case produces much more gas than the ICD cases. Also, the open hole gas production is much greater then the gas constraint in the Goliat reservoir model, almost 4 times higher. This is caused by the unrestricted gas production and that the well is run by constant BHP. This allows much gas to be produced, since the gas saturation is high at 1826 days. Along with this large increase in gas production, more oil and water is produced. What is also readily apparent from the graph is that the ICD completion greatly reduces the gas production and keeps it more or less constant compared to the openhole case. Restricting the gas production is important for production on Goliat and ICDs was originally introduced to restrict gas production. This shows that there is a good benefit on reducing gas production from installing ICDs in well KP7.

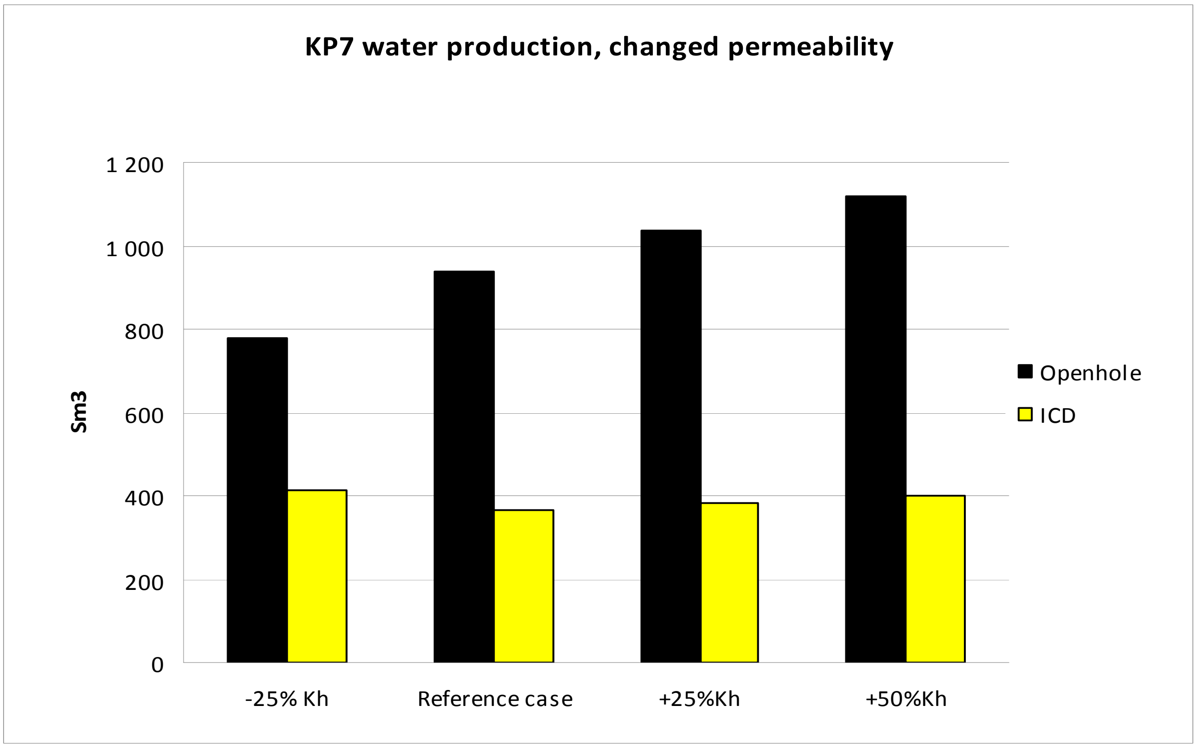

Figure 91 KP7 water production for the altered permeability case.

In the above figure water production with altered permeability is plotted. It is clear that with the used constraints on the well, water production for the openhole case is increasing. The apparent increase is significant and it is a side effect of increased oil and gas production. The ICD completion greatly reduces water production and keeps the amount of water more or less constant. The main reason for the increase in water production for the openhole case is that the well now is run with a BHP constraint.

In general the recommended ICD completion is showing good benefits even with a changed permeability. The production of oil, gas and water is kept fairly constant even with changed permeability. This clearly demonstrates the benefits of a well designed ICD completion. The results also show that the ICDs will restrict production of both gas and water. There is no proof that the ICD completion is operating outside the “working window”. The recommended uniform ICD completion shows an independence to changes in permeability. Restricting gas and water production is important, since too high production will lead to a lower overall hydrocarbon recovery for the field.

From the graphs above it may look strange that an open hole completion is not selected as the preferred completion type. The main reason for this is because for these sensitivities, as few restrictions as possible was used. This will of course not be the case in real life, since there will be several constraints on the wells performance, such as limitations on gas processing. More importantly the recommended ICD completion is not as dependent on the permeability as a tailored ICD completion would be. In summary, the recommended completion found from the simulations is robust enough to handle changes in permeability.

Case	Days	Name	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT	BHP	Comments
14	1826	OH +25% Kh	5 125	2,56	1 037	499	16,8	190	Reference case for 25% increase in Kh
15	1826	Recommended ICD + 25% Kh	2 745	0,86	384	314	12,3	190	Recommended ICD completion run with 25% extra Kh
16	1826	OH + 50% Kh	5 575	2,93	1 117	526	16,7	190	Reference case for 50% increase in Kh
17	1826	Recommended ICD +50%Kh	2 865	0,89	399	312	12,2	190	Recommended ICD completion run with 50% increase in Kh
18	1826	OH - 25% Kh	3 785	1,69	780	448	17,1	190	Reference case for a 25% reduction in Kh
19	1826	Recommended ICD -25% Kh	2 901	0,92	414	316	12,5	190	Recommended ICD completion run with 25% reduction in Kh

Table 13 Excerpt from table 2

In general a uniform completion set up is less sensitive towards changes in permeability than a tailor made design. The reason for that is that a tailor made design is heavily based on the permeability. When running sensitivities on permeability it can be experienced that some nozzle settings work for the permeability present and others don't even with a uniform set up. In those cases, nozzle settings used for the uniform set up was to close to the end of there "work window". Meaning that i.e. that the smallest nozzle setting was planned due to the need for heavy choking, but the result from the log reveals a permeability that does not require the same heavy choking. In such a case the smallest nozzle size may not work as good as a larger nozzle size. Consequences of this can be reduced oil recovery and early breakthrough of gas or water. To mitigate this, nozzles with lower choking must be used.

The "work window" for different nozzle sizes is hard to define exactly as it is reservoir specific. If sensitivity on permeability had been run for the available nozzle size, a "work window" for the Kobbe reservoir on Goliat could be defined. Defining a very accurate "work window" is difficult, since much of the information it will be based on is not available until start of production. When that information is present a recheck can be done to see if the right ICD set up was used and if other settings can give better results. In this thesis, finding the "work window" is not a part of the objectives and no further investigation has been conducted.

4.1.5 Length change KP7

In section 3.2.3 the results from the sensitivities on well length was presented. The main result is that both a shorter and a longer well may prove beneficial. Although the simulations have only been done in NETool^{TM} the result indicates that the length of KP7 may not currently be optimized to its full potential. The reason for this is that a longer well gives more oil initially and practically the same amount later in the well life. The shorter well produces less oil initially and more in late life. In well KP7 a large part of the water production comes from the toe section, see appendix A.3 and A.23. This reduces the well exposure to this zone could give more oil and less water production. Increasing the well length may bring the water zone closer and cause earlier water breakthrough. However the amount of oil in the extended section may make it economical. The full impact from these length changes are not seen in NETool^{TM} simulations. Only Eclipse^{TM} simulations will reveal the impact and result of such changes. From the simulations it looks like that the current well profile is a good compromise between a longer or a shorter well. Due to timeframe limitations it was not possible to do any Eclipse^{TM} simulations on well length.

4.2 Discussion of results KP9

4.2.1 Selection of uniform vs. tailored design

For well KP9 the same set of nozzle sensitivities was run as for KP7. KP9 have a more varied permeability profile than KP7. This can be seen in appendix A.30. The result after running nozzle sensitivity is inconclusive, meaning no uniform setting proves much better than the other ones. This indicates that the permeability present in KP9 varies too much for a uniform setting to fit. The “work window” of the nozzles does not fit all permeability variations along the reservoir section. To mitigate this, a tailor made solution was developed and it proved better than the uniform solution. The tailor made solution includes blank pipe, varied ICD settings and varying packer spacing. The tailor made solution was simulated for the latter time steps and still it proved beneficial. It was therefore selected as the recommended ICD design for use.

Since the permeability varies so much in KP9, the tailor made ICD solution also varies considerably. This high degree of variation involves the following nozzle sizes; 4x4mm, 4x1,6mm and 2x2,5mm. The spacing of each set up of ICD nozzles in the well varies from 24m up to 146m, see appendix A.40 for ICD set up. The complexity of the tailor made solution with blank pipe, packers and ICDs may prove to be to complex for installing. This is due to the possibility of not getting to desired depth with the completion, a different permeability than planned for, and practical constraints with regards to pipe handling on the rig. These constraints should also be evaluated before opting for a tailor made solution.

In well KP9 several nozzle sizes where used in the recommended completion, due to a heterogeneous reservoir. It is apparent from NETool™ simulations that no uniform ICD choke setting proves to be the best solution. The reason is that there are too large permeability variations along the reservoir section. This cause the uniform ICD choke settings to work in some places, but not work in other parts of the well. A tailor made solution with varying chokes should be chosen to avoid ICD chokes operating outside the “working window”. Since this “working window” is dependent on permeability, the heterogeneity of the reservoir section will determine if a uniform or a tailored solution should be used. If an inconclusive result is obtained from nozzle sensitivities in NETool™; a tailor made solution with varying chokes should be evaluated.

As seen in table 14, the uniform solution does provide an increase in oil production and a decrease in water production, although the difference between the reference case and the tailor made solution is even greater. In table 15 the actual difference can be seen between the open hole reference case for that time step and the recommended solution for the same time step. A visual presentation of the difference can be seen in figure 93 and figure 94.

Case	Days	Name	Oil rate [Sm^3/d]	Gas rate [$MMSm^3/d$]	Water rate [Sm^3/d]	GOR	WCUT	BHP	Comments
4	2556	Open Hole	427	0,11	305	266	42	126	Reference case
5	2556	2x1.6mm ICD BP Packers	473	0,13	259	270	35	108	First simulation run, with BP and packers installed
6	2556	2x2,5mm ICD BP Packers	470	0,13	262	273	36	120	Second simulation run, with BP and packers installed
7	2556	2x4mm ICD BP Packers	474	0,13	258	277	35	124	Third simulation run, with BP and packers installed
8	2556	4x1.6mm ICD BP packers	470	0,13	262	271	36	119	Fourth simulation run, with BP and packers installed
9	2556	4x2.5mm ICD BP packers	473	0,13	259	276	35	123	Fifth simulation run, with BP and packers installed
10	2556	4x4mm ICD BP Packers	475	0,13	257	277	35	124	Sixth simulation run, with BP and packers installed
11	**2556**	**Recommended Tailored ICD**	**504**	**0,15**	**228**	**307**	**31**	**122**	**Simulation run with recommended tailored ICD setting**
23	**4017**	**Recommended Tailored ICD**	**313**	**0,10**	**450**	**308**	**59**	**133**	**Simulation run with recommended tailored ICD setting**
29	**5113**	**Recommended Tailored ICD**	**169**	**0,05**	**467**	**322**	**73**	**153**	**Simulation run with recommended tailored ICD setting**

Table 14 Cut out of table 4, results from different nozzle settings

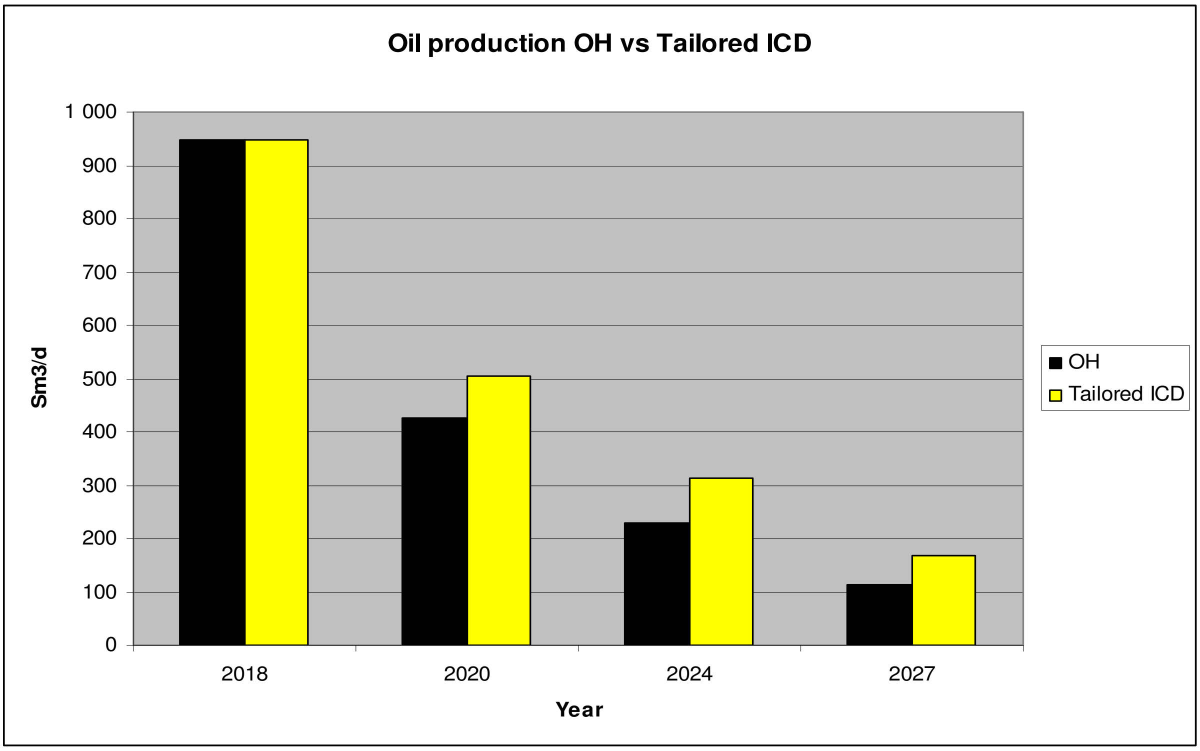

Figure 92 Difference in oil production between OH and Tailored ICD design

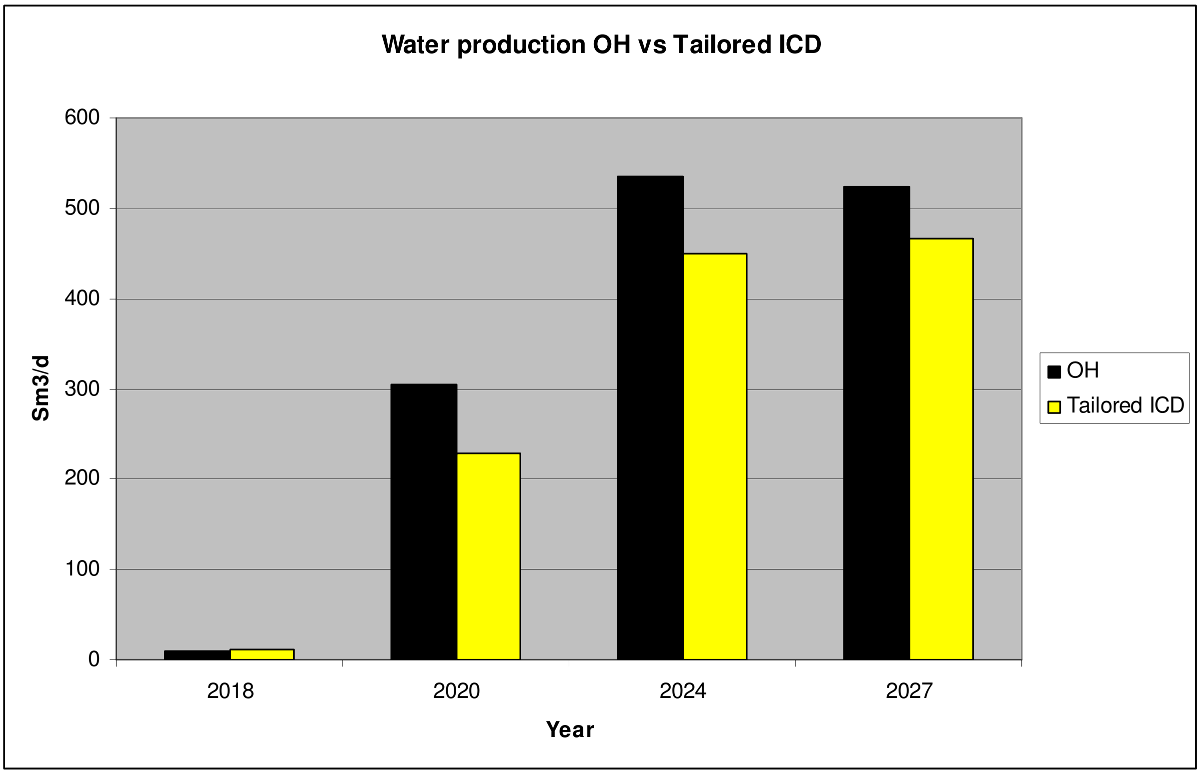

Figure 93 Difference in water production between OH and Tailored ICD design

What is evident from table 15 is that there is little effect of the ICD in the early life at 1826 days. This is due to a very low water cut at this point. The real effect of the ICD is not clearly seen. The effect on production is more pronounced in one of the later time steps, where a good increase in oil production is expected as well as a good reduction in water production. The water cut is reduced significantly from installing the ICD, with as much as 11%. The BHP found in the simulations is lower than for the open hole reference case.

Also of interest is that the gas production does not increase as much, except for the early time step. This proves that the gas is kept dissolved in the oil during production and not boiling of. Though for the time step at 1826 days gas production is increasing and that is believed to be caused by gas boiling off downhole. The reason for that can be found in the difference in BHP. A difference of 9 bars in BHP at 1826 days could make the flow go enter the two phase region and two phase flow will occur with free gas in the well. Gas boiling off down hole is not desired since it decreases the lifting capability of the well and could reduce the production. Mitigating this problem can be done by lowering the drawdown in the well and have a higher BHP. That is difficult, since a large part of the recommended ICD completion solution is with the largest nozzle size. What can be done is to choose a uniform setting, where the BHP is higher, with less heavy choking from small nozzle sizes.

It should be noted that for the KP9 simulations, a difference between Eclipse™ data and NETool™ output was found for the BHP, see chapter 3. This difference will add to the difference seen in the previous section. The result obtained in NETool™ may be exaggerated compared to the actual behaviour of the well when it is put on production. Simulations in Eclipse™ may give a better insight in the wells behaviour over life. From those simulations the final completion design will have to be selected.

OH vs. Recommended						
Measure	**Oil rate**	**Gas rate**	**Water rate**	**GOR**	**WCUT**	**BHP**
Time step/Unit	[Sm³/d]	[MMSm³/d]	[Sm³/d]	[Sm³/Sm³]	[%]	[Bar]
1826 days (2018)	-0,71	0,17	0,71	180,22	0,07	-9,22
2556 days (2020)	77,18	0,04	-77,18	40,94	-10,54	-4,28
4017 days (2024)	84,44	0,03	-84,44	24,94	-11,07	-5,67
5113 days (2027)	56,91	0,02	-56,91	26,30	-8,95	-4,08

Table 15 Difference between OH and recommended ICD setting

4.2.2 Compartmentalisation and annular flow

As previously stated, compartmentalisation of the reservoir section is important for optimal performance of the ICDs. It is even more important in a very heterogeneous reservoir were some parts of the well will produce much more than others. If no packers are installed in such a case, then the production will be dominated by the high productivity zones. This could lead to lost production and earlier water or gas breakthrough.

In very heterogeneous reservoirs where the completion solution is a tailored ICD design, the placement of packers becomes more important than for a uniform ICD solution. The reason for that is that a different number of nozzles and sizes will have different ΔP's that will steer the flow towards the path of least resistance. This "steering" of the flow could potentially cause most of the flow to go through a very confined area causing high annular flow in that area and increased risk of erosion. By installing annular packers this "steering" is reduced. Both the varied packer spacing and the more practical uniform spacing will reduce this "steering" and reduce the annular flow.

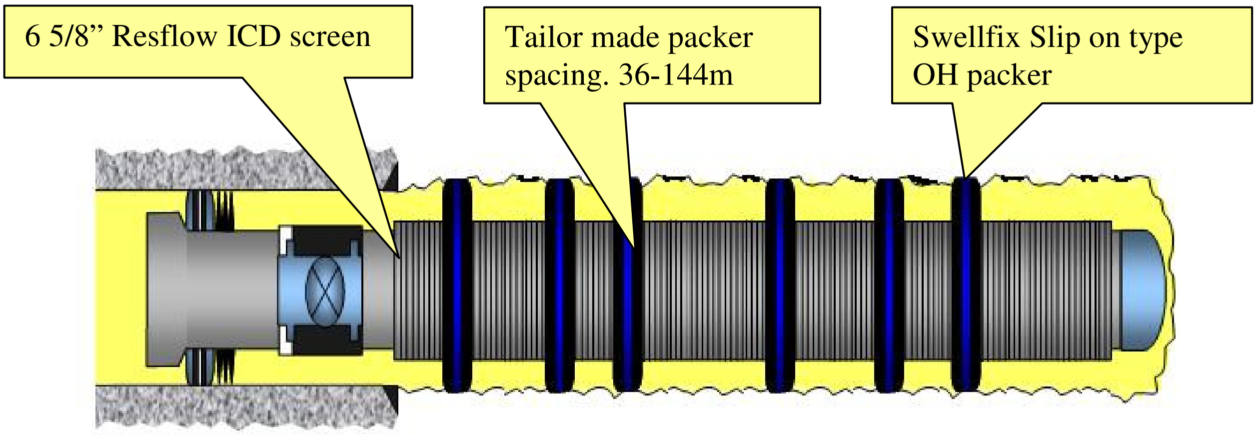

Figure 94 Tailored packer spacing in a horizontal well with ICD, KP9

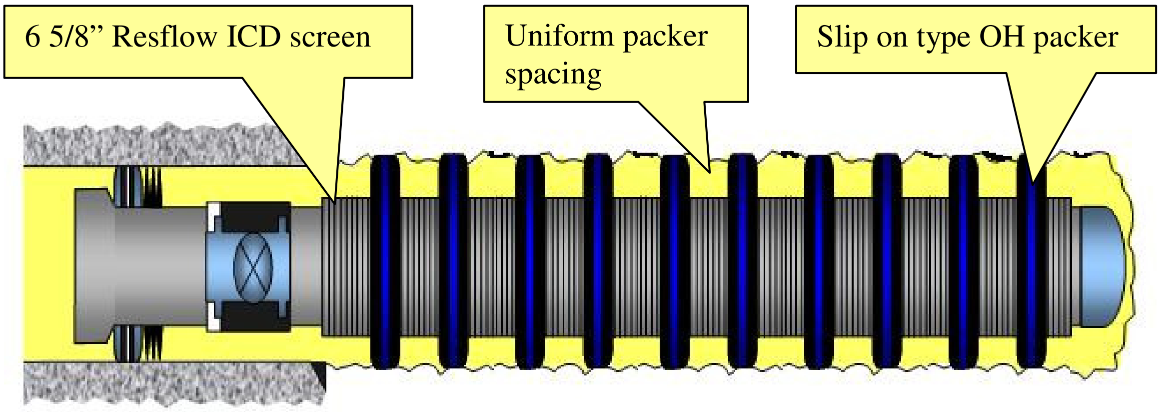

Figure 95 Example of a uniform packer spacing, used for practicality

Figure 97 illustrates the effect of open hole packers in well KP9. The plot is from 2556 days (2020). The blue curve is showing the annular flow without any open hole packers installed, the purple one is showing the effect of a varied packer spacing. It can be observed that annular flow of oil is the biggest concern for KP9. Compared to the annular flow rates in KP7, the annular flow is lower for KP9. There are some sections in the case without open hole packers were the annular flow converges into a small part of the well. Eliminating this convergence is one of the main objectives with installing open hole packers. The purple line shows that the annular flow is almost eliminated. This low annular flow is causing a lower erosion risk of the screen and also avoiding preferential flow from high productivity zones.

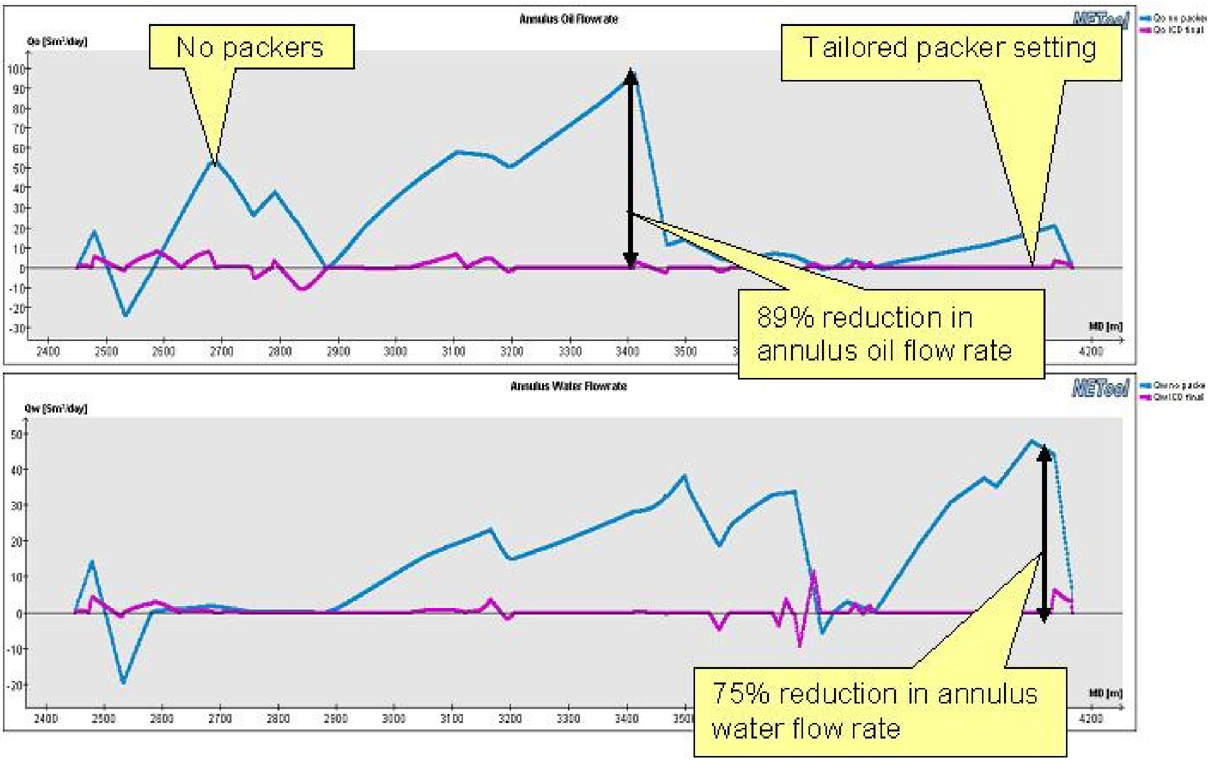

Figure 96 Reduction in annular oil and water flow by installing open hole packers

Table 16 shows the difference between a uniform ICD solution, the recommended tailored solution and a "practical" case. The practical case has packers every 5th joint, whilst the other cases have a varied packer spacing. It is clear that the recommended ICD design gives the best oil rate and lowest water production. This solution is however the most complex solution and it carries some issues with how "installation friendly" it is. Case number 10 is a uniform ICD solution with a varied packer spacing. This set-up gives extra oil production compared to open hole and is less complex to install. Case number 13 is a practical case with a uniform ICD setting, 4x4mm ICD, and packers every 5th joint. This case still gives an increase in oil production compared to the open hole reference case, but it underperforms compared to the other two cases. This illustrates that the most practical solution may not be the best solution for the reservoir. It is also observed that the difference in production between case 11 and 13 is also present at 4017 days (2024); i.e. case 23 and 25. It is clear that the practical case does not work particularly well for KP9. A reason for that may be linked to the compartmentalisation not being the best one, thus allowing preferential flow from high producing zones or possibly restricting some zones.

Case	Days	Name	Oil rate [Sm³/d]	Gas rate [MMSm³/d]	Water rate [Sm³/d]	GOR	WCUT	BHP	Comments	Appendix
10	2556	4x4mm ICD BP Packers	**475**	0,13	**257**	277	35	124	Sixth simulation run, with BP and packers installed	
11	**2556**	**Recommended Tailored ICD**	**504**	**0,15**	**228**	**307**	**31**	**122**	**Simulation run with recommended tailored ICD setting**	
13	2556	ICD practical case	**458**	0,12	**274**	270	37	118	Practical case with packer at every 5th joint and same size on all ICDs	
23	**4017**	**Recommended Tailored ICD**	**313**	**0,10**	**450**	**308**	**59**	**133**	**Simulation run with final ICD setting**	
25	4017	ICD practical	**266**	0,08	**497**	289	65	130	Practical case run for showing effect at higher water cut	

Table 16 Excerpt from table 4, Recommended tailored ICD design vs. Practical ICD design

4.2.3 Erosion risk

As for KP7, the same erosion velocity limit applies to well KP9; i.e. 160 m/s. To determine the highest risk of nozzle erosion, the velocity through the smallest nozzle setting must be investigated. Figure 98 plots the velocity through the nozzles with a 2x1,6mm nozzle setting. The velocity through the smallest nozzle setting is below the erosion free limit found in testing. The spike at approximately 2740m is due to computational errors in NETool™ and is not representative of the actual velocity through the nozzles. For the rest of the well the velocity is well below the erosion limit and erosion should as such not pose a problem.

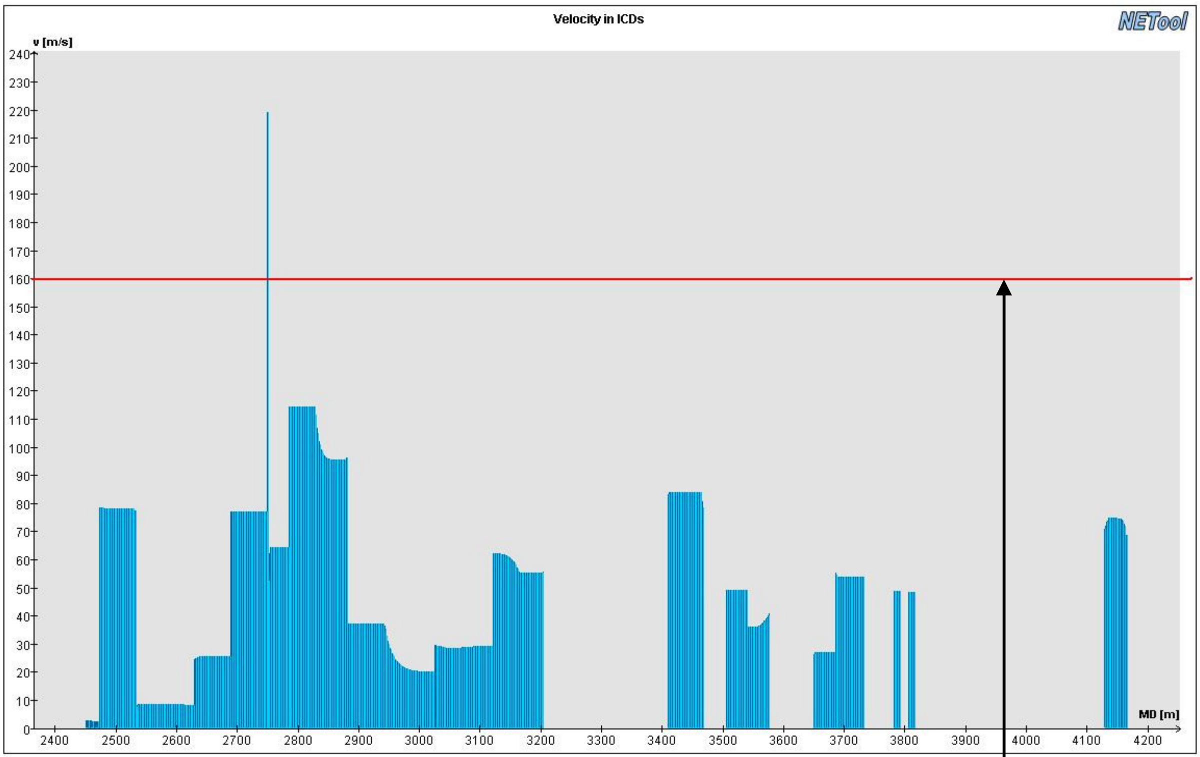

Figure 97 Velocity through nozzles 2x1,6mm KP9, 2556 days

Figure 99 is showing the velocity through the ICDs with the recommended tailored solution. The velocity is low and well below the erosion limit. For the KP9 tailored ICD solution the erosion risk of the nozzles is deemed to be low.

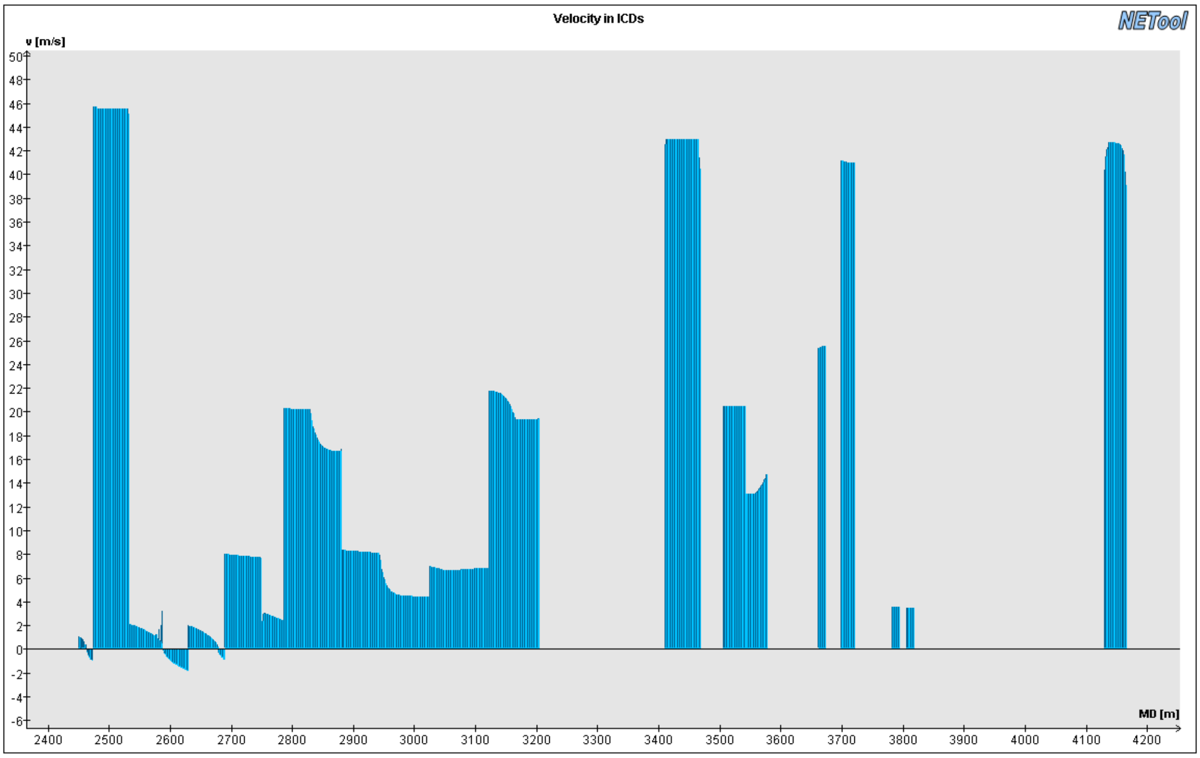

Figure 98 Velocity through nozzles for recommended tailored design KP9, 2556 days

Nozzle erosion is not the only concern in a standalone screen completion. The erosion risk of the screens installed must also be quantified. This has been done the same way for KP9 as it was done for KP7. The same equation was used, but with different inputs. The C-factor was calculated based on the equation presented in SPE 95294, [54]. The equation is:

$$C = V_p \cdot \sqrt{\rho_m} \tag{4}$$

For KP9 there has been simulated a standalone screen case with packers every 5th joint. This standalone screen case will be compared to the tailored ICD solution. The much lower flow rates and lower velocity in KP9 compared to KP7 indicate a lower risk of screen erosion. Table 17 lists the calculated C-factor for KP9 at 2556 days (2020). Both completion types have a low risk of screen erosion. This is due to the lower flow rates and velocities. Another factor is the volume of free gas flowing. In KP7 there is some free gas in the well at 1826 days, see section 3.1, and this makes the velocities much higher than they normally would be. For KP9 there are a difference in C-factor for the two completion concepts, but they are both well below 30. The risk of screen erosion therefore is low

			C-Factor
Annular Velocity WWS completion	0,25 m/s	0,82 ft/s	**4,87**
Annular velocity tailored ICD	0,05 m/s	0,164 ft/s	**0,97**
ρ_{oil}	652,5 kg/m^3	35,31 lb/ft^3	

Table 17 Calculation of C-factor at 2556 days (2020)

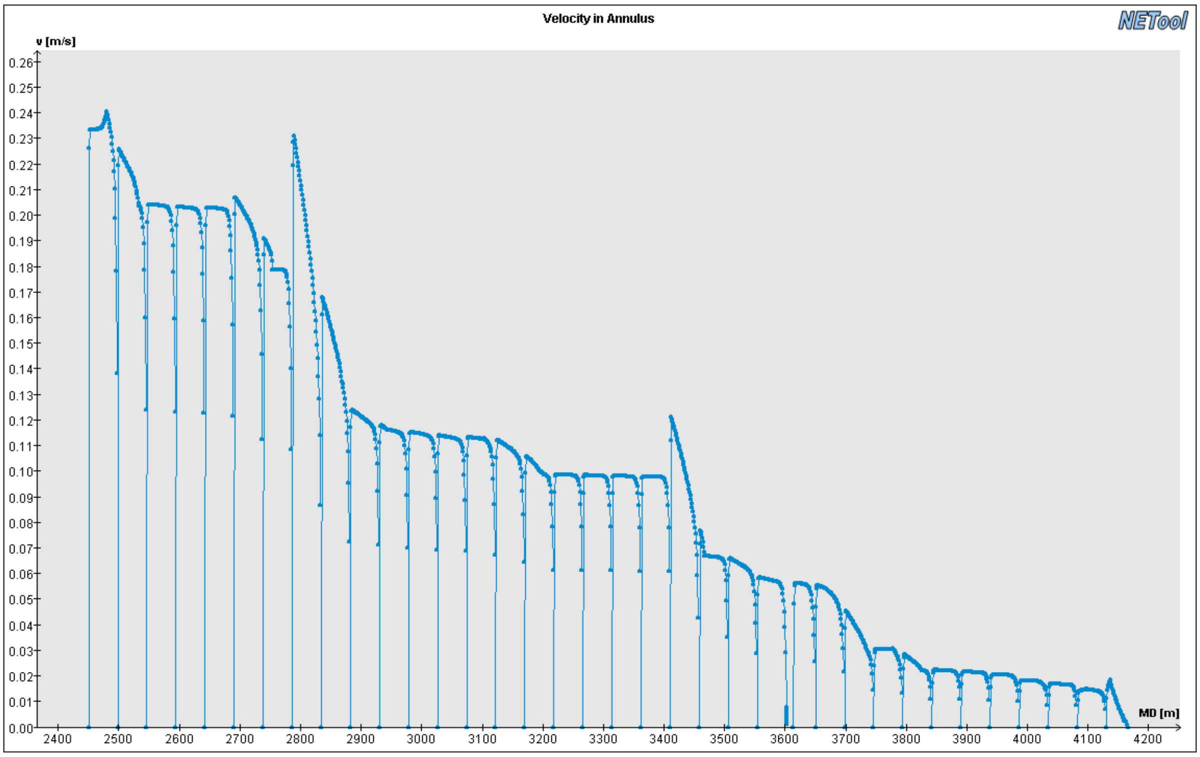

Figure 99 Velocity for a standalone screen completion (no ICD) in KP9 2556 days.

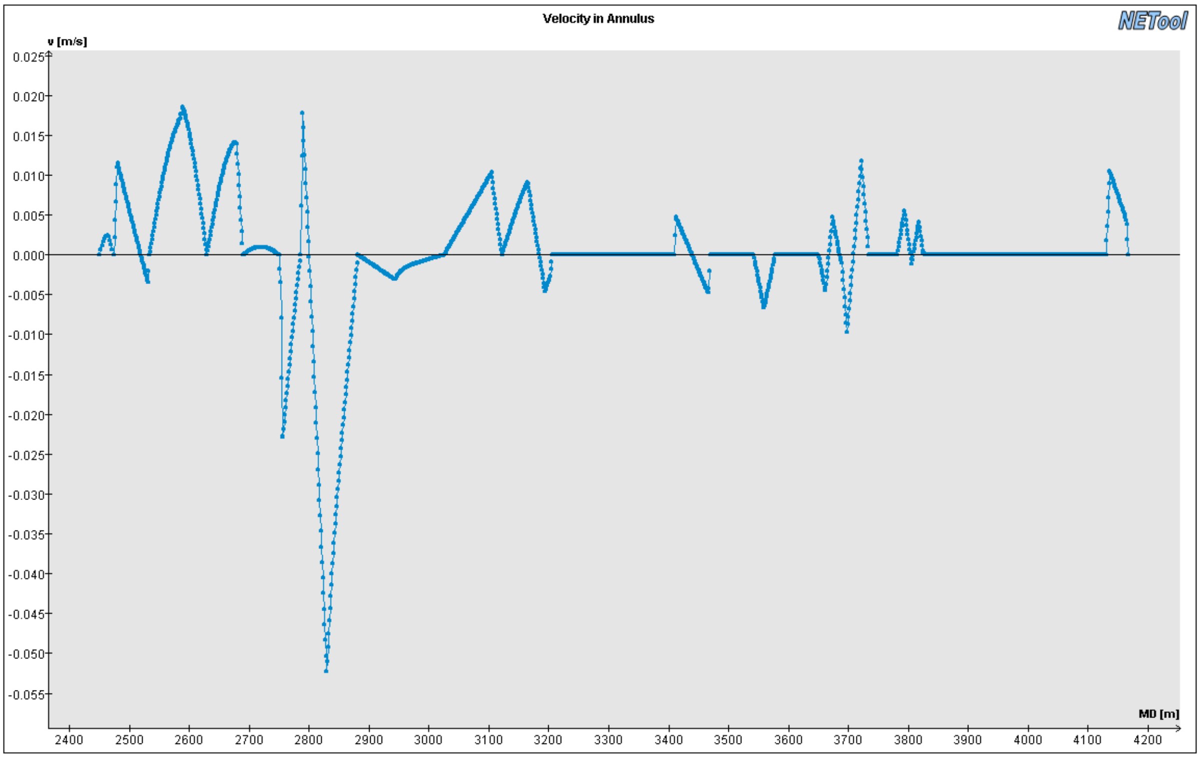

Figure 100 Annular velocity in recommended tailored ICD completion for KP9 2556 days (2020)

4.2.4 Impact from changes in permeability

Well KP9 was simulated with a change in K_h. The change in K_h was a 25% and 50% increase and a 25% reduction in K_h. The ratio between K_V/K_h was kept constant at 0,1. The recommended tailored ICD solution was simulated with a change in permeability and the simulation was done at 2556 days (2020).

From the plot in figure 101 it is apparent that the ICD completion gives an increase in oil production if the permeability is increased. Even though the amount of produced oil is reduced, there is still a benefit from ICDs compared to the open hole case. For the 25% lower permeability case the production of oil is practically the same for the open hole and the ICD case. The reason is that the tailored ICD design is not designed for that permeability. The tailored ICD completion has to be redesigned in the case of a lower permeability. This is a good illustration on the limitation of a tailored completion to the permeability profile. If a 50% increase in permeability is observed, a redesign or remodelling with NETool™ will reveal if there is some extra oil to be gained.

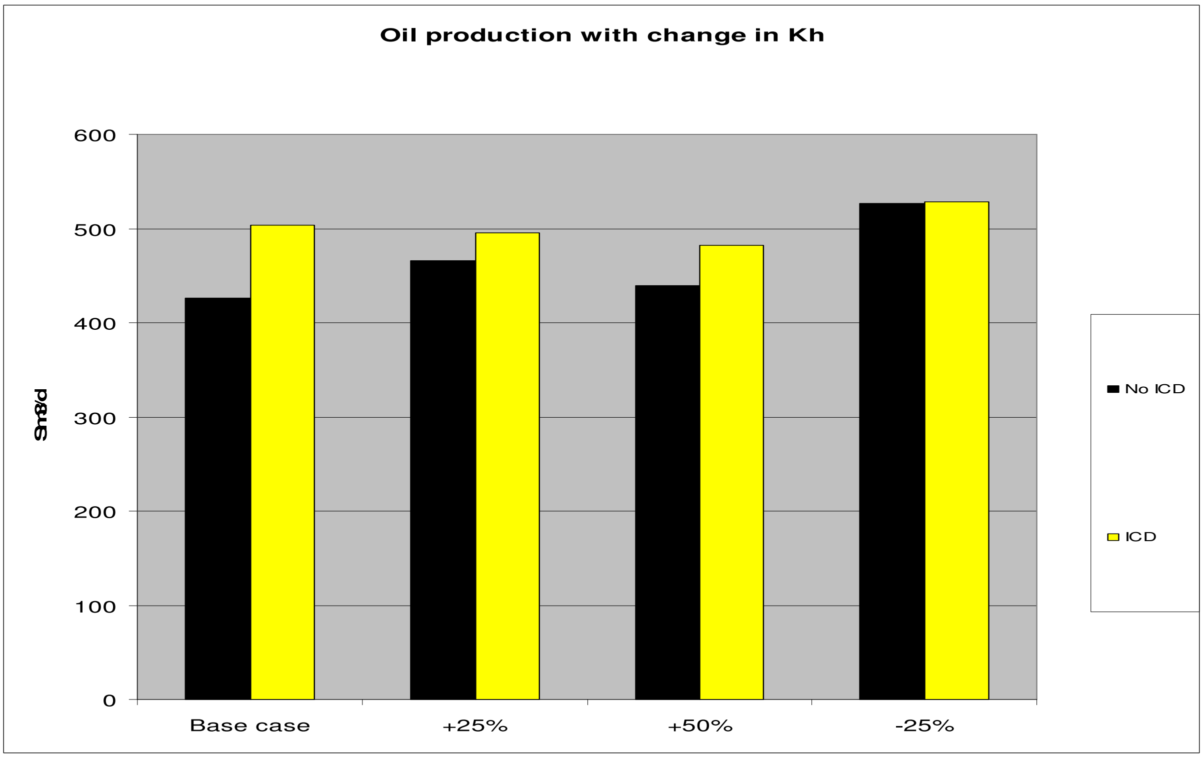

Figure 101 Oil production KP9 with changed permeability, 2556 days (2020)

In figure 102 it is apparent that the tailored ICD completion reduces the water production compared to the open hole case. The reduction of produced water is smaller for the 25% and 50% increase in permeability. If the permeability is lowered by 25% there is no reduction in water production. This is related to the tailored ICD design being heavily dependent on the permeability it is designed for. Redesigning the ICD design is required if a 25% reduction in permeability is experienced after logging the well.

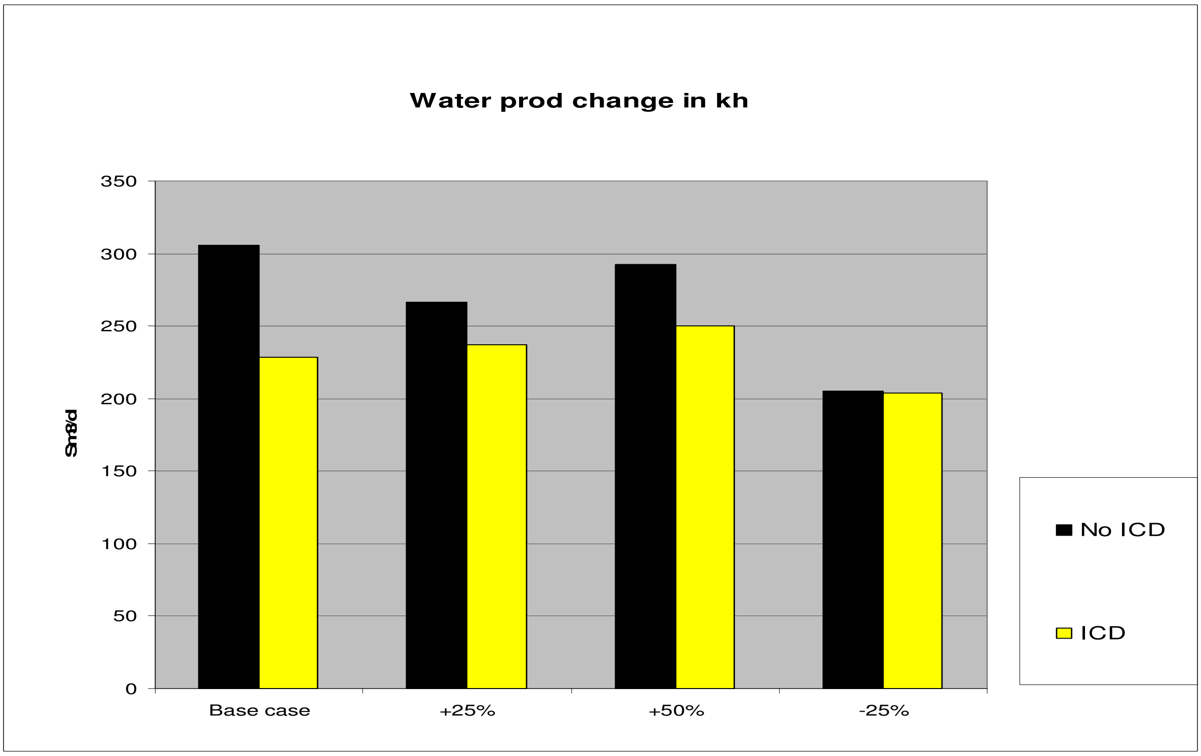

Figure 102 Water production KP9 with changed permeability, 2556 days (2020)

Figure 103 show that a higher permeability creates an increased BHP due to better pressure communication with the well. For the 25% reduction in permeability case, the completion is choking the well without giving any increase in oil or reduction in water production.

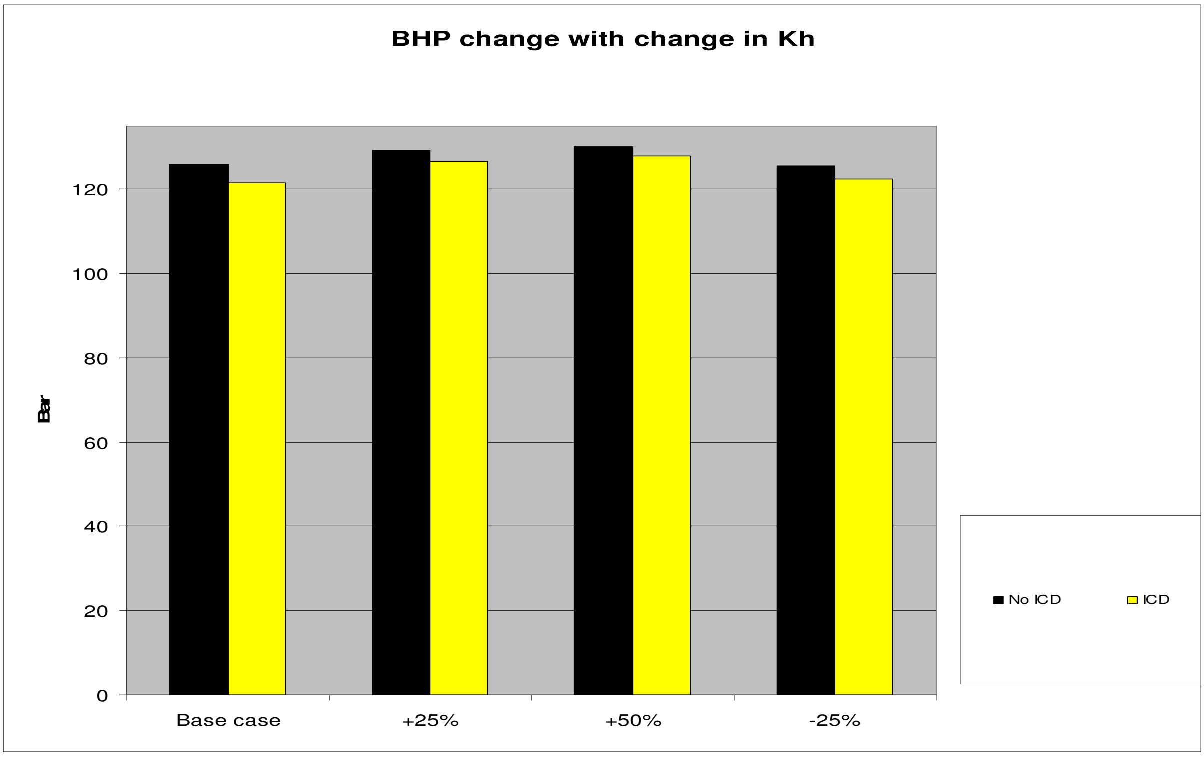

Figure 103 BHP in KP9 with changed permeability, 2556 days (2020)

From these simulated cases of changed permeability it can be concluded that a tailored solution is sensitive to changes in permeability. Especially if the actual permeability is lower than the planned. This is related to the earlier discussed "working window" of the ICD, although now it is the "working window" of the completion that is too narrow. If a uniform ICD setting for KP9 had been run with the same permeability changes, this would not have been this sensitive towards changes in the permeability. If a tailored ICD completion is planned for installation in a well, these types of permeability sensitivities should be run in order to see how sensitive it is to permeability changes. The results do not indicate that the completion installed cannot produce, but that it will not realize the benefits intended. Secondary effects like a more even clean up and reduction of annular flow may still be in place, but they will not show up in the simulations.

4.2.5 Length change for KP9

Sensitivity on well length was also done for well KP9. The result, see section 3.4.3, was clearer and only a shorter well proved to be useable. The reason is that the longer well goes into a higher pressure zone. This causes crossflow downhole and reduced production. For the longer case production of water is increased significantly. This crossflow is undesired and should be prevented, since control of flow in the reservoir is lost.

Water production in KP9 mostly takes place in the toe of the well. Reducing the well length will reduce water and increase oil production. This effect can be seen in figures 69 and 70. An improvement from a shorter well is expected. This improvement indicates that there is possibly something to be gained in KP9 by making the well shorter. Although this is only done in NETool™ a similar effect can be expected from possible Eclipse™ simulations.

All of this leads to that KP9 may have a benefit from a shorter well. However that will have to be studied further. A longer well clearly does not prove any better for KP9.

4.3 Improvements from new technology

Currently there are several ongoing research projects to develop new and better ICD types by the ICD vendors. Some of these new technologies may have a benefit for the Goliat project in terms of increased oil production or reduction in water production. Some technologies that may be beneficial are presented below.

One main focus point in the research is to develop an active ICD system that will react to the fluids being produced or that can be controlled remotely. This may sound similar to an active DHFC system; although for this system an ICD generates the pressure drop. In an active DHFC system the valve part of the system is creating the pressure drop and this can be actively controlled. In the new developments the ICD itself cannot be controlled, but rather a sliding sleeve. The sliding sleeve would introduce a flow restriction and causing more pressure drop, even though the main pressure drop will be generated through the ICD. The system will then be an active controlled ICD system. An example of such an active ICD system is seen the figures 104 and 105. Figure 104 is Baker Hughes sliding sleeve technology. [55]

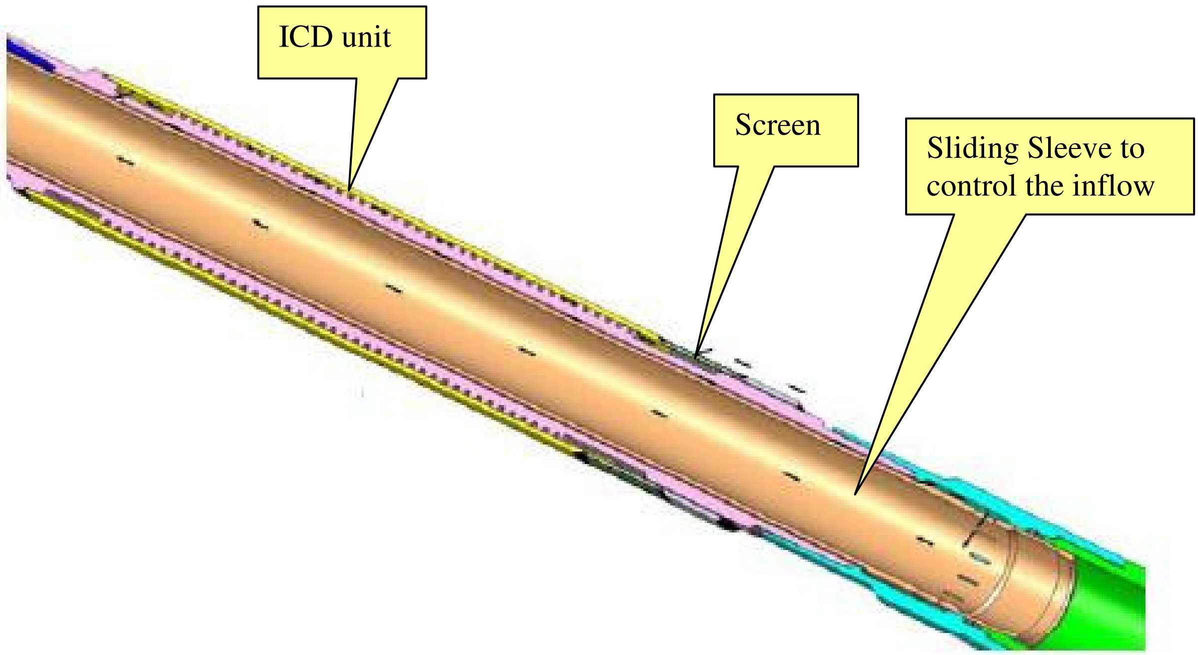

Figure 104 Baker Hughes Sliding sleeve, [55]

The objective with this system is to improve flow control down hole. The main focus areas with this system are; be able to seal off some zones , choke harder or lower in some zones and improve production from low producing zones. This system can be designed to be self actuated, controlled remotely or controlled by wireline intervention. For Goliat a remotely or self actuated system would be ideal, due to the remote location and restrictions on subsea well operations.

In the figure below Tendeka’s FloRight Wireless ICD system is illustrated. This system is remotely operated and uses sliding sleeves to control the ICD system. The system relies on acoustic transmitted signals from the upper completion and down to the Wireless ICD sleeves. Signals are transmitted by an acoustic transmitter; this transmitter is a part of the upper completion and connected by cables to the well head. The system is made up of different layers, were the ICD and screen is the outer layer and the sliding sleeves the inner layer. The screen and ICD is the passive part as in a standard ICD completion. The sliding sleeve makes up the active part and can be controlled to choke the flow if required. The ability to control the inflow and react to changes could significantly improve the performance of a well. This type of system will be able to maintain a more constant flow since it can regulate production from different zones. Keeping the flow more constant may give increased production and recovery over life of the well. Though this system is complex and likely will exhibit some reliability issues to begin with, it still may prove beneficial on Goliat. [56]

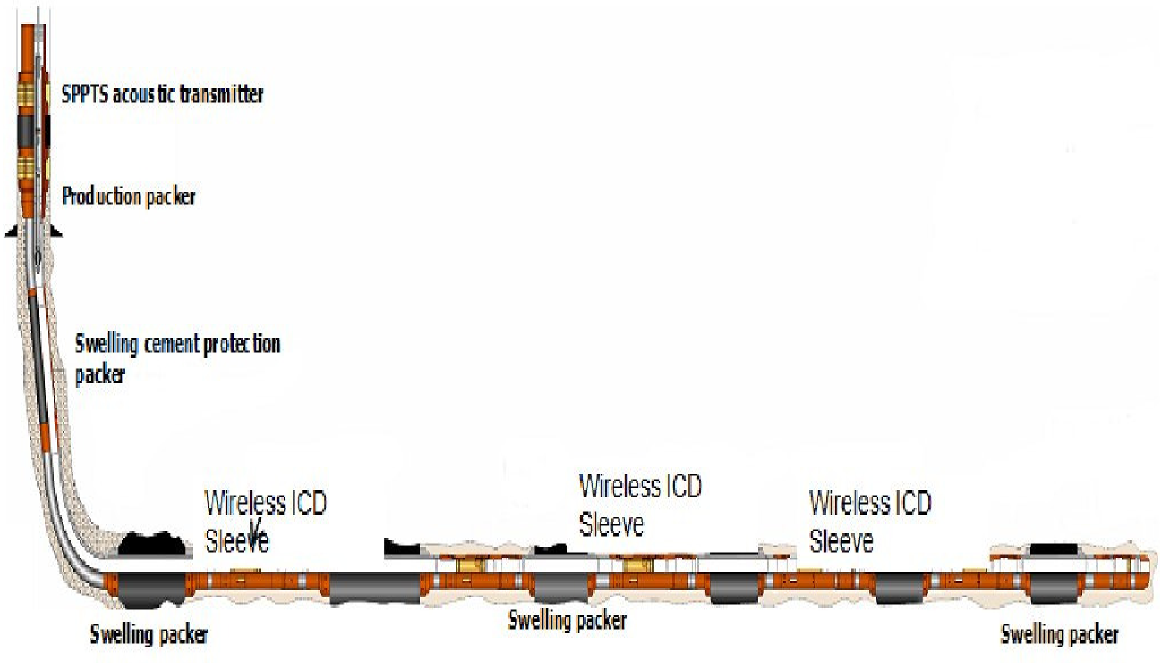

Figure 105 FloRight Wireless ICD System, Tendeka [56]

One type of ICDs that may not have the big impact on production, but rather improve the installation of the lower completion, is ICD check valves. This is basically the same type of ICD already available, but now including a cage and a neutrally buoyant ball that are attached to the ICD. A cage and a neutrally buoyant ball would remove the need for running an inner string (wash pipe) when installing the lower completion; it may further remove the need for installing a deep set barrier valve and prevent fluid losses when running the upper completion. Below is a figure of Tendeka FloCheck^{TM} valve with cage and ball. The ball and the age are not over engineered and ideally they would erode away during production. [38]

Figure 106 FloCheck Insert nozzle and Ball, Tendeka [38]

The check valves will be installed in all ICDs when installing the completion and the ball and the cage should disappear after the well is put on production. The way the system works is that the neutral buoyant balls matches the fluid density of the drilling mud and any pumping on surface will activate the check valve. The flow through the FloCheck^{TM} valve is dependent on the pressure put on the fluid column. The balls will respond to this and seal the ICD if pumping is started and un-check if the pressure is relieved. When pumping in a heavier fluid the balls will try to float on top of the fluid, but due to the pressure created when pumping they will move to the ball seat. When the balls are seated, they will remain there because of differential pressure from inside. When the first nozzles get plugged by the ball the pressure wave will cause the rest of the check valves to close. From the pressure wave a domino effect occurs as more and more nozzles are plugged. To open the ICD the pressure must be relived. To be sure that the check valves work one must monitor the fluid column. If there are no changes observed prior to POOH, the check valves seal the lower completion. The figure 107 shows the FloCheck^{TM} valve with the ball in closed position and in fully opened position. [38, 57]

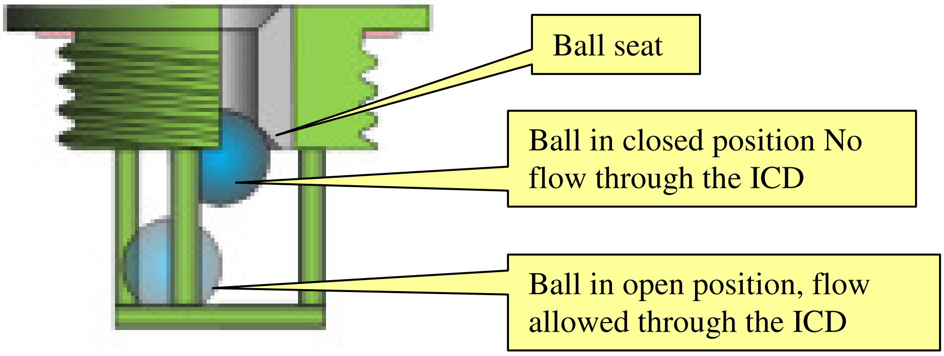

Figure 107 FloCheck ICD valve Tendeka, [38]

Installing an ICD completion with check valves can eliminate the need for a deep set barrier when the upper completion is run. However this is dependent on the well being in overbalance all the time, and that all the ICD check valves are closed.

Possible benefits from this system can be:

- reduced risk of having losses after installing the lower completion
- reduced need for a deep set barrier valve
- ability to pump through the lower completion string when RIH
- the lower completion can be RIH without wash pipe
- packers can be set against the lower completion string, due to the check valves sealing

Another type of ICD that maybe can have a value for Goliat is the new Baker Hughes ICD type, the Equalizer Select^{TM}. This new type of ICD has a different way of creating pressure drop than the selected Resflow^{TM} ICD. It creates the pressure drop over a larger area and not instantaneous like the nozzle type ICDs. Due to this and the different properties of the ICD it may prove a beneficial for oil production or reduce water production. This is dependent on its ability to generate enough pressure drop over the available area. In the thesis there has not been done any simulation with this type of ICD, since the factors governing the ICD performance is considered to be confidential. See section 2.3 and 2.5 for more detailed technical and physical description. [25]

4.4 Results from Eclipse simulations

The results obtained from Eclipse shows there is an effect from installing ICDs in KP7. With the currently available data an effect on the recovery factor is seen. Table 18 below shows that the difference in recovery is small between the ICD completions. The lowest recovery is for the open hole case. It can also be observed that the recovery is higher for all ICD completions, compared to the open hole case. A possible reason for this is the more even influx into the well created by the ICDs. This reduces preferential flow from high productive zones. Restricting high productivity zones is important for most applications, but even more when there is a high degree of reservoir heterogeneity. Well KP7 are placed in the upper Kobbe reservoir, the least heterogenic reservoir on Goliat. Still the heterogeneity plays a role in terms of production from different zones. The effect of heterogeneity is reduced by installing ICDs in the well. A more even influx will allow low productive zones to contribute more to the overall well production. A result of this is increased recovery.

A similar result is seen for the gas production. The open hole case is producing the most gas. It is also apparent that the smallest ICD setting produces the least amount of gas. The low gas production is a result of heavy choking by the small ICD setting. Heavy choking by the ICDs creates a low flowing BHP which will not favour production of gas. This is due to the higher mobility of the gas restricting its flow towards the well with a low flowing BHP. If the well has a high flowing BHP, gas production will be increased and the mobility of the gas allows it to flow more easily towards the well. A small ICD setting will be able to restrict gas production to some degree and a larger nozzle size will encourage oil production.

Another interesting aspect is that the smallest nozzle size will exhibit the highest amount of water production, while controlling the gas. The reason is that the heavy choking creates a high drawdown and a low flowing BHP. A low flowing BHP will cause more water produced, as the water will be “drawn” towards the well. These two effects combined causes water to breakthrough faster in much larger quantities when this happens. Too rapid breakthrough of water is undesirable as it will lead to lower recovery of oil and possible shorting of the wells life. In applications where controlling gas production is more important, increased water production may have to be accepted in order to control the gas. A low flowing BHP combined with a high drawdown will encourage water production.

KP7 Recovery data					
	Oil Cumulative	Oil recovery factor (compared to PDO)		Gas Cumulative	Gas recovery factor (compared to PDO)
Openhole	3 666 317	24,04 %		3 443 158 800	87,72 %
2x2,5mm	3 707 633	24,31 %		3 374 858 500	85,98 %
2x4mm	3 728 115	24,45 %		3 423 153 200	87,21 %
4x4mm	3 747 826	24,58 %		3 429 116 700	87,37 %

Table 18 recovery factor for Oil and gas compared to submitted PDO documentation

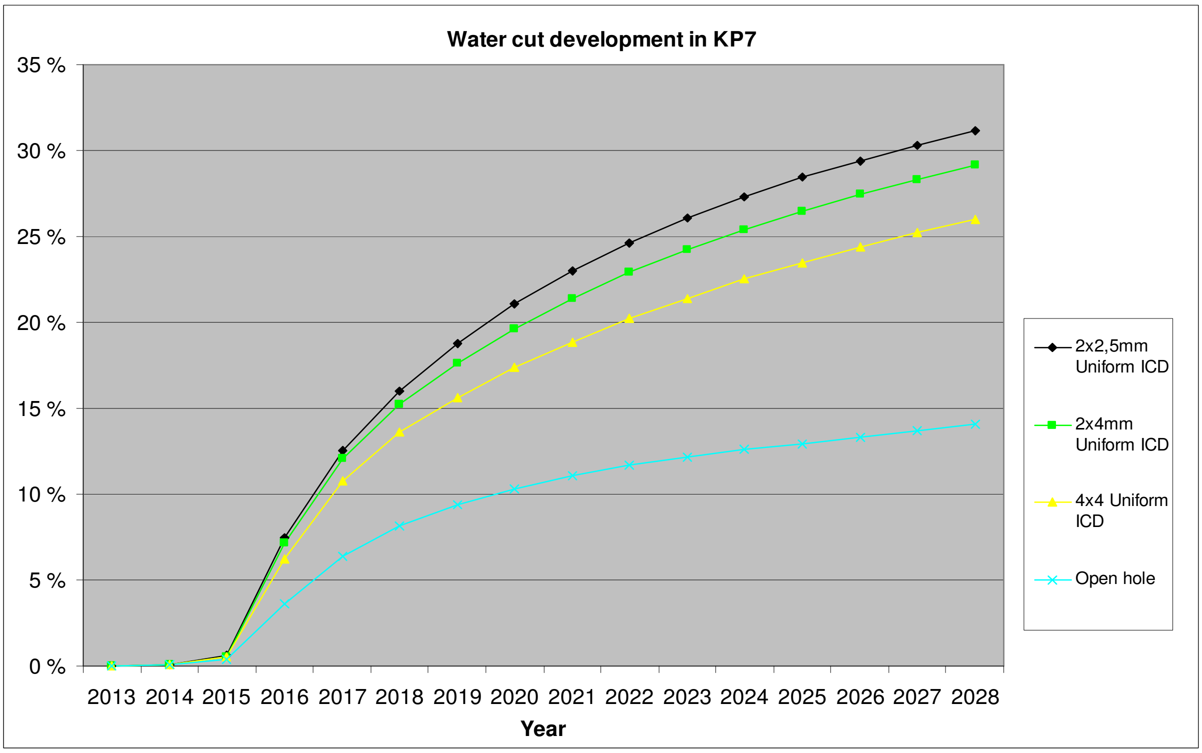

Figure 108 Water cut development in simulated Eclipse™ cases

From the above illustration it is clear that selection of ICD setting will have a large influence on water production. The smallest nozzle size has a much more rapid development in the water cut, i.e. the well is producing more water. The largest ICD has a much slower progression in water cut. The end result quite clearly shows that the effect on the water cut from different ICD settings. If restricting water production is important; a larger ICD setting should be used.

It is also apparent that open hole with no ICDs produces the least amount of water. The reason for low water production with open hole is uncertain as there are several factors influencing the wells water production. One possible explanation is that installing an ICD completion in the well introduces an extra ΔP over the well, which will promote water production. The extra ΔP causes a lower flowing BHP, thus promoting water production. In open hole the flowing BHP would be higher and less favourable for water production. Another possible reason is that the heel-toe effect influences water production, which is mainly taking place in the toe. If this is the case, then water production would increase dramatically when the pressures get more equal. Communication between segments in the reservoir is also influencing well production and may also be a reason for low water production. The Kobbe reservoir on Goliat has a high degree of internal communication and a result is that production form one well will influence production form another well. This influence could possibly allow low production of water from one well and much more in another well. Since only KP7 is studied here, it is not possible to say whether this is the explanation for low water production in open hole. Communication between segments in the reservoir is further discussed in section 4.4.1.

Figure 109 shows the oil rates and total production obtained in Eclipse™ for different completion setups. An open hole case goes off plateau earlier, compared to the 4x4mm and 2x4mm ICD cases. Those two setups experience a longer plateau period and the result of that is seen in the cumulative production curve. The two ICD sizes produce more oil in the early life of the field. Production in early life is a goal for all field developments, as this ensures a quick payback of the CAPEX costs for the field development.

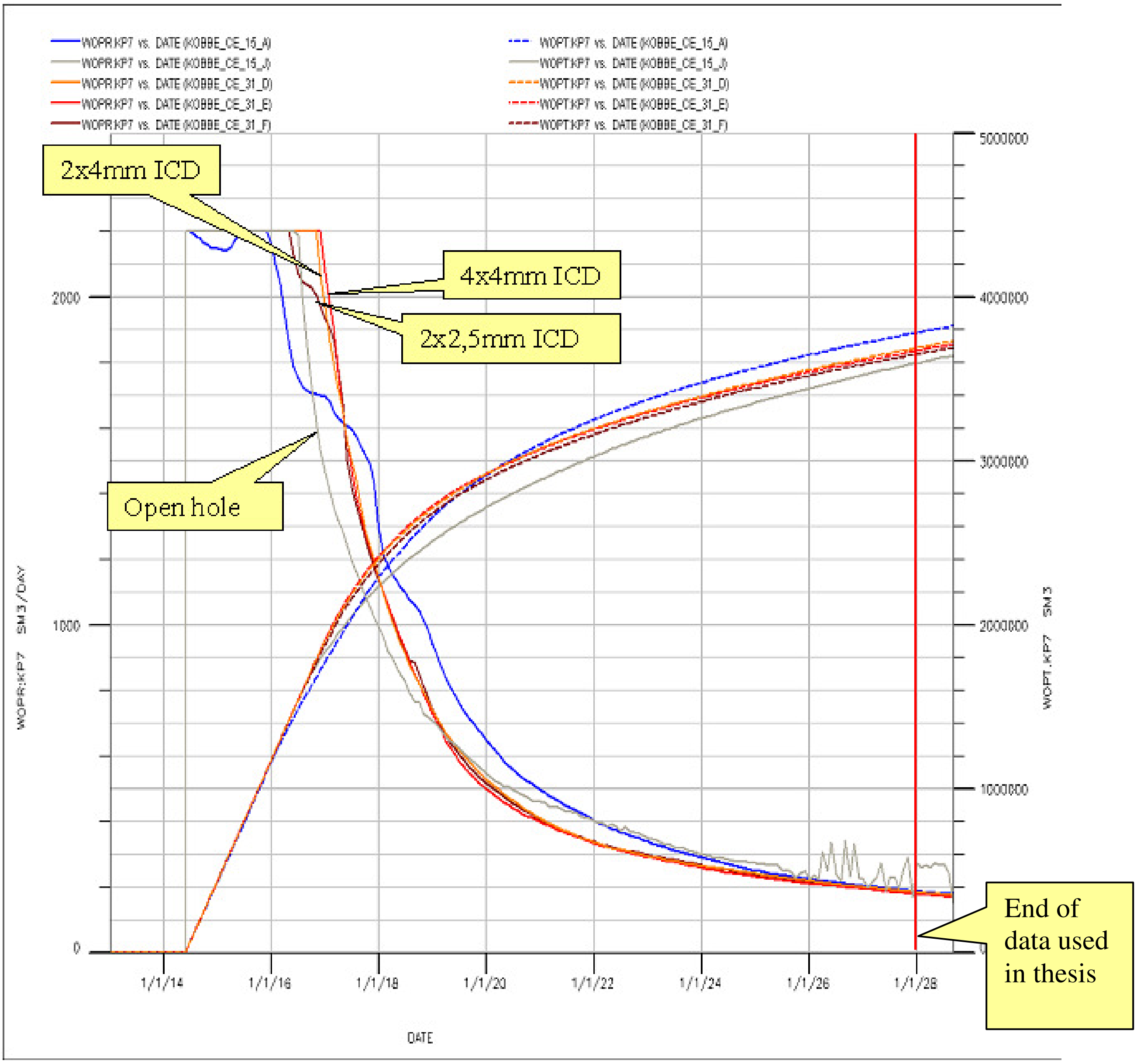

Figure 109 Eclipse results, both daily production rates and cumulative production [58].

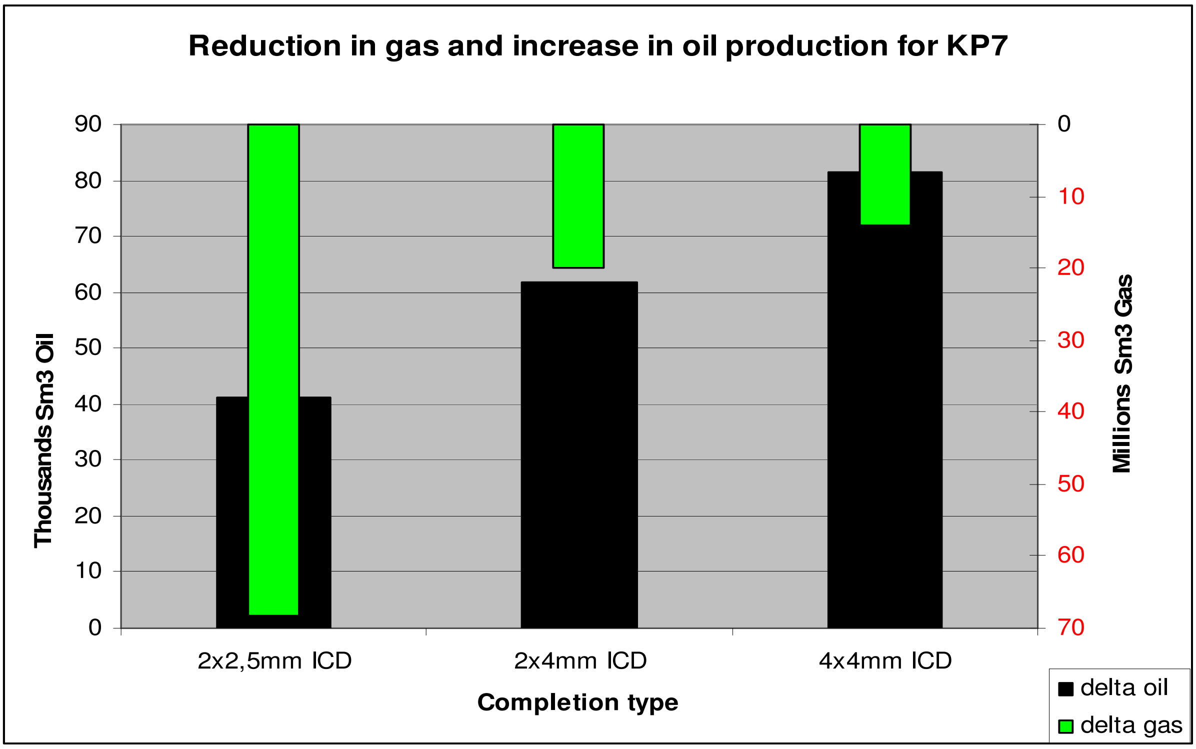

Figure 110 Reduction in gas and increase in oil production by installing ICDs in well KP7 compared to open hole

The above plot highlights the effect on oil and gas production from installing ICDs in KP7. It is apparent that smaller and fewer nozzles will reduce the gas production further. Increased number and larger diameter nozzles will increase the oil production.

KP7 production data from Eclipse							
	Oil [Sm^3]	Water [Sm^3]	Gas [Sm^3]	WCUT	ΔOil [Sm^3]	ΔOil [bbl]	ΔGas [Sm^3]
Openhole	3 666 317	599 696	3 443 158 800	14 %	0	0	0
2x2,5mm	3 707 633	1 676 795	3 374 858 500	31 %	41 317	259 468	68 300 300
2x4mm	3 728 115	1 531 464	3 423 153 200	29 %	61 799	388 096	20 005 600
4x4mm	3 747 826	1 314 746	3 429 116 700	26 %	81 510	511 880	14 042 100

Table 19 production data and comparison with open hole case, from Eclipse™

For KP9 it is not possible to state anything clearly as there are no Eclipse™ results for that well. There are only the results obtained in NETool™, these show a benefit by installing ICDs (see chapter 3.4.1 and 4.2.1)

4.4.1 Difference between NETool™ results and Eclipse™

Communication between segments and wells in the reservoir is an important consideration when simulating different completion types and changing between different software.

On Goliat there is communication between several wells in upper Kobbe, but less so in Lower Kobbe. The consequence is that all the oil producer wells in upper Kobbe must have an ICD completion. Not all wells are in communication with each other. The communication within each segment and the wells can be seen in table 20 below. There is communication between several regions and it has the biggest impact on the wells in upper Kobbe. Most of the oil producers are placed in upper Kobbe. It is this communication that NETool™ does not account of. The recommended completion set up must therefore be run in Eclipse^{TM}. There is little communication between the lower and upper Kobbe reservoirs. These two reservoirs are separated with a shale layer.

Region	Compartment	Unit	Well	In communication with region
1	S3	Upper Kobbe	KP1	4
2	S4	Upper Kobbe	KP4	-
3	C5A	Upper Kobbe	KP5	-
4	M0	Upper Kobbe	KP6	1
			KP7	
5	S3	Lower Kobbe	KP9	6,8
			KP16	
6	S4	Lower Kobbe	KP9	5,8
			KP16	
7	C5A	Lower Kobbe	-	-
8	M0	Lower Kobbe	KP9	5,6
			KP16	

Table 20 Overview of communication in the Kobbe reservoir [1]

From table 20 it is apparent that reservoir communication is important in order to understand the outputs and get accurate and consistent results. When installing ICDs, this communication becomes even more important, since the wells are choked with the installation of ICDs. The flow of oil, gas or water will migrate towards the well with the least resistance to flow. If one well is installed with ICDs and the well in communication does not have ICDs installed, then the production will shift towards the well without ICDs. The well without ICDs has a lower resistance to flow. To mitigate this problem, the wells communicating with each other must all have ICDs. The important aspect in the planning is to define which wells that communicate with each other. Since NETool^{TM} does not see the communication in place it will in some cases be more a completion design tool than a reservoir simulations tool.

Another difference between NETool^{TM} and Eclipse^{TM} is in the detail of the completion design. There are limitations in Eclipse^{TM} simulation capabilities for detailed set ups. More precisely, Eclipse^{TM} can only calculate with one ICD per segment in the reservoir model, see figure 111. This restricts the possibility of simulating the same completion in NETool^{TM} and Eclipse^{TM}. To mitigate this, an Eclipse^{TM} useable input must be made. This input can be seen in table 5. NETool^{TM} calculates in more detailed the actual completion to be installed. The results from NETool^{TM} are more detailed and useable in planning of the completion work. The difference in input is not believed to have a huge impact on the performance and reliability of the simulations.

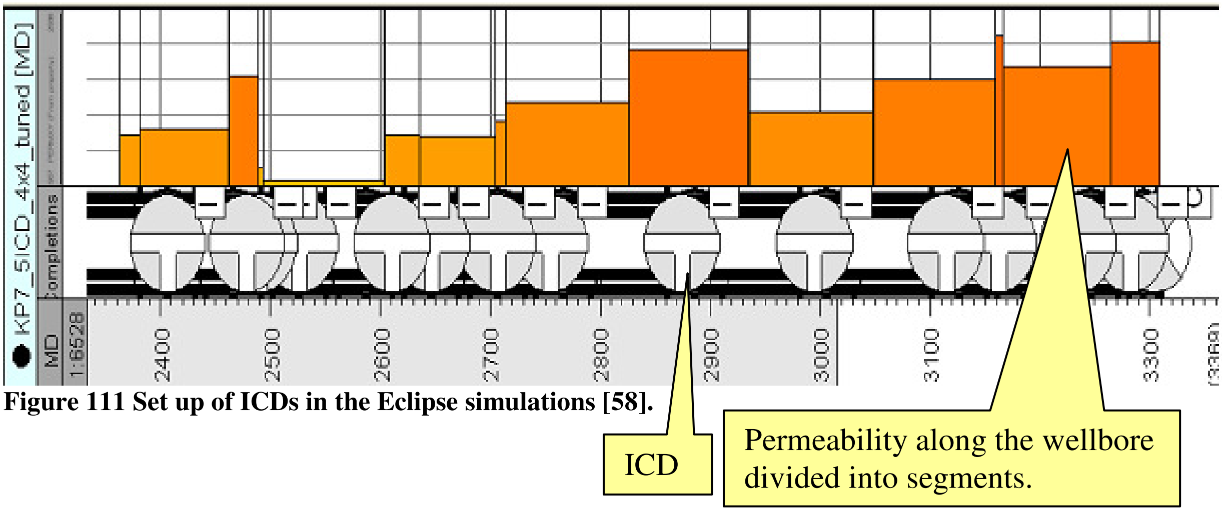

Figure 111 Set up of ICDs in the Eclipse simulations [58].

Applied constraints when simulating in NETool™ is influencing the results obtained. Use of the right constraint is important for obtaining results that are reliable and reasonable. When to use constraints is sometimes hard to define, as it is dependent on what is intended to study with the simulation. If changes in permeability are studied, using BHP or tubing head pressure would be the best solution. The effect on oil, gas and water production will clearly be seen. If the well is run by an oil, gas or water constraint, the effect of permeability change will be hidden. The reason is that a change in permeability will change the production of oil, gas or water. Constraining the well by one of the mentioned inputs will mask the result. To mitigate this, BHP or tubing head pressure must be used.

Chapter 5 Conclusion and recommendations

5.1 Conclusions

A substantial amount of papers, presentations and reports on ICD technology has been reviewed for the thesis (see reference). The review generally indicates a positive benefit on oil, water and gas production from installation of ICDs. It has also been shown that ICDs will smoothen/equalize the inflow along the wellbore. ICDs will create a better and more uniform cleanup of the well.

From the reviewed literature and simulations work it is clear that an ICD completion is a simple and reliable solution for the Goliat oil wells studied. ICDs have proven to be beneficial for optimizing oil, gas and water production in several other fields.

The different ICD types available today have different applications dependent on choking requirement and viscosity dependency. LOVICD types are viscosity dependent, while HIVICD types are viscosity independent. From the literature review only one failure of an ICD completion have been found.

NETool^{TM} simulations have been performed for both the wells studied in the thesis. Results from the simulations shows a benefit from installing ICDs in both wells. Recovery factor for KP7 is increased (+0,54%) compared to recovery with an open hole completion. Increased oil production and reduced water production is expected. Reduction in gas production is difficult to achieve because of gas re-injection and low GOR.

Simulations indicate that a uniform ICD nozzle setting is the best option for KP7 and a tailored (varying) ICD nozzle setting is the best choice for KP9. A recommended lower completion design has been proposed for both wells. For KP7 a lower completion ICD design with a 4x4mm ICDs, varying packer spacing and blank pipe for isolating a high permeable zone is recommended. For KP9 a lower completion ICD design with 2x2,5mm, 4x1,6mm and 4x4mm ICDs, varying packer spacing and blank pipe for isolating a high permeable zone is recommended. An option for KP9 is a 4x4mm uniform ICD setting. Blank pipe and swell packers have shown a positive effect on reduction of water production and for isolating zones with no production.

Compartmentalisation is important for the effect of an ICD completion. The effect of the completion is reduced significantly if no annular isolation is used. The risk of sand production will increase if no open hole packers are installed, due to increased annular flow.

Sensitivities on permeability changes proved that a uniform ICD setting is robust towards changes in permeability. A varying ICD solution is more sensitive to lower permeability. If there is large uncertainty in the permeability, a uniform solution will be able to handle a wider range of permeabilities than a varying solution.

A change in screen size from 6 5/8” to 5 ½” screen size did neither prove beneficial nor detrimental for either well. Although a 6 5/8” screen will have higher annular velocity.

The sensitivity on risk of nozzle erosion shows that the smallest nozzle sizes may experience erosion. The recommended ICD sizing for both wells are not in danger of nozzle erosion. The risk of screen erosion is significantly reduced compared to a similar completion without ICDs.

The risk of screen erosion is deemed to be low for both the recommended ICD completion set ups.

Sensitivity on changing reservoir section length for well KP7 proved possible benefits for both a longer and a shorter well. A shorter well gave less water production in the simulations. From the simulations it is hard to conclude which length option is the best. Investigation of a length change in KP9 proved only beneficial for a shorter well. Severe cross flow was observed with a longer well and cannot be recommended.

5.2 Recommendations

NETool^{TM} simulations should be done for every well planned with ICDs. Simulations should include nozzle sensitivities, uniform vs. varied ICDs, sensitivities to changes in permeability and sensitivities to changes in reservoir fluid properties.

Installation of ICDs in Goliat multilateral wells should be considered and simulated in NETool^{TM}. Benefits from installing ICDs in multilateral wells have been found in the literature review.

Further studies on well placement and length changes in Eclipse^{TM} for KP7, KP9 and other producer wells are recommended for further verification of NETool^{TM} results obtained.

Purchasing the NETool^{TM} ICD simulation software for in-house work should be considered.

During master thesis work differences in well trajectory were found for both wells studied. The differences were corrected during the work. It is recommended that well placement and trajectories in Drilling and Subsurface departments are checked and compared.

It is recommended to have good understanding and ownership in place for the ICD design process prior to start drilling of wells.

Understanding the relationship between the ICDs configuration and the formation permeability is very important for success in implementing an ICD completion.

Continuing the good cooperation between Drilling and Subsurface, as it has been during this thesis, is important for the success in well delivery & production of the wells on Goliat.

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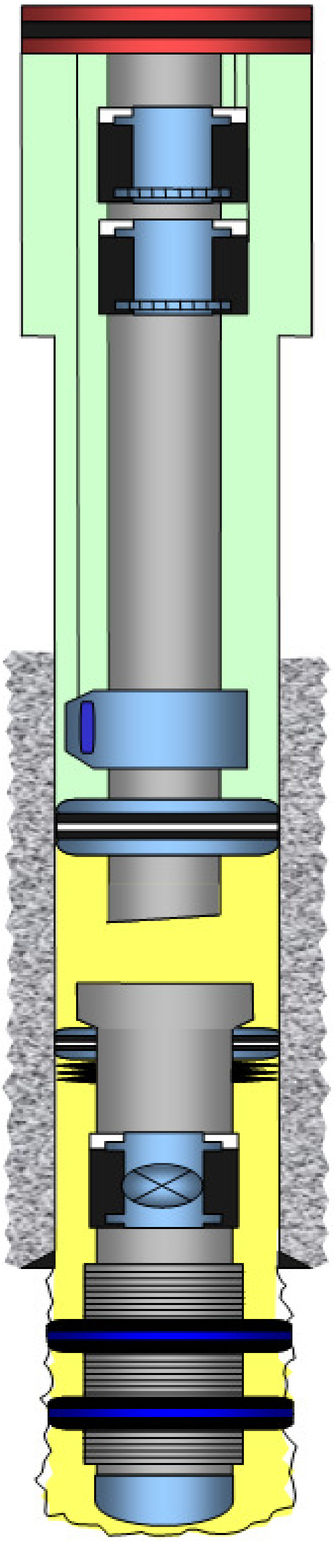
List of Figures

List of Tables

Appendixes

A.1 Well Completion Schematic for Kobbe OP

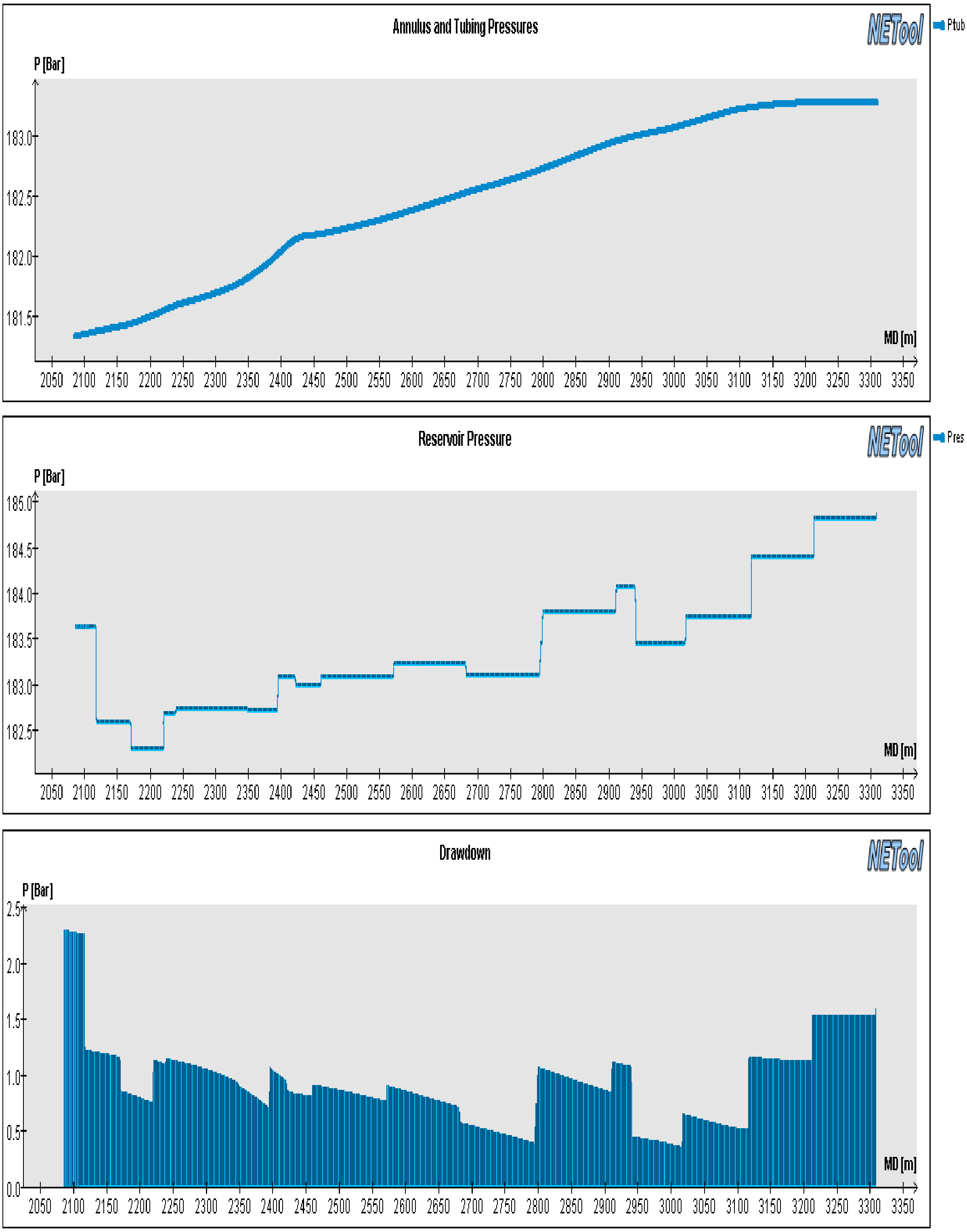


Completion Schematic for all OP wells in Kobbe.

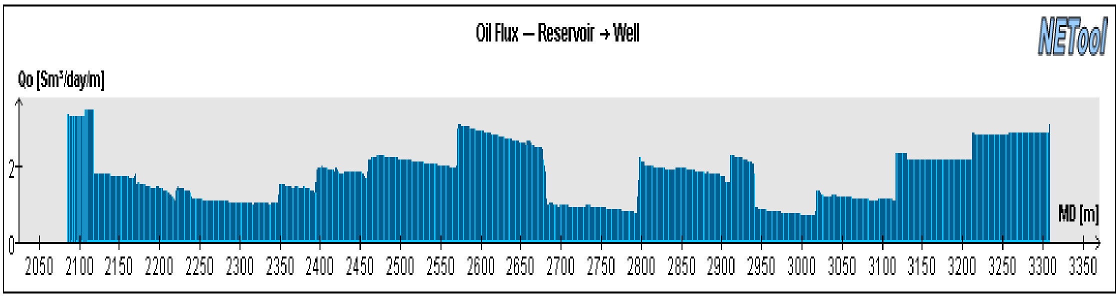
A.2 Plots for well KP7, 730 days, initial case with Open Hole

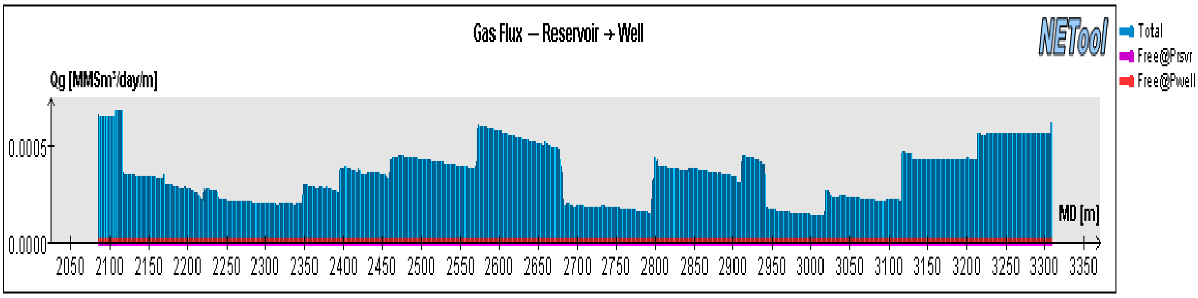
Completion overview for the initial case:

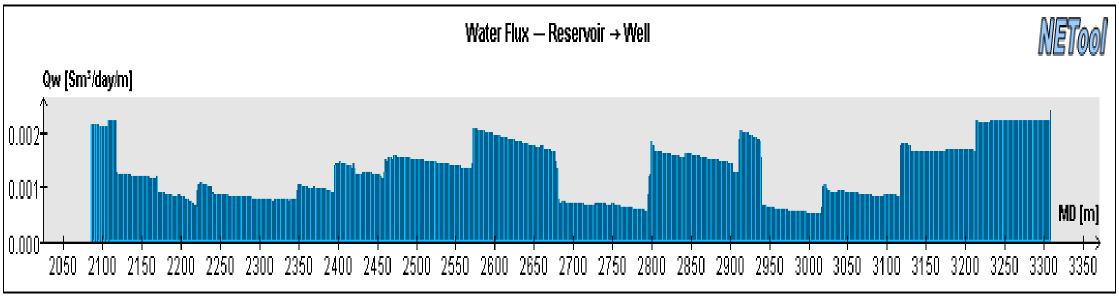
Seg #	Segment Top MD	Segment Length	Segment Type	Well Hole Size	Has Annulus	Seg #	Segment Top MD	Segment Length	Segment Type	Well Hole Size	Has Annulus
	[m]	[m]		[mm]		[m]	[m]		[mm]		
1	2085	0.3	Cemented	215.9	No	54	2721	12	Open hole	215.9	No
2	2085.3	23.7	Open hole	215.9	No	55	2733	12	Open hole	215.9	No
3	2109	12	Open hole	215.9	No	56	2745	12	Open hole	215.9	No
4	2121	12	Open hole	215.9	No	57	2757	12	Open hole	215.9	No
5	2133	12	Open hole	215.9	No	58	2769	12	Open hole	215.9	No
6	2145	12	Open hole	215.9	No	59	2781	12	Open hole	215.9	No
7	2157	12	Open hole	215.9	No	60	2793	12	Open hole	215.9	No
8	2169	12	Open hole	215.9	No	61	2805	12	Open hole	215.9	No
9	2181	12	Open hole	215.9	No	62	2817	12	Open hole	215.9	No
10	2193	12	Open hole	215.9	No	63	2829	12	Open hole	215.9	No
11	2205	12	Open hole	215.9	No	64	2841	12	Open hole	215.9	No
12	2217	12	Open hole	215.9	No	65	2853	12	Open hole	215.9	No
13	2229	12	Open hole	215.9	No	66	2865	12	Open hole	215.9	No
14	2241	12	Open hole	215.9	No	67	2877	12	Open hole	215.9	No
15	2253	12	Open hole	215.9	No	68	2889	12	Open hole	215.9	No
16	2265	12	Open hole	215.9	No	69	2901	12	Open hole	215.9	No
17	2277	12	Open hole	215.9	No	70	2913	12	Open hole	215.9	No
18	2289	12	Open hole	215.9	No	71	2925	12	Open hole	215.9	No
19	2301	12	Open hole	215.9	No	72	2937	12	Open hole	215.9	No
20	2313	12	Open hole	215.9	No	73	2949	12	Open hole	215.9	No
21	2325	12	Open hole	215.9	No	74	2961	12	Open hole	215.9	No
22	2337	12	Open hole	215.9	No	75	2973	12	Open hole	215.9	No
23	2349	12	Open hole	215.9	No	76	2985	12	Open hole	215.9	No
24	2361	12	Open hole	215.9	No	77	2997	12	Open hole	215.9	No
25	2373	12	Open hole	215.9	No	78	3009	12	Open hole	215.9	No
26	2385	12	Open hole	215.9	No	79	3021	12	Open hole	215.9	No
27	2397	12	Open hole	215.9	No	80	3033	12	Open hole	215.9	No
28	2409	12	Open hole	215.9	No	81	3045	12	Open hole	215.9	No
29	2421	12	Open hole	215.9	No	82	3057	12	Open hole	215.9	No
30	2433	12	Open hole	215.9	No	83	3069	12	Open hole	215.9	No
31	2445	12	Open hole	215.9	No	84	3081	12	Open hole	215.9	No
32	2457	12	Open hole	215.9	No	85	3093	12	Open hole	215.9	No
33	2469	12	Open hole	215.9	No	86	3105	12	Open hole	215.9	No
34	2481	12	Open hole	215.9	No	87	3117	12	Open hole	215.9	No
35	2493	12	Open hole	215.9	No	88	3129	12	Open hole	215.9	No
36	2505	12	Open hole	215.9	No	89	3141	12	Open hole	215.9	No
37	2517	12	Open hole	215.9	No	90	3153	12	Open hole	215.9	No
38	2529	12	Open hole	215.9	No	91	3165	12	Open hole	215.9	No
39	2541	12	Open hole	215.9	No	92	3177	12	Open hole	215.9	No
40	2553	12	Open hole	215.9	No	93	3189	12	Open hole	215.9	No
41	2565	12	Open hole	215.9	No	94	3201	12	Open hole	215.9	No
42	2577	12	Open hole	215.9	No	95	3213	12	Open hole	215.9	No
43	2589	12	Open hole	215.9	No	96	3225	12	Open hole	215.9	No
44	2601	12	Open hole	215.9	No	97	3237	12	Open hole	215.9	No
45	2613	12	Open hole	215.9	No	98	3249	12	Open hole	215.9	No
46	2625	12	Open hole	215.9	No	99	3261	12	Open hole	215.9	No
47	2637	12	Open hole	215.9	No	100	3273	12	Open hole	215.9	No
48	2649	12	Open hole	215.9	No	101	3285	12	Open hole	215.9	No
49	2661	12	Open hole	215.9	No	102	3297	12,4	Open hole	215.9	No
50	2673	12	Open hole	215.9	No	TOE	3309				
51	2685	12	Open hole	215.9	No						
52	2697	12	Open hole	215.9	No						
53	2709	12	Open hole	215.9	No						

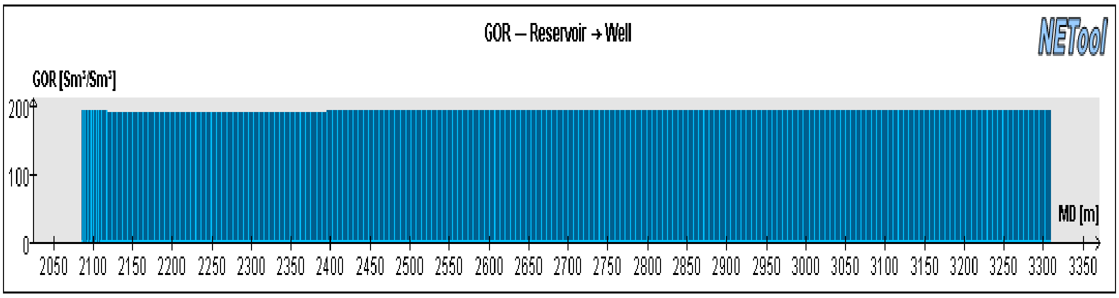


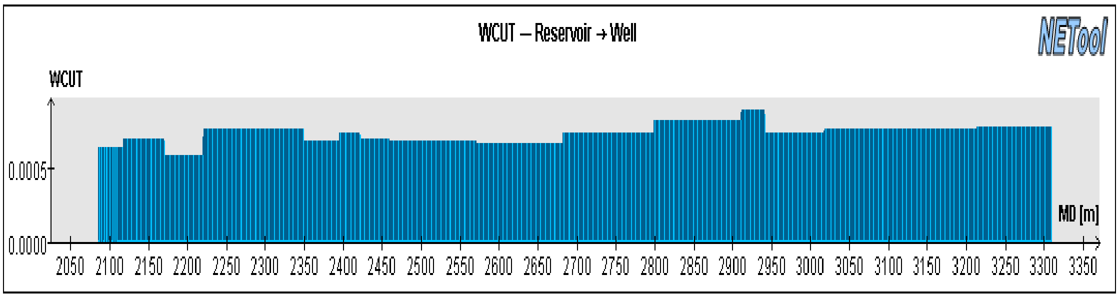
Annulus and tubing pressure, Reservoir pressure and Dradown. What this plot shows is how the different pressures develop along the wellbore, with the heel at the left and the toe to the right The top figure is showing the annulus and tubing pressure present. The second one how the reservoir pressure is behaving along the well. The third is showing the drawdown in the well.



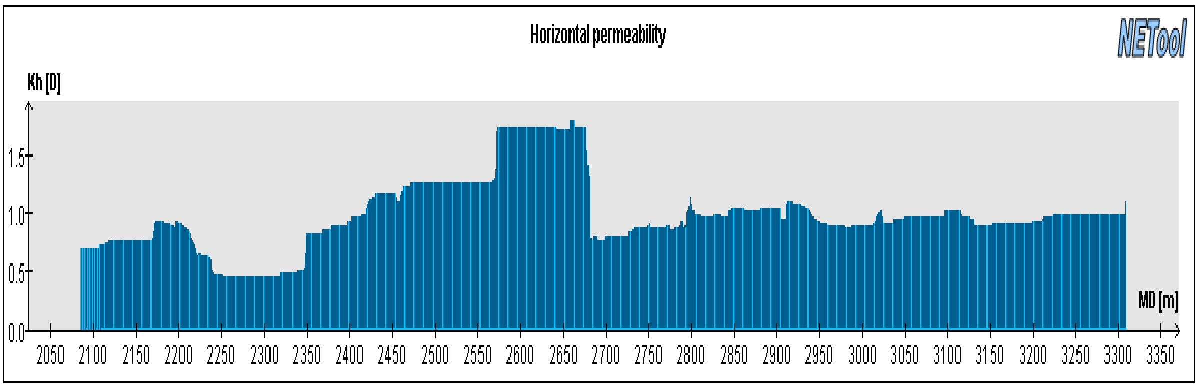


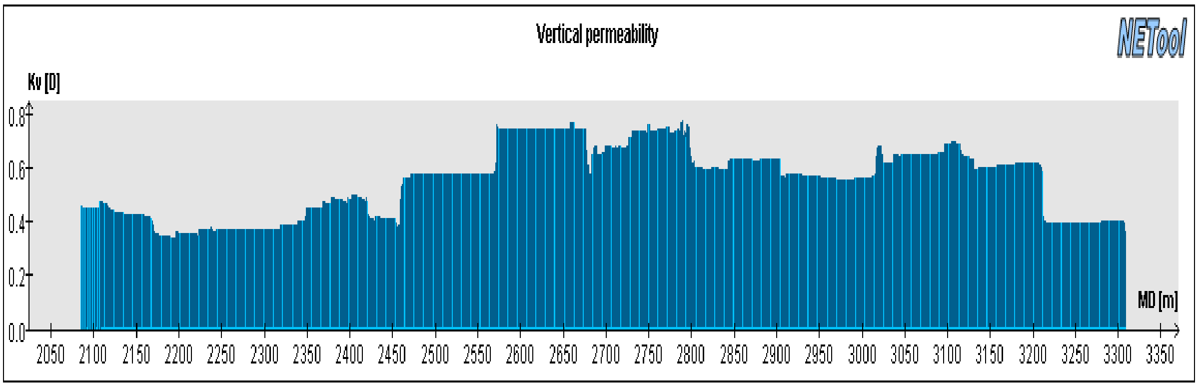


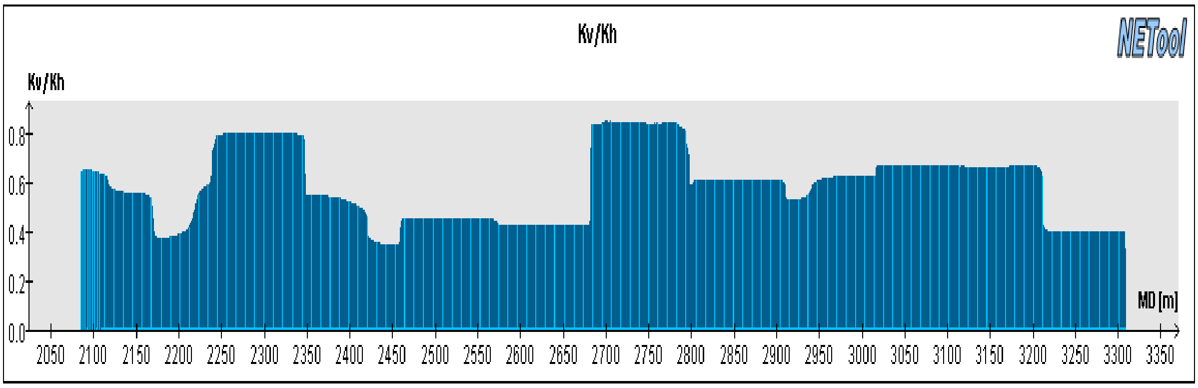


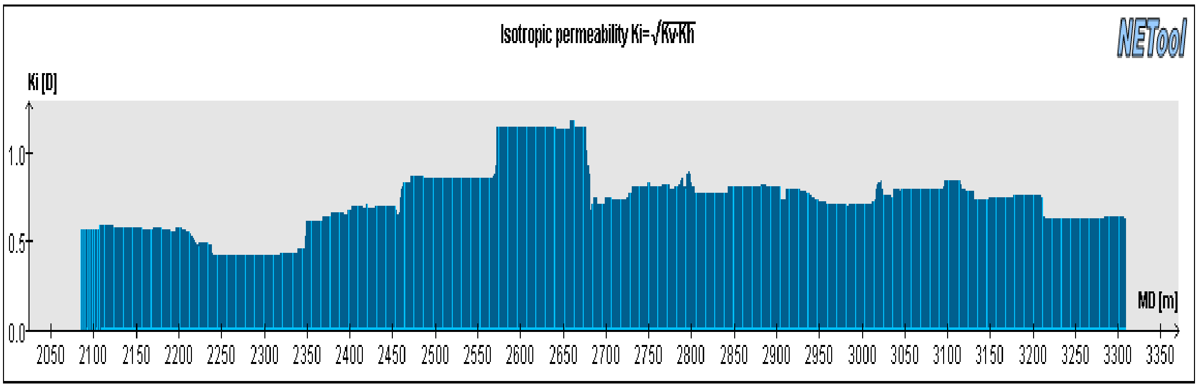


This plot here is showing the influx of oil, gas and water from the reservoir and into the well. As well as the GOR and the water cut. All plots are along the wellbore. What it shows us is how much of oil, gas and water is flowing into the well from the reservoir. Units are in Sm^3/d for oil and water, while gas is measured in $MMSm^3/d$

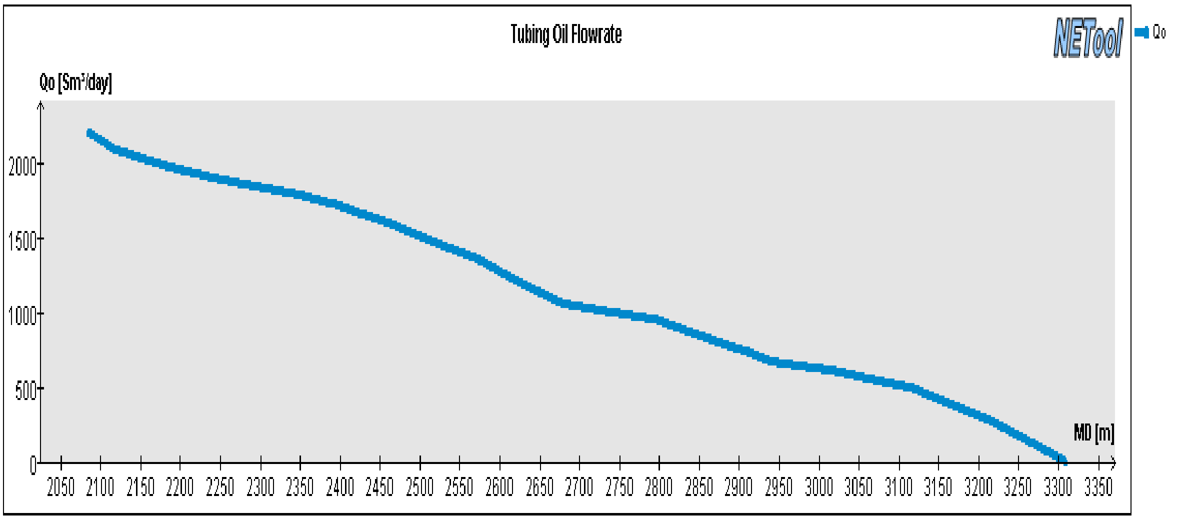


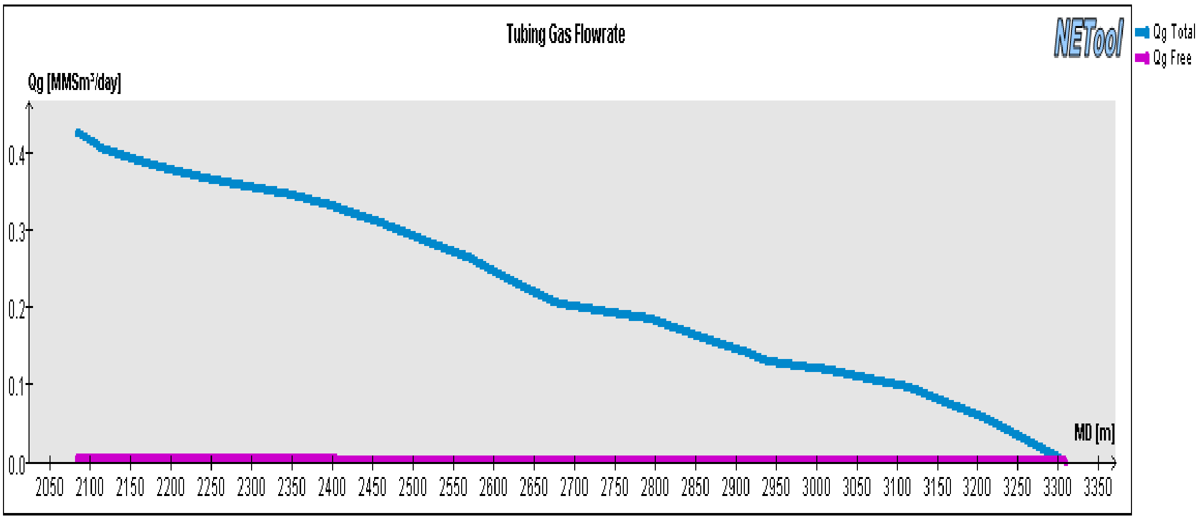


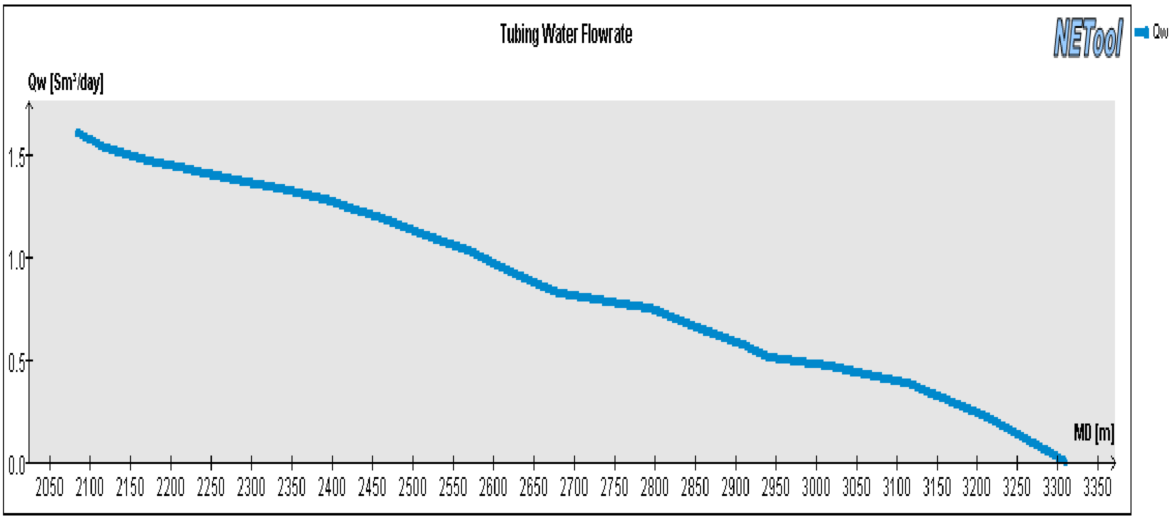




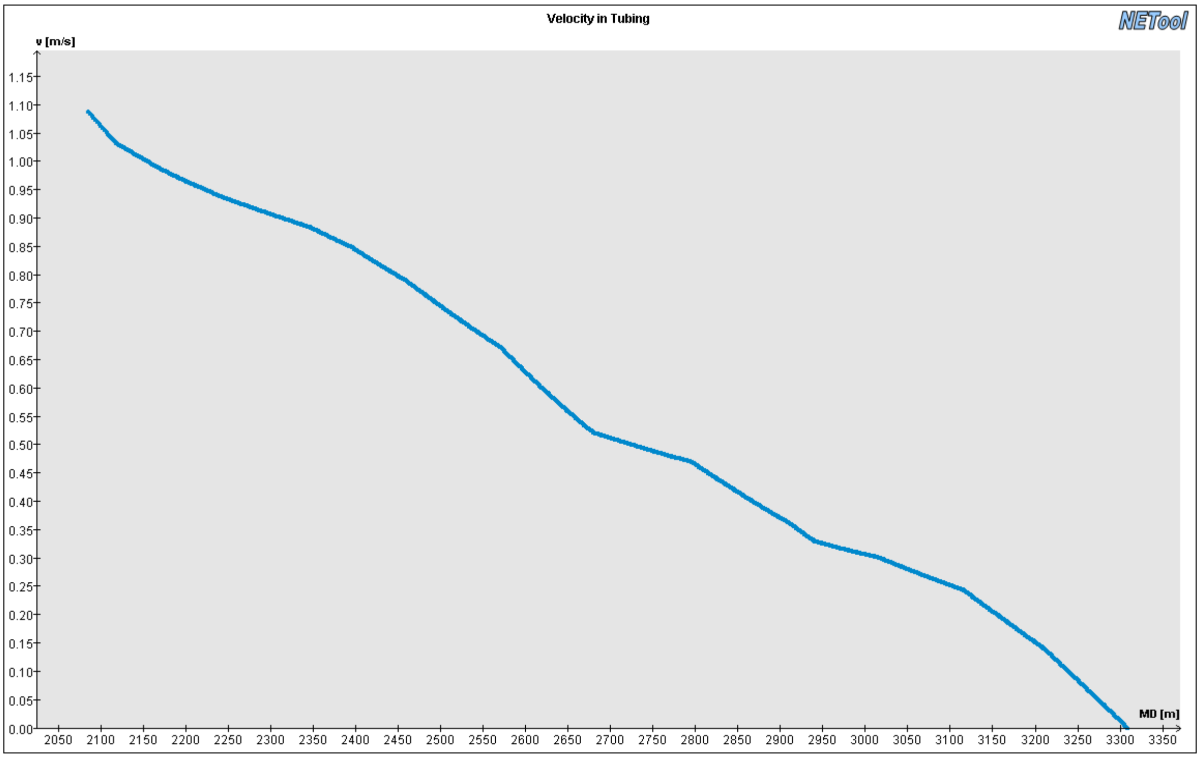
This plot here shows the permeability for the well, from heel to toe. This permeability plot will be the permeability present in most simulations run. It can from the plot be seen a good permeability and the level of heterogeneity is medium.



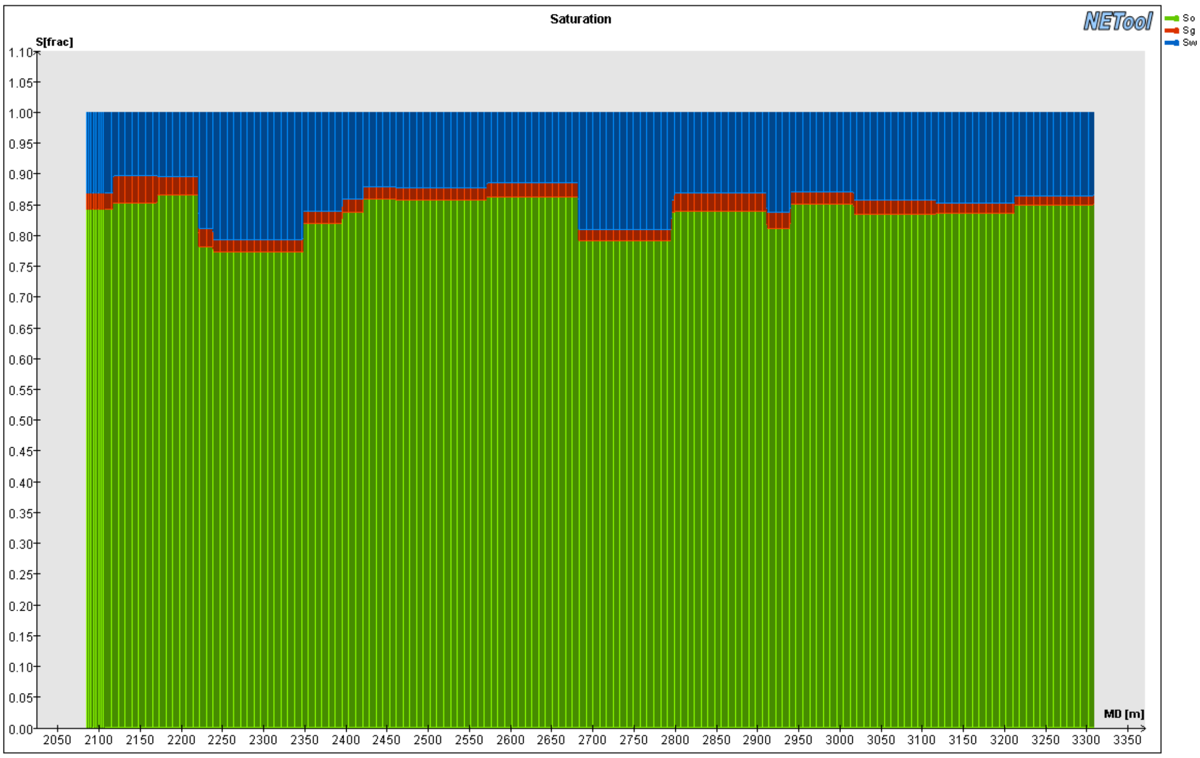




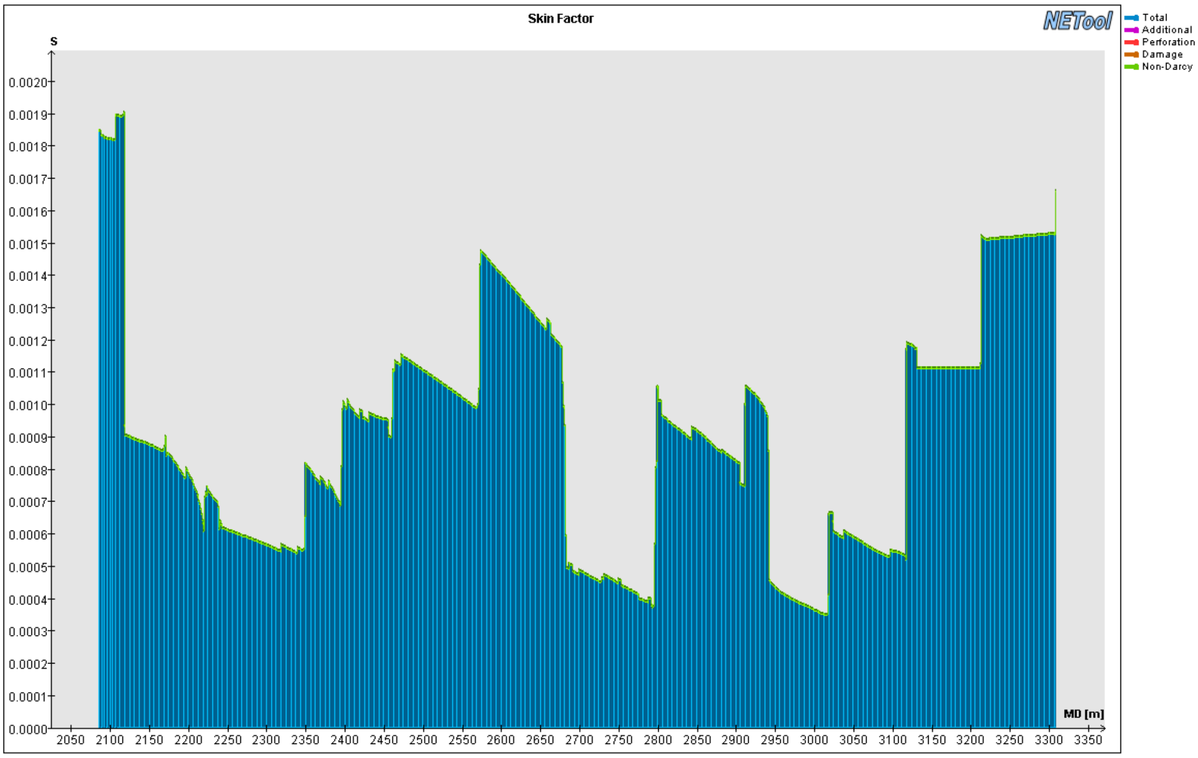
This plot is showing the tubing flow of oil, gas and water. It is a cumulative plot going from the toe at the right towards the heel at the left. It is ending up at the amount of produced oil, gas and water through the tubing.



This plot is showing the velocity in the tubing. Going from the toe at the right a to the heel at the left side. The highest velocity is seen at the heel part were the flow is highest.



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations. We see the plot going from the toe too the heel part of the well. At this initial stage the oil saturation is high, but it will decrease towards the late life of the well.

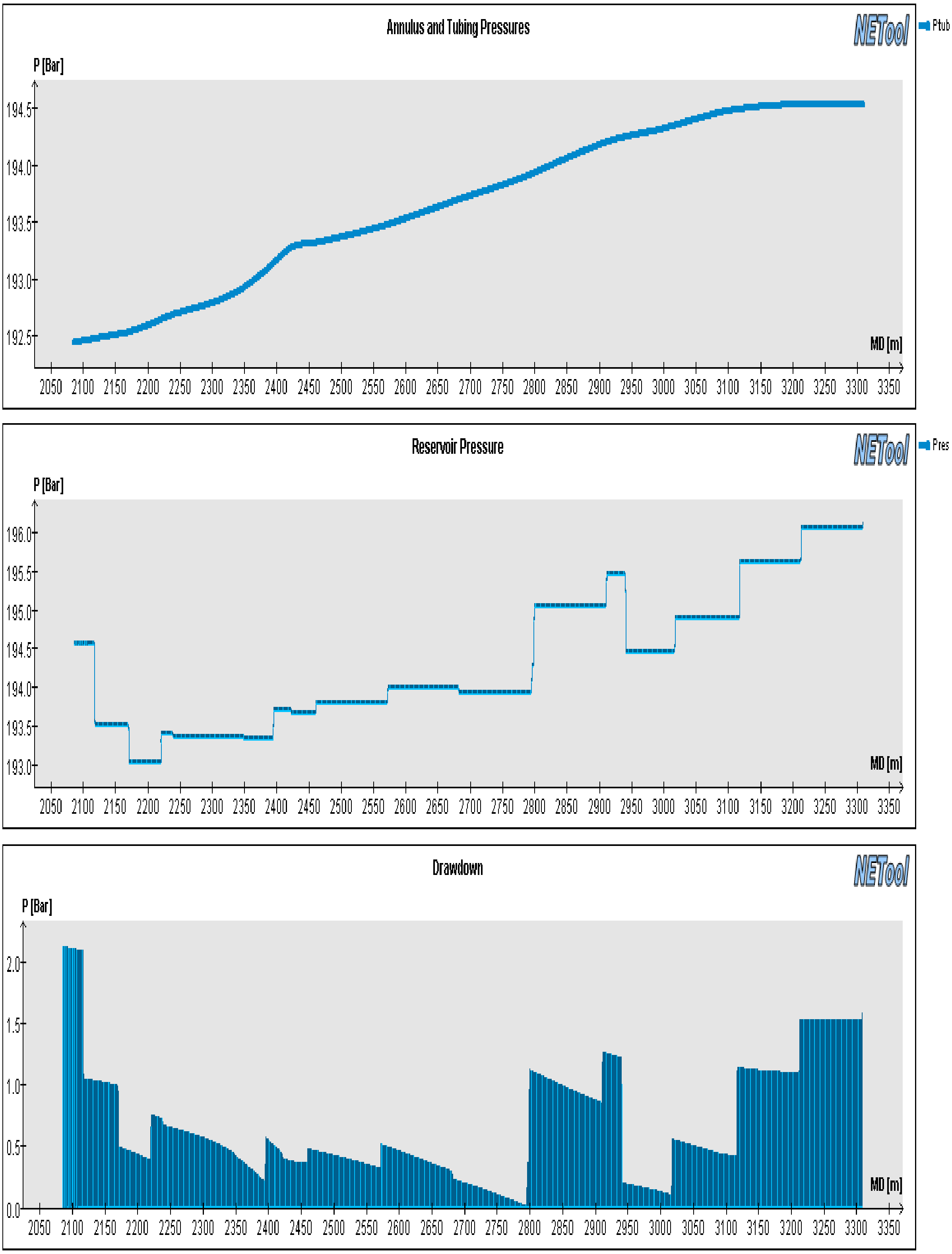


This plot is showing the skin factor in the model along the wellbore. The plot is going from the toe at the right and towards the heel at the left. From the scale it can be seen that there is little skin in the well.

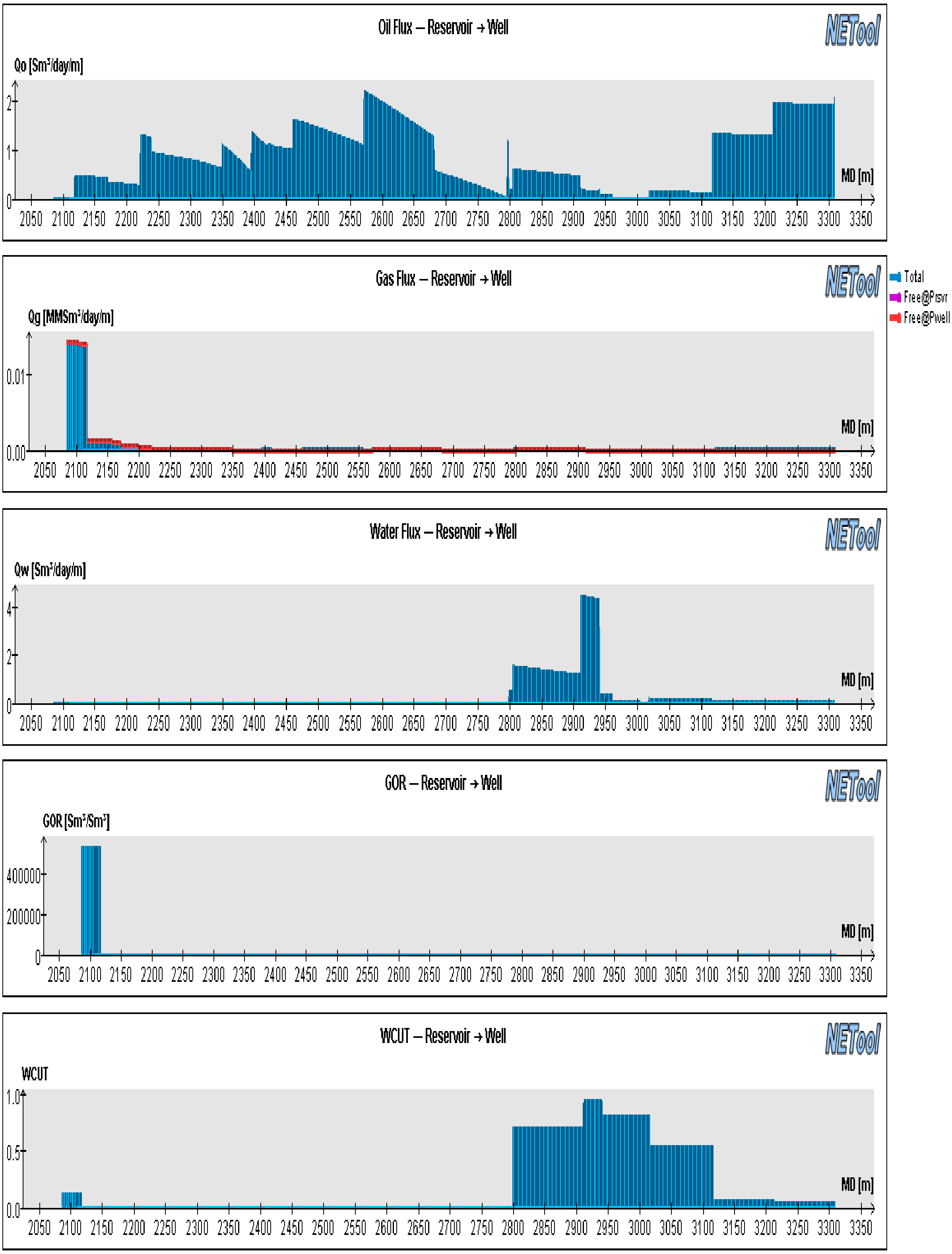
A.3 Plots for well KP7, 1826 days, reference case with Open Hole

Completion overview for the reference case:

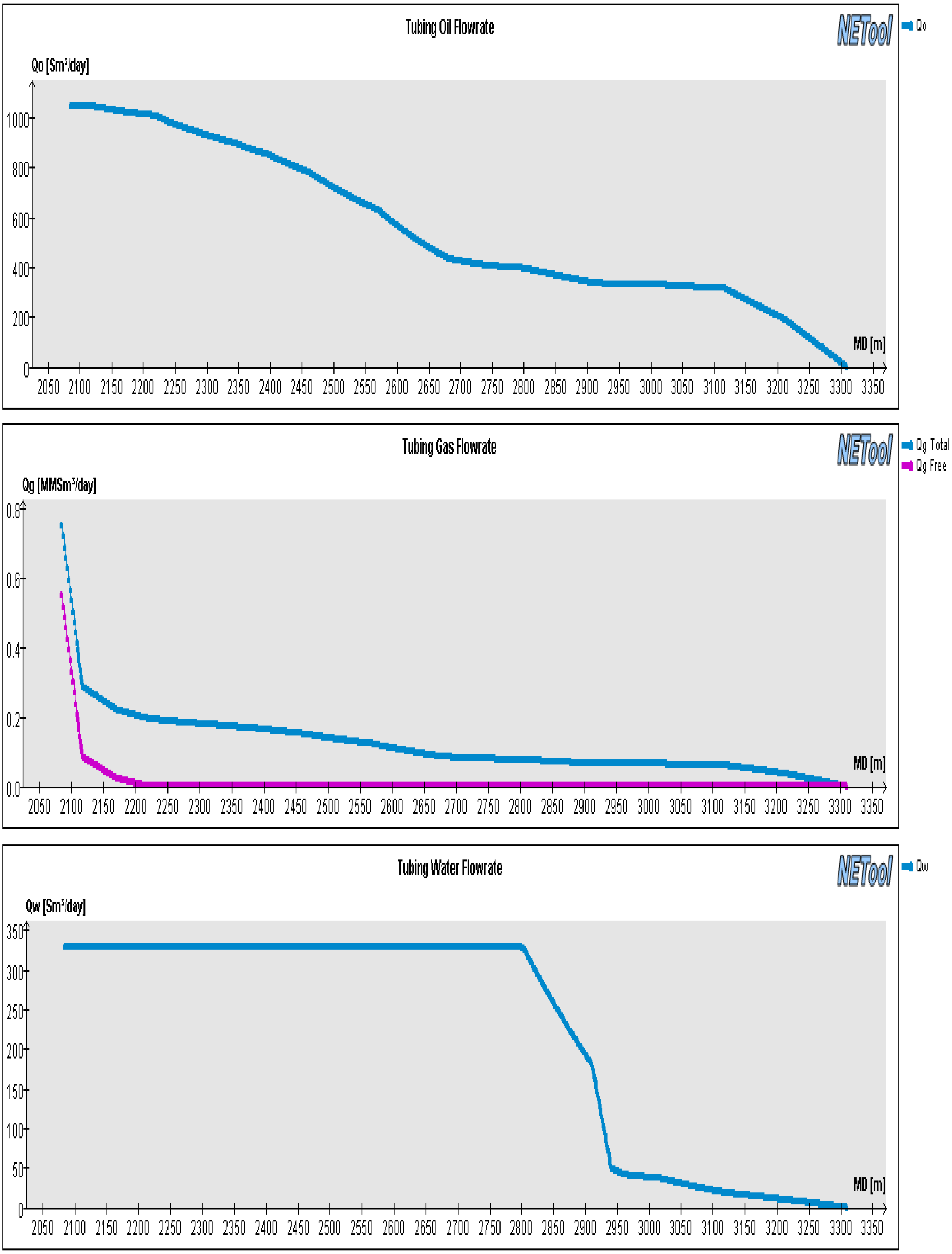
Seg #	Segment Top MD [m]	Segment Length [m]	Segment Type	Well Hole Size [mm]	Has Annulus
1	2085	0.3	Cemented bp	215.9	No
2	2085.3	23.7	Open hole	215.9	No
3	2109	12	Open hole	215.9	No
4	2121	12	Open hole	215.9	No
5	2133	12	Open hole	215.9	No
6	2145	12	Open hole	215.9	No
7	2157	12	Open hole	215.9	No
8	2169	12	Open hole	215.9	No
9	2181	12	Open hole	215.9	No
10	2193	12	Open hole	215.9	No
11	2205	12	Open hole	215.9	No
12	2217	12	Open hole	215.9	No
13	2229	12	Open hole	215.9	No
14	2241	12	Open hole	215.9	No
15	2253	12	Open hole	215.9	No
16	2265	12	Open hole	215.9	No
17	2277	12	Open hole	215.9	No
18	2289	12	Open hole	215.9	No
19	2301	12	Open hole	215.9	No
20	2313	12	Open hole	215.9	No
21	2325	12	Open hole	215.9	No
22	2337	12	Open hole	215.9	No
23	2349	12	Open hole	215.9	No
24	2361	12	Open hole	215.9	No
25	2373	12	Open hole	215.9	No
26	2385	12	Open hole	215.9	No
27	2397	12	Open hole	215.9	No
28	2409	12	Open hole	215.9	No
29	2421	12	Open hole	215.9	No
30	2433	12	Open hole	215.9	No
31	2445	12	Open hole	215.9	No
32	2457	12	Open hole	215.9	No
33	2469	12	Open hole	215.9	No
34	2481	12	Open hole	215.9	No
35	2493	12	Open hole	215.9	No
36	2505	12	Open hole	215.9	No
37	2517	12	Open hole	215.9	No
38	2529	12	Open hole	215.9	No
39	2541	12	Open hole	215.9	No
40	2553	12	Open hole	215.9	No
41	2565	12	Open hole	215.9	No
42	2577	12	Open hole	215.9	No
43	2589	12	Open hole	215.9	No
44	2601	12	Open hole	215.9	No
45	2613	12	Open hole	215.9	No
46	2625	12	Open hole	215.9	No
47	2637	12	Open hole	215.9	No
48	2649	12	Open hole	215.9	No
49	2661	12	Open hole	215.9	No
50	2673	12	Open hole	215.9	No
51	2685	12	Open hole	215.9	No
52	2697	12	Open hole	215.9	No
53	2721	12	Open hole	215.9	No
54	2733	12	Open hole	215.9	No
55	2745	12	Open hole	215.9	No
56	2757	12	Open hole	215.9	No
57	2769	12	Open hole	215.9	No
58	2781	12	Open hole	215.9	No
59	2793	12	Open hole	215.9	No
60	2805	12	Open hole	215.9	No
61	2817	12	Open hole	215.9	No
62	2829	12	Open hole	215.9	No
63	2841	12	Open hole	215.9	No
64	2853	12	Open hole	215.9	No
65	2865	12	Open hole	215.9	No
66	2877	12	Open hole	215.9	No
67	2889	12	Open hole	215.9	No
68	2901	12	Open hole	215.9	No
69	2913	12	Open hole	215.9	No
70	2925	12	Open hole	215.9	No
71	2937	12	Open hole	215.9	No
72	2949	12	Open hole	215.9	No
73	2961	12	Open hole	215.9	No
74	2973	12	Open hole	215.9	No
75	2985	12	Open hole	215.9	No
76	2997	12	Open hole	215.9	No
77	3009	12	Open hole	215.9	No
78	3021	12	Open hole	215.9	No
79	3033	12	Open hole	215.9	No
80	3045	12	Open hole	215.9	No
81	3057	12	Open hole	215.9	No
82	3069	12	Open hole	215.9	No
83	3081	12	Open hole	215.9	No
84	3093	12	Open hole	215.9	No
85	3105	12	Open hole	215.9	No
86	3117	12	Open hole	215.9	No
87	3129	12	Open hole	215.9	No
88	3141	12	Open hole	215.9	No
89	3153	12	Open hole	215.9	No
90	3165	12	Open hole	215.9	No
91	3177	12	Open hole	215.9	No
92	3189	12	Open hole	215.9	No
93	3201	12	Open hole	215.9	No
94	3213	12	Open hole	215.9	No
95	3225	12	Open hole	215.9	No
96	3237	12	Open hole	215.9	No
97	3249	12	Open hole	215.9	No
98	3261	12	Open hole	215.9	No
99	3273	12	Open hole	215.9	No
100	3285	12	Open hole	215.9	No
101	3297	12	Open hole	215.9	No
102	3309	12.4	Open hole	215.9	No
TOE	3309.400				



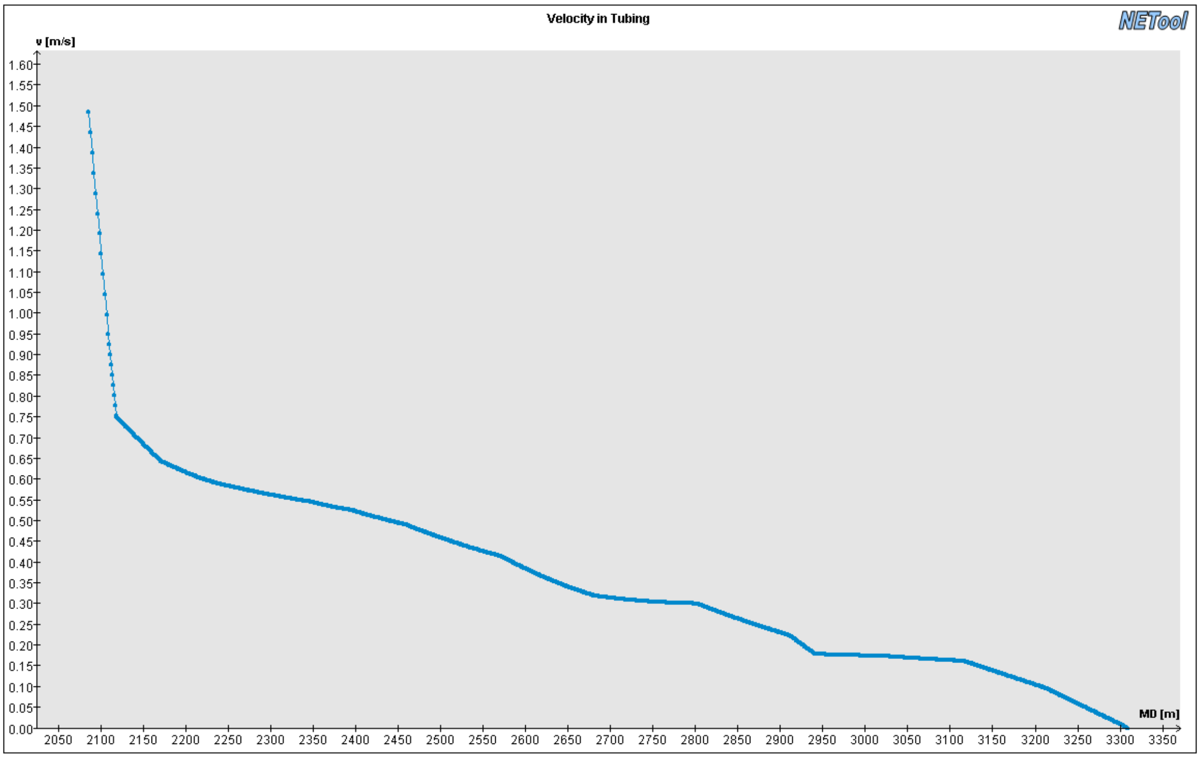
Annulus and tubing pressure, Reservoir pressure and Dradown along the wellbore.



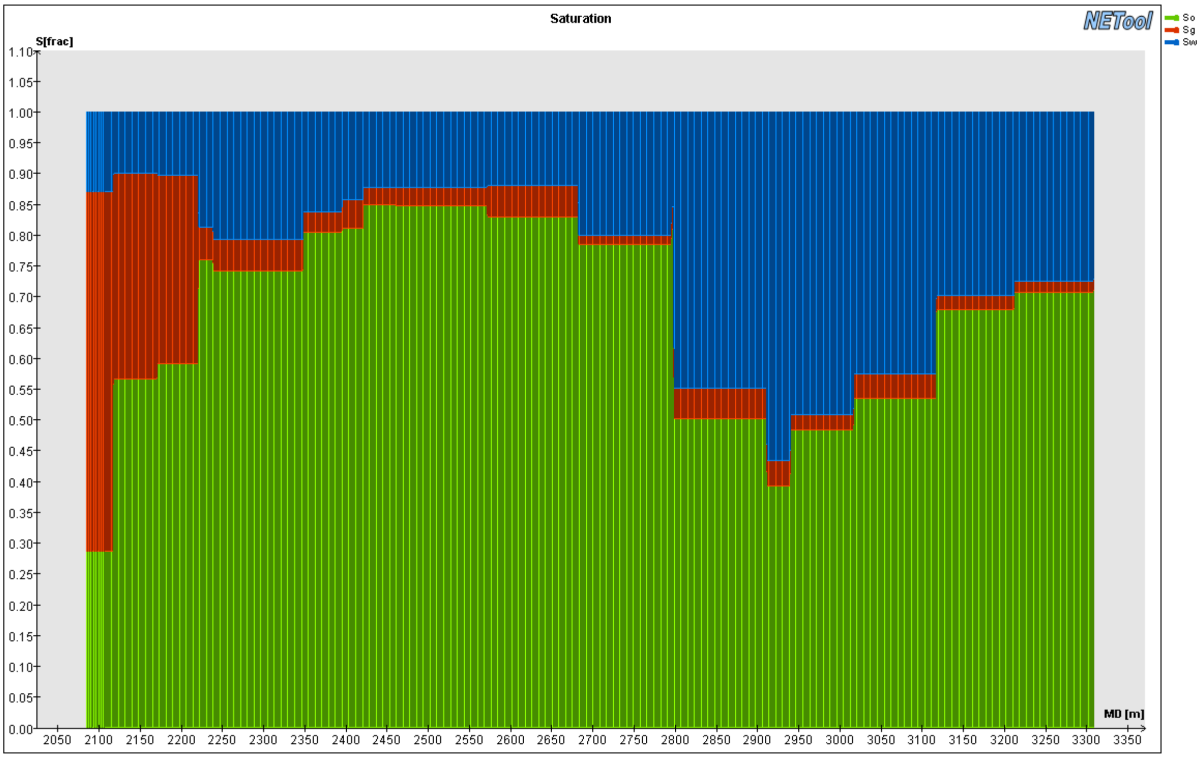
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



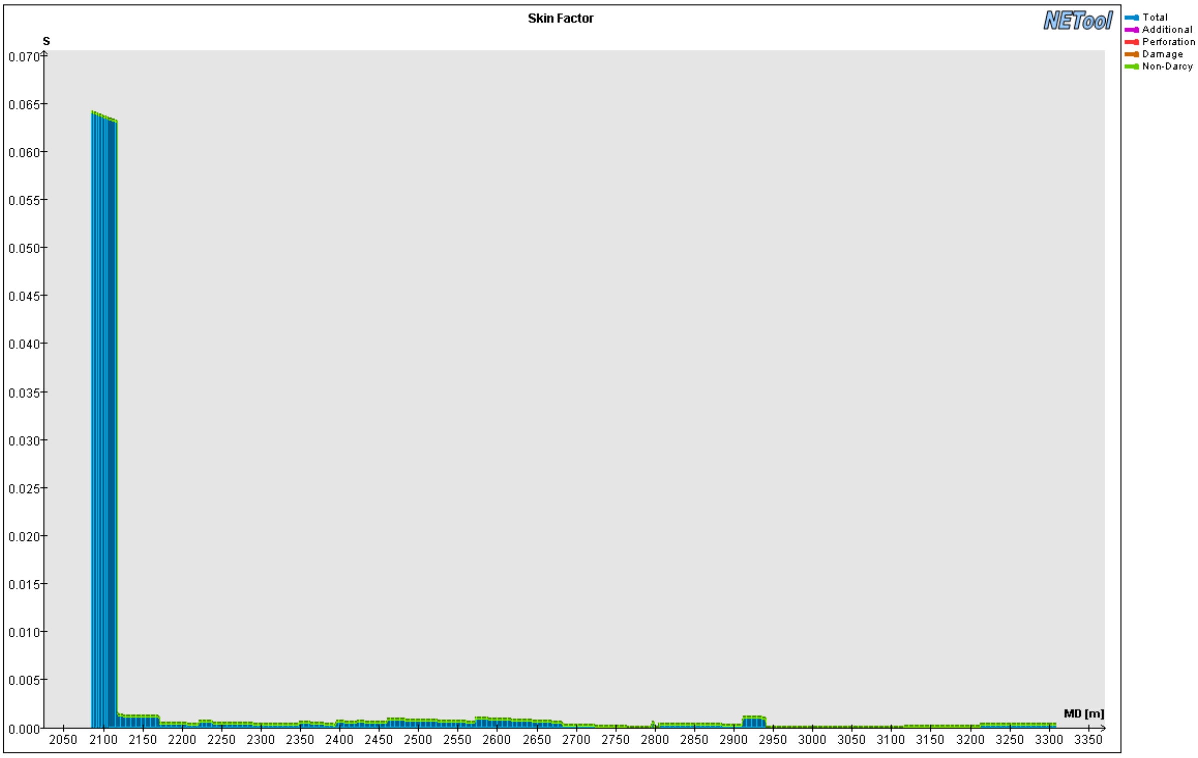
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the tubing along the wellbore.



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



Skin factor plot for the well and given time step.

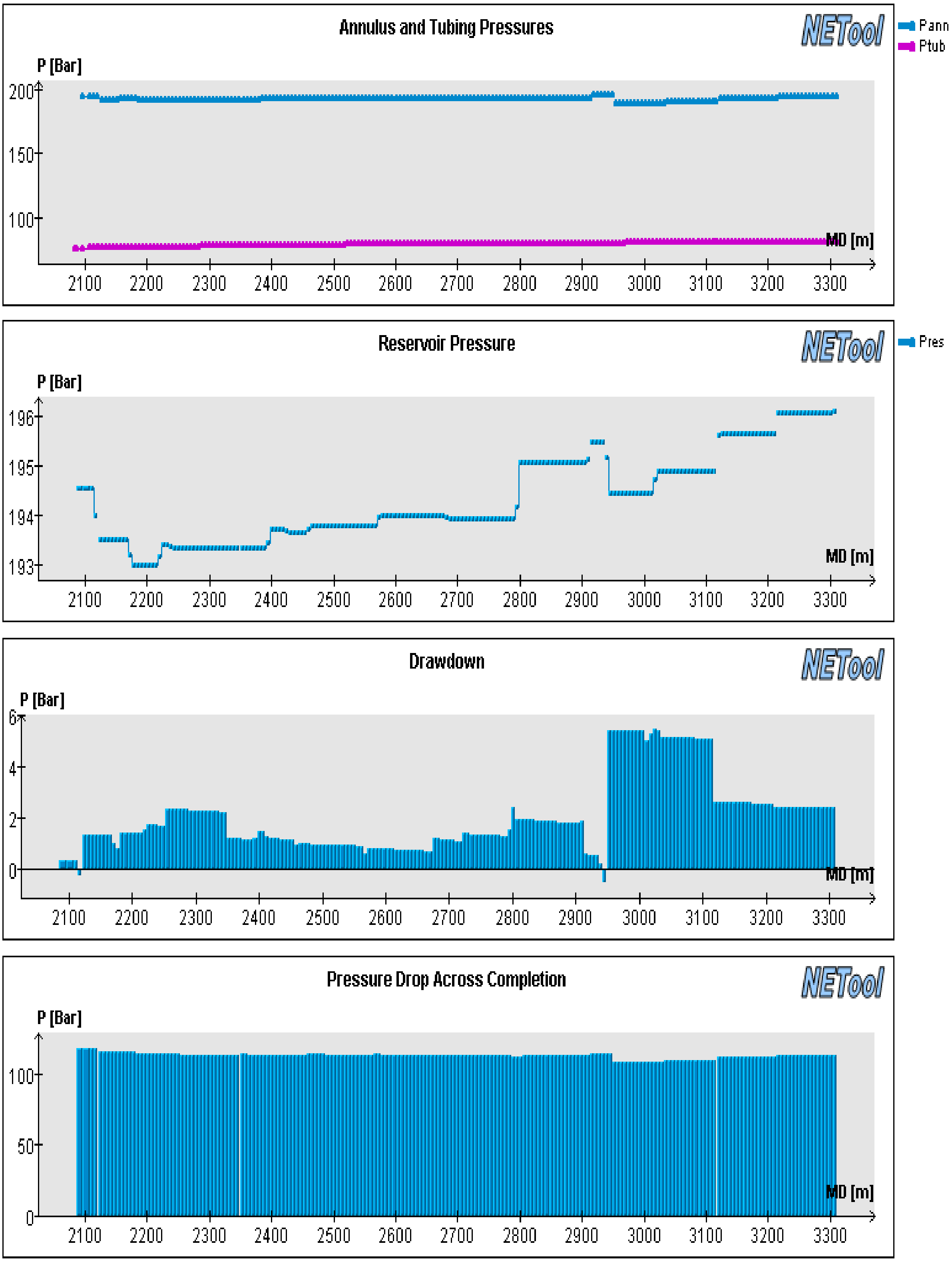
A.4 Plots for well KP7, 1826 days, 2x1,6mm ICD

Completion overview for the 2x1,6mm case:

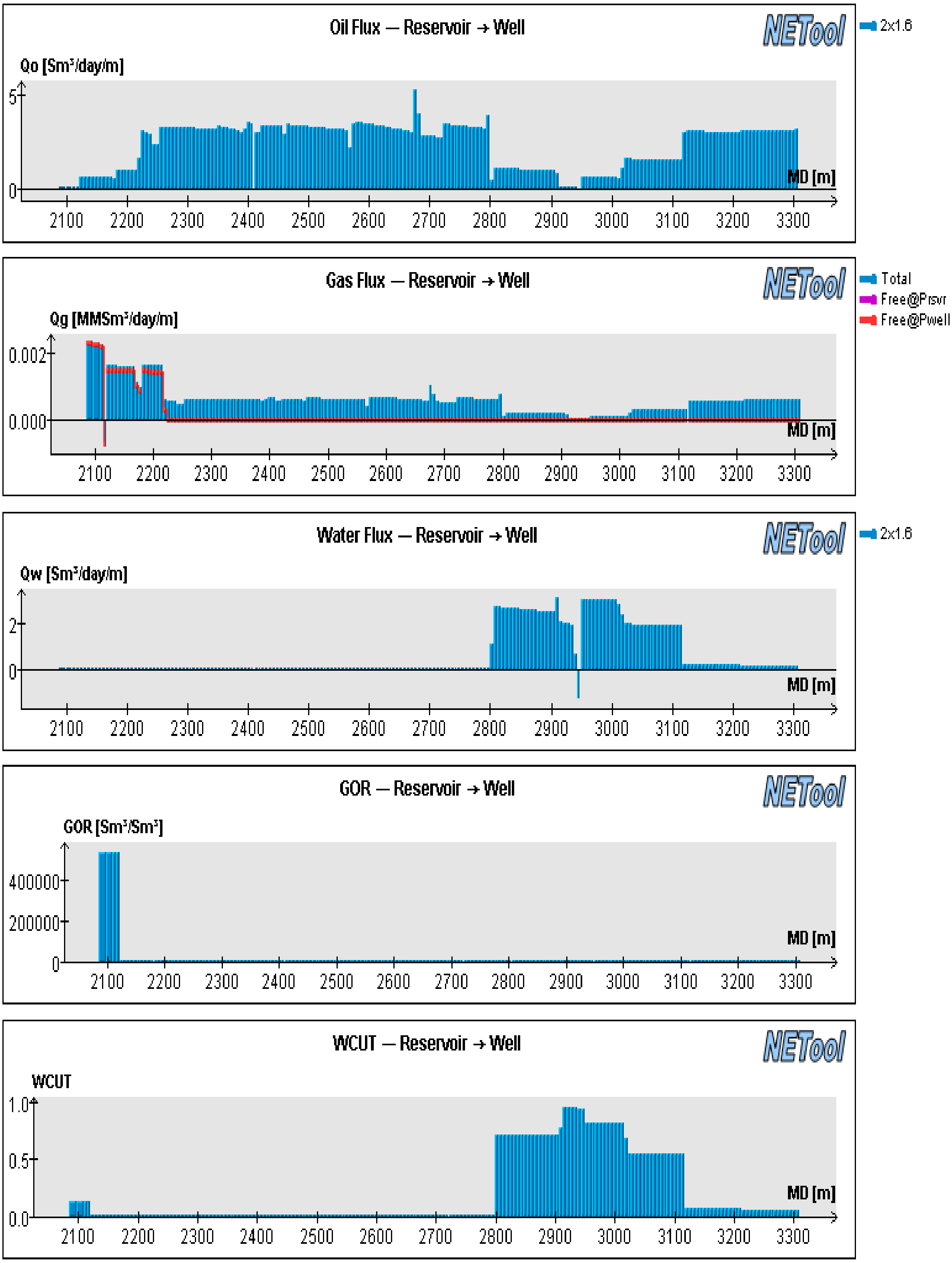
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	2	1,6	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	2	1,6	Yes	Yes	No	38	2457	12,0	Nozzle ICD	2	1,6	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
5	2121	12,0	Nozzle ICD	2	1,6	Yes	No	No	40	2481	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
6	2133	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	41	2493	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
7	2145	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	42	2505	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
8	2157	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	43	2517	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
9	2169	11,7	Nozzle ICD	2	1,6	Yes	Yes	No	44	2529	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
11	2181	12,0	Nozzle ICD	2	1,6	Yes	No	No	46	2553	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
12	2193	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	48	2565	12,0	Nozzle ICD	2	1,6	Yes	No	No
14	2217	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	49	2577	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
15	2229	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	50	2589	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
16	2241	11,7	Nozzle ICD	2	1,6	Yes	Yes	No	51	2601	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
18	2253	12,0	Nozzle ICD	2	1,6	Yes	No	No	53	2625	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
19	2265	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	54	2637	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
20	2277	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	55	2649	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
21	2289	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	56	2661	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
22	2301	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	58	2673	11,7	Nozzle ICD	2	1,6	Yes	No	No
24	2325	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	59	2685	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
25	2337	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	60	2697	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	2	1,6	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	63	2721	12,0	Nozzle ICD	2	1,6	Yes	No	No
29	2373	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	64	2733	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
30	2385	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	65	2745	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
31	2397	11,7	Nozzle ICD	2	1,6	Yes	Yes	No	66	2757	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
33	2409	12,0	Nozzle ICD	2	1,6	Yes	No	No	68	2781	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
34	2421	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	69	2793	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
35	2433	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

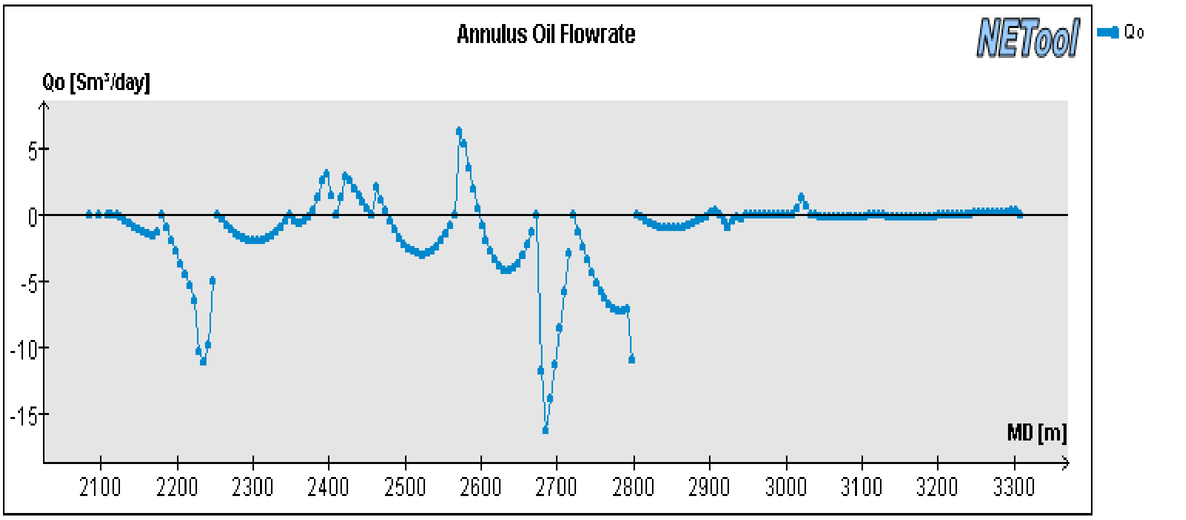
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	2805	12,0	Nozzle ICD	2	1,6	Yes	No	No	**102**	3117	12,0	Nozzle ICD	2	1,6	Yes	No	No
72	2817	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**103**	3129	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
73	2829	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**104**	3141	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
74	2841	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**105**	3153	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
75	2853	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**106**	3165	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
76	2865	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**107**	3177	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
77	2877	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**108**	3189	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
78	2889	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**109**	3201	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
79	2901	11,7	Nozzle ICD	2	1,6	Yes	Yes	No	**110**	3213	0,3	**Packer**	-	-	No	No	N/A
80	2912,7	0,3	**Packer**	-	-	No	No	N/A	**111**	3213	12,0	Nozzle ICD	2	1,6	Yes	No	No
81	2913	12,0	**Blank pipe**	-	-	Yes	No	No	**112**	3225	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
82	2925	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**113**	3237	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
83	2937	11,7	**Blank pipe**	-	-	Yes	Yes	No	**114**	3249	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
84	2948,7	0,3	**Packer**	-	-	No	No	N/A	**115**	3261	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
85	2949	12,0	Nozzle ICD	2	1,6	Yes	No	No	**116**	3273	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
86	2961	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**117**	3285	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
87	2973	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**118**	3297	12,4	Nozzle ICD	2	1,6	Yes	Yes	No
88	2985	12,0	Nozzle ICD	2	1,6	Yes	Yes	No	**TOE**	3309							
89	2997	11,7	Nozzle ICD	2	1,6	Yes	Yes	No									
90	3008,7	0,3	**Packer**	-	-	No	No	N/A									
91	3009	12,0	Nozzle ICD	2	1,6	Yes	No	No									
92	3021	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
93	3033	0,3	**Packer**	-	-	No	No	N/A									
94	3033,3	11,7	Nozzle ICD	2	1,6	Yes	No	No									
95	3045	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
96	3057	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
97	3069	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
98	3081	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
99	3093	12,0	Nozzle ICD	2	1,6	Yes	Yes	No									
100	3105	11,7	Nozzle ICD	2	1,6	Yes	Yes	No									
101	3116,7	0,3	**Packer**	-	-	No	No	N/A									

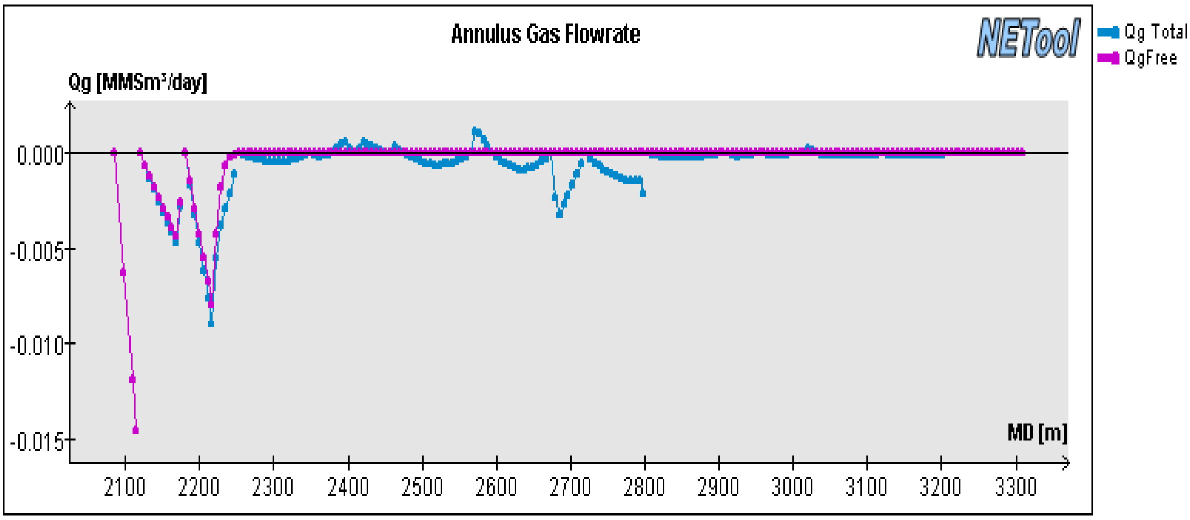


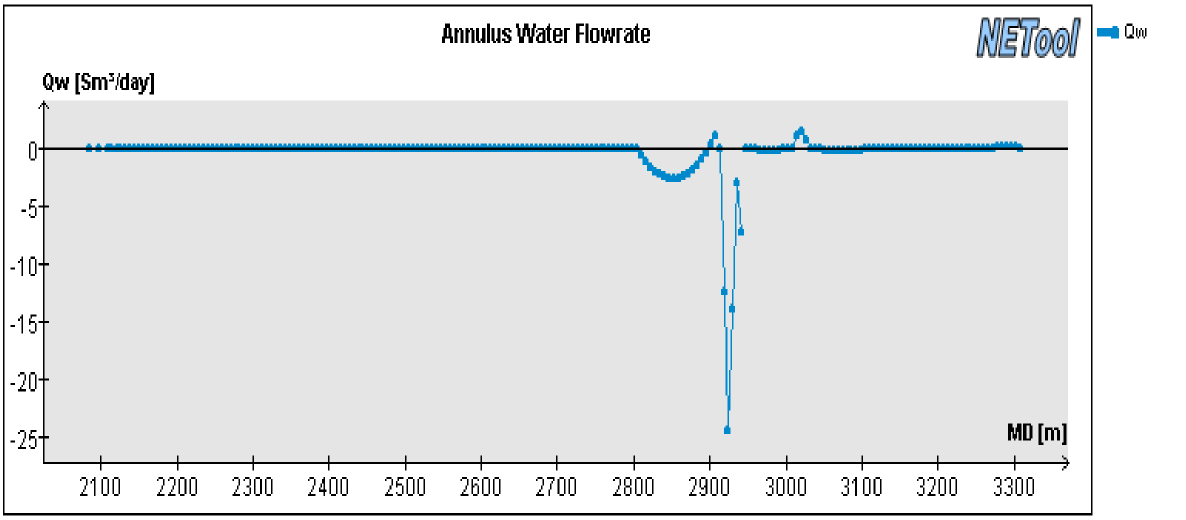
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



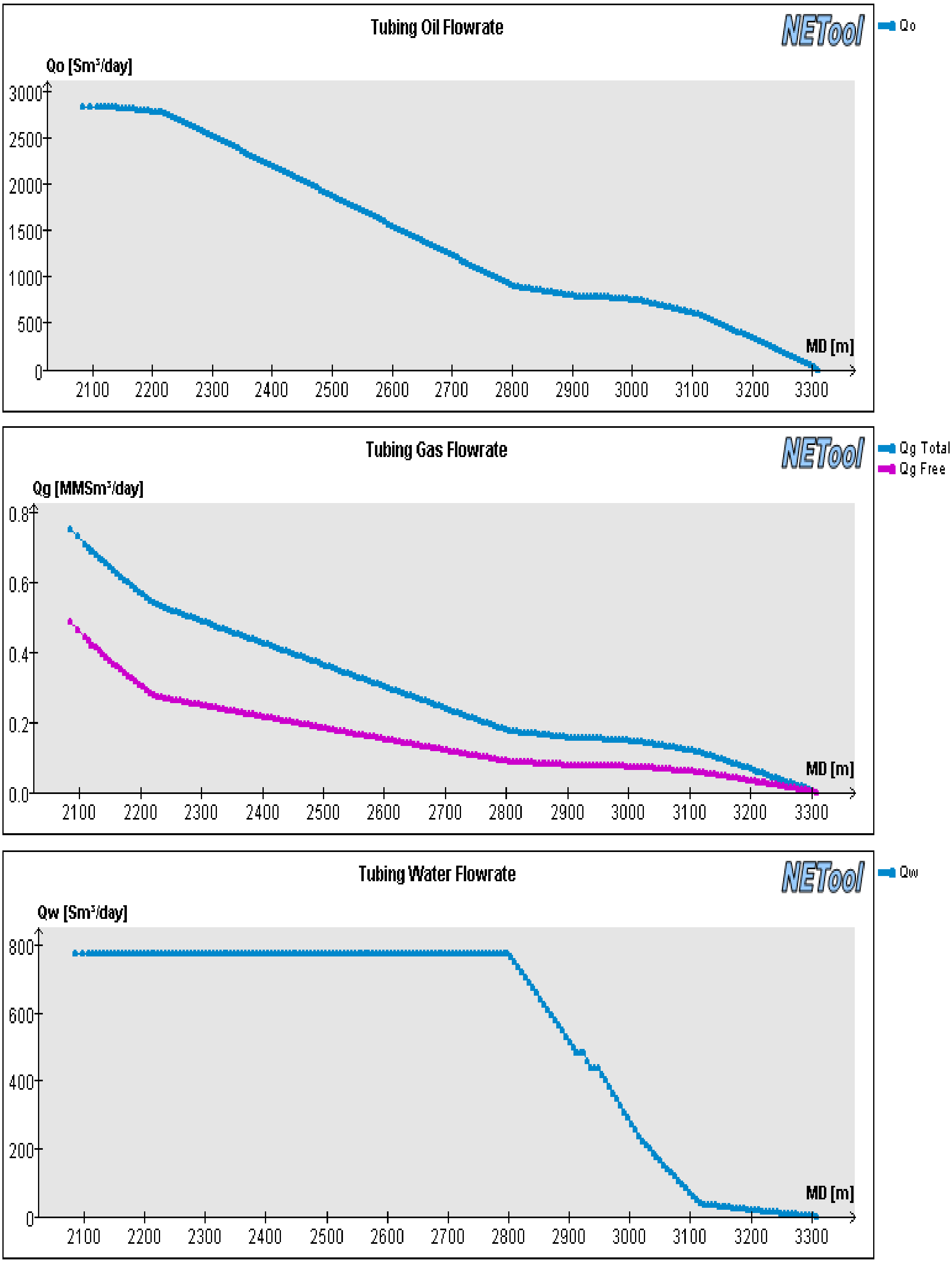
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



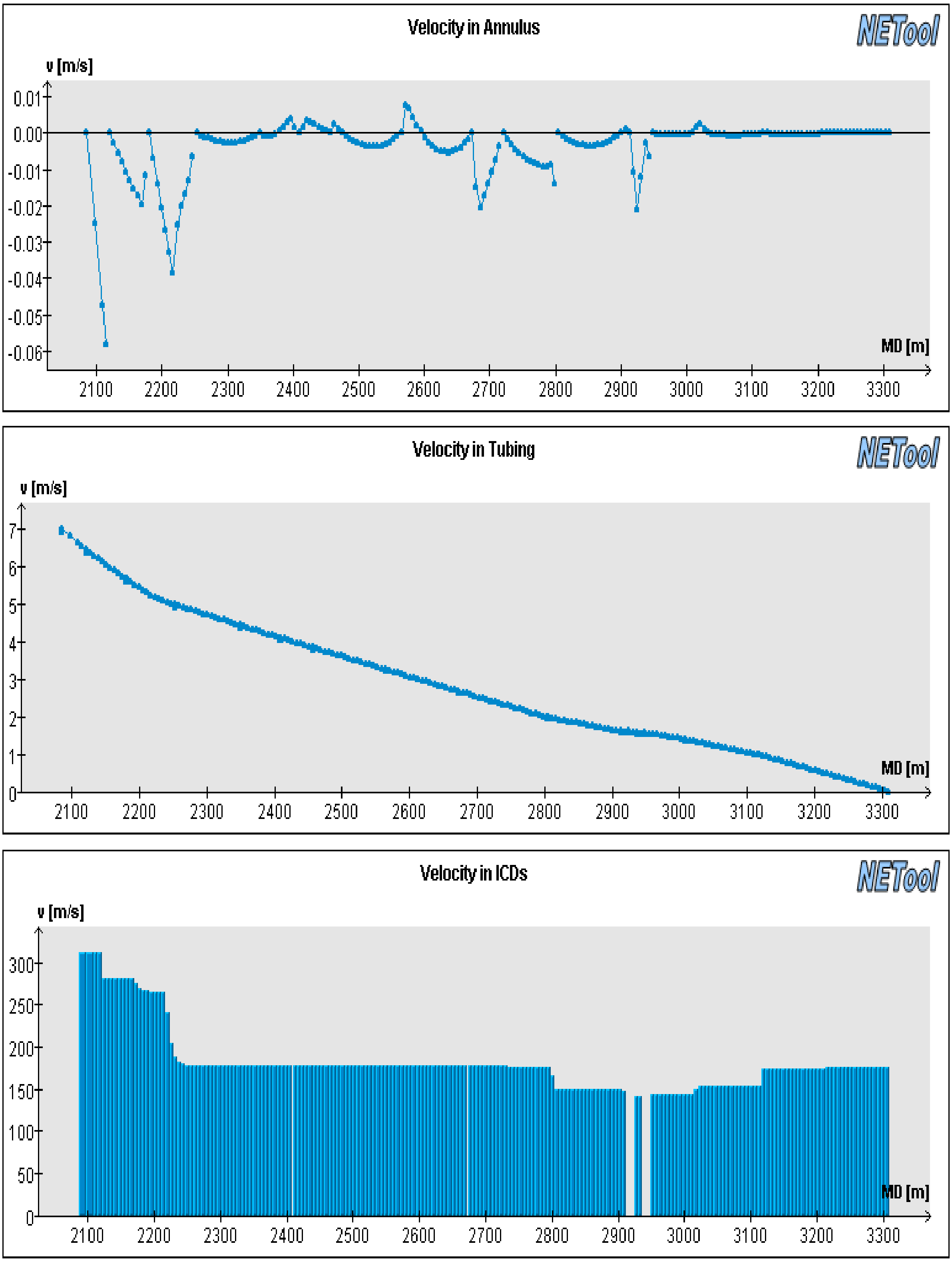




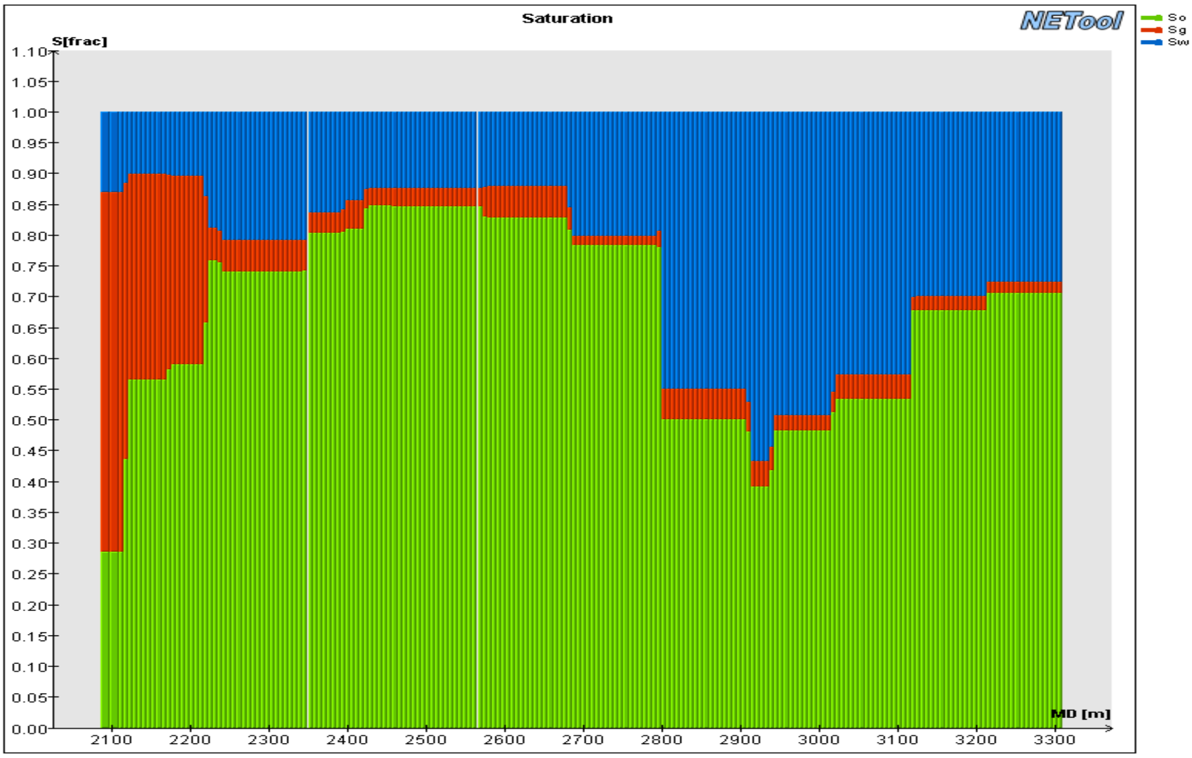
Annulus oil, gas and water flow rate along the wellbore. Going from heel at the left to the toe at the right. Negative value for the flow means flow towards the toe. A positive number indicates flow towards the heel.



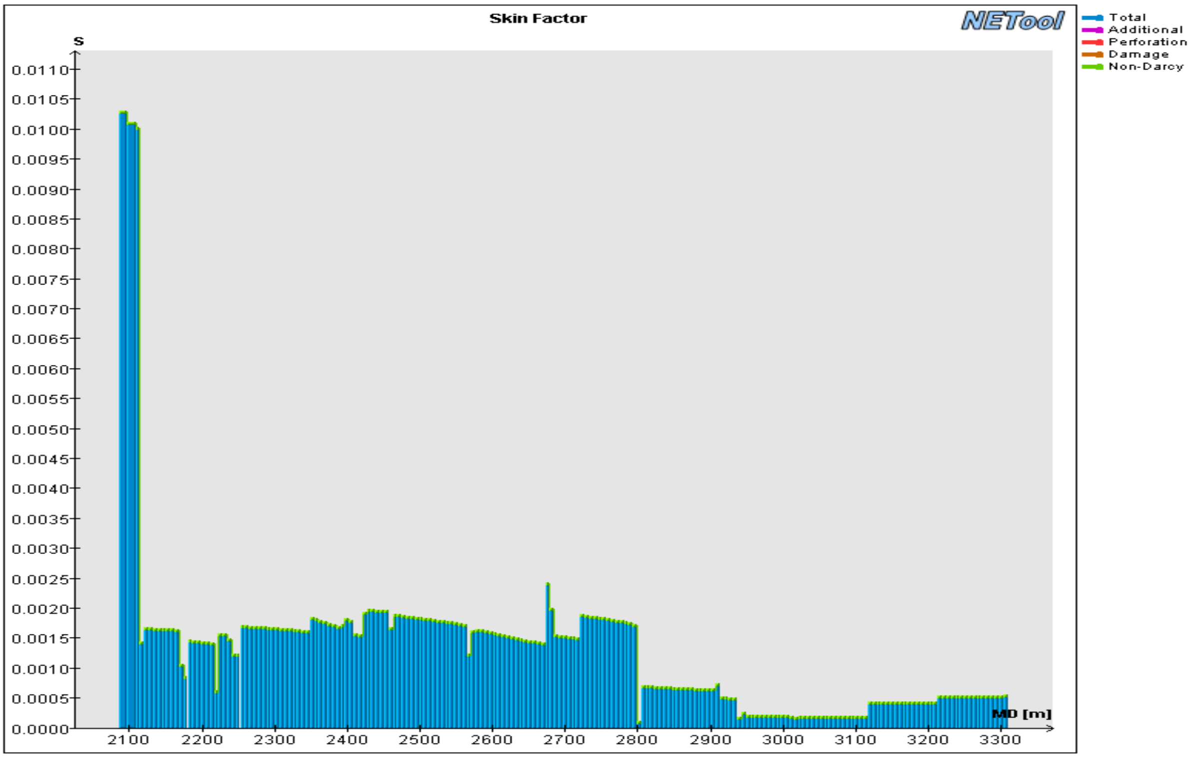
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



Skin factor plot for the well and given time step.

A.5 Plots for well KP7, 1826 days, 2x2,5mm ICD

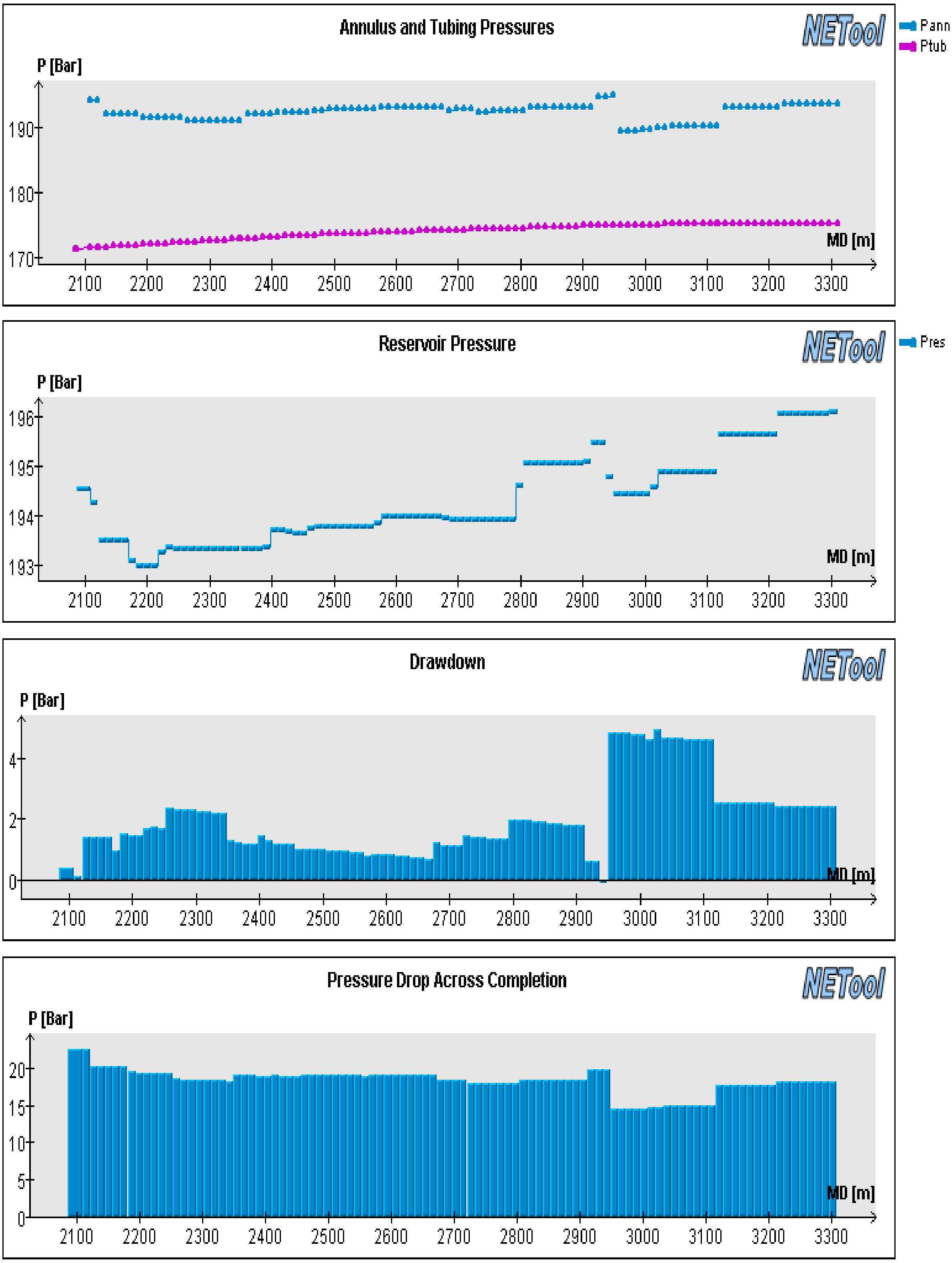
Completion overview for the reference case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

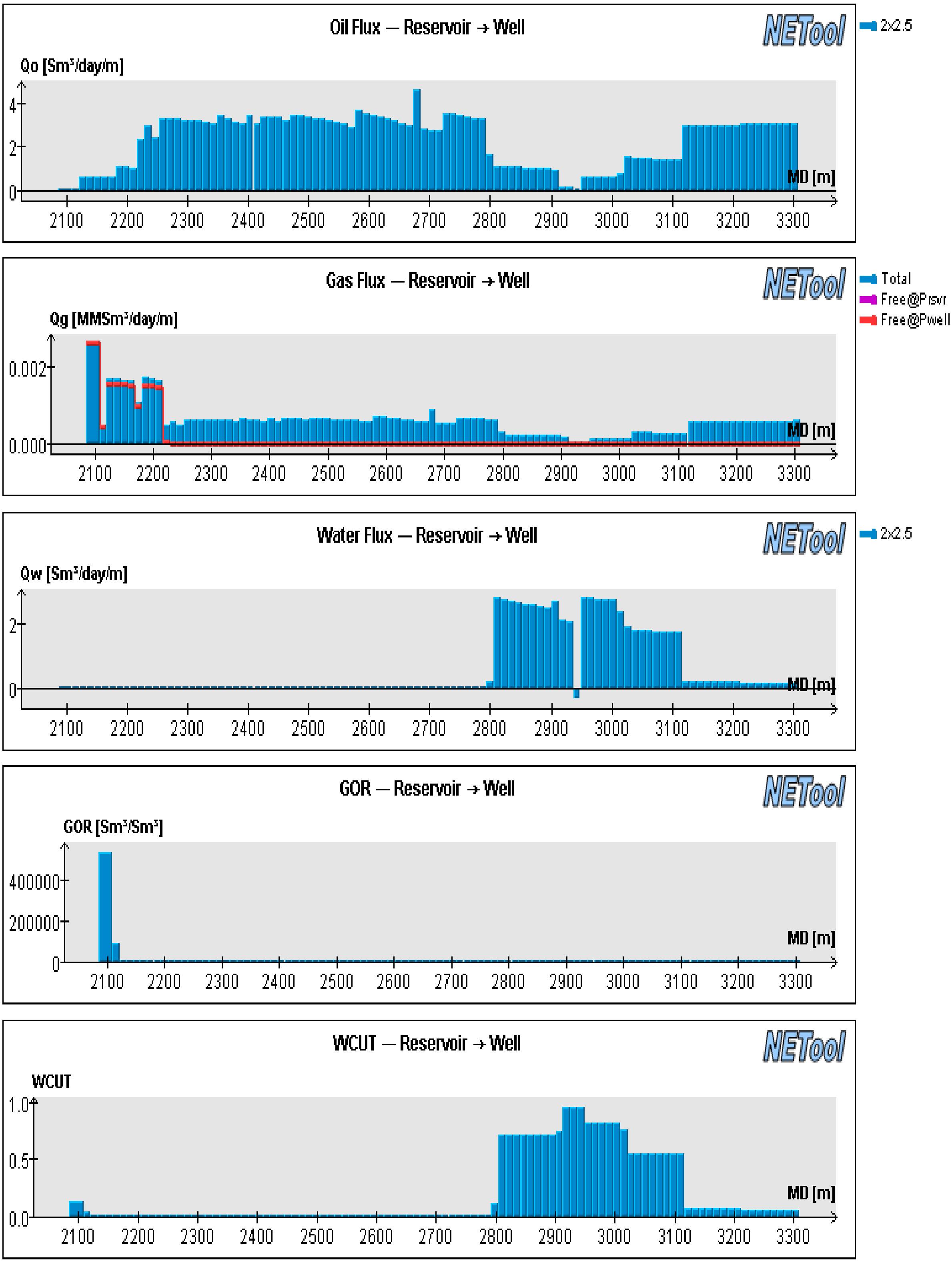
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	2	2,5	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	38	2457	12,0	Nozzle ICD	2	2,5	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
5	2121	12,0	Nozzle ICD	2	2,5	Yes	No	No	40	2481	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
6	2133	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	41	2493	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
7	2145	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	42	2505	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
8	2157	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	43	2517	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
9	2169	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	44	2529	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
11	2181	12,0	Nozzle ICD	2	2,5	Yes	No	No	46	2553	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
12	2193	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	48	2565	12,0	Nozzle ICD	2	2,5	Yes	No	No
14	2217	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	49	2577	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
15	2229	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	50	2589	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
16	2241	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	51	2601	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
18	2253	12,0	Nozzle ICD	2	2,5	Yes	No	No	53	2625	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
19	2265	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	54	2637	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
20	2277	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	55	2649	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
21	2289	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	56	2661	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
22	2301	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	58	2673	11,7	Nozzle ICD	2	2,5	Yes	No	No
24	2325	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	59	2685	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
25	2337	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	60	2697	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	2	2,5	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	63	2721	12,0	Nozzle ICD	2	2,5	Yes	No	No
29	2373	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	64	2733	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
30	2385	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	65	2745	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
31	2397	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	66	2757	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
33	2409	12,0	Nozzle ICD	2	2,5	Yes	No	No	68	2781	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
34	2421	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	69	2793	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
35	2433	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	**Nozzle ICD**	2	2,5	Yes	No	No
72	2817	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
73	2829	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
74	2841	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
75	2853	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
76	2865	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
77	2877	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
78	2889	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
79	2901	11,7	**Nozzle ICD**	2	2,5	Yes	Yes	No
80	2912,7	0,3	**Packer**	-	-	No	No	N/A
81	2913	12,0	**Blank pipe**	-	-	Yes	No	No
82	2925	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
83	2937	11,7	**Blank pipe**	-	-	Yes	Yes	No
84	2948,7	0,3	**Packer**	-	-	No	No	N/A
85	2949	12,0	**Nozzle ICD**	2	2,5	Yes	No	No
86	2961	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
87	2973	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
88	2985	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
89	2997	11,7	**Nozzle ICD**	2	2,5	Yes	Yes	No
90	3008,7	0,3	**Packer**	-	-	No	No	N/A
91	3009	12,0	**Nozzle ICD**	2	2,5	Yes	No	No
92	3021	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
93	3033	0,3	**Packer**	-	-	No	No	N/A
94	3033,3	11,7	**Nozzle ICD**	2	2,5	Yes	No	No
95	3045	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
96	3057	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
97	3069	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
98	3081	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
99	3093	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
100	3105	11,7	**Nozzle ICD**	2	2,5	Yes	Yes	No
101	3116,7	0,3	**Packer**	-	-	No	No	N/A

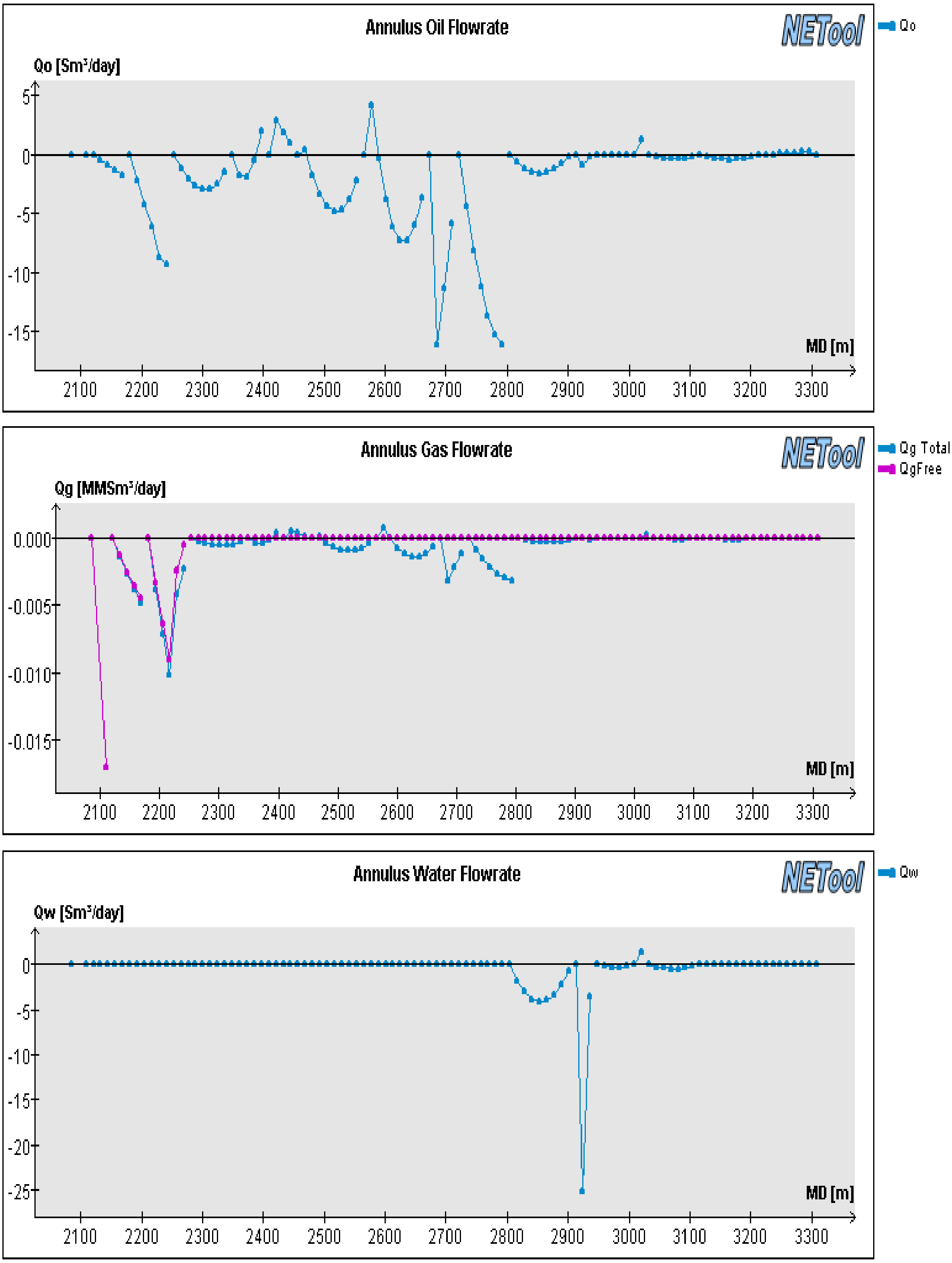
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	**Nozzle ICD**	2	2,5	Yes	No	No
103	3129	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
104	3141	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
105	3153	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
106	3165	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
107	3177	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
108	3189	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
109	3201	11,7	**Nozzle ICD**	2	2,5	Yes	Yes	No
110	3213	0,3	**Packer**	-	-	No	No	N/A
111	3213	12,0	**Nozzle ICD**	2	2,5	Yes	No	No
112	3225	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
113	3237	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
114	3249	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
115	3261	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
116	3273	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
117	3285	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No
118	3297	12,4	**Nozzle ICD**	2	2,5	Yes	Yes	No
TOE	3309							



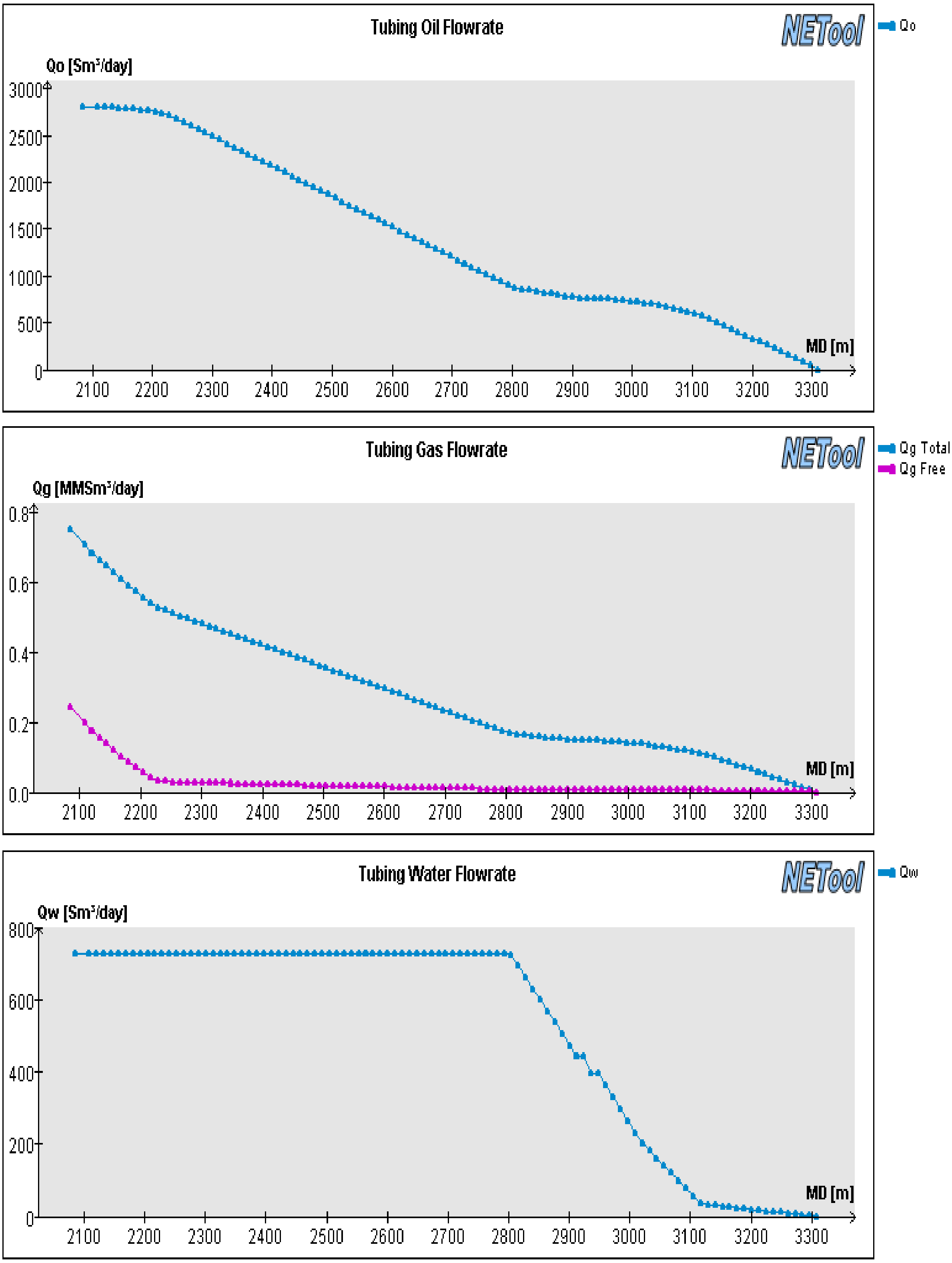
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



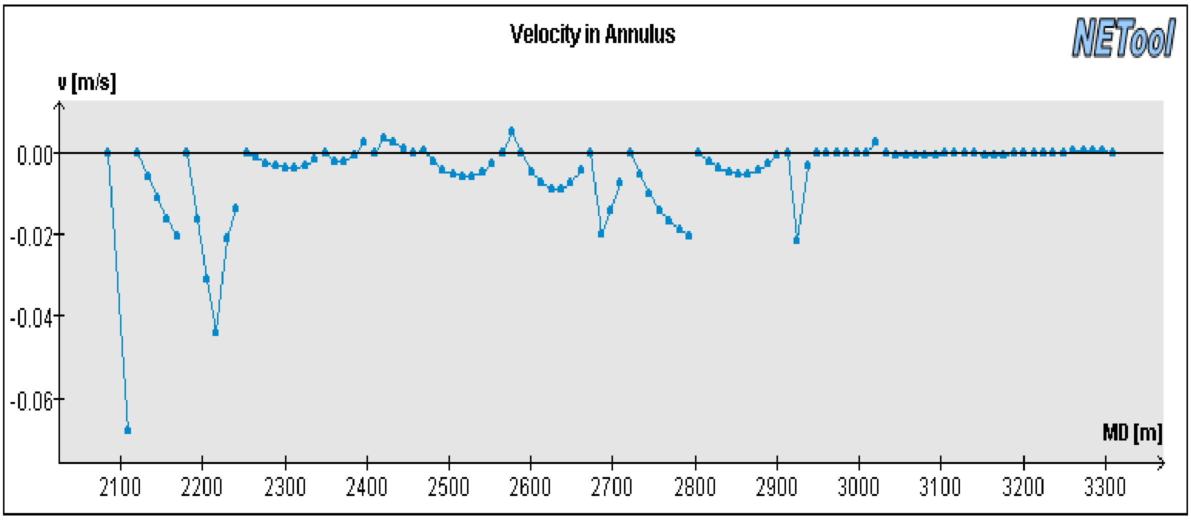
Influx of oil, gas and water from the reservoir and into the well along the wellbore

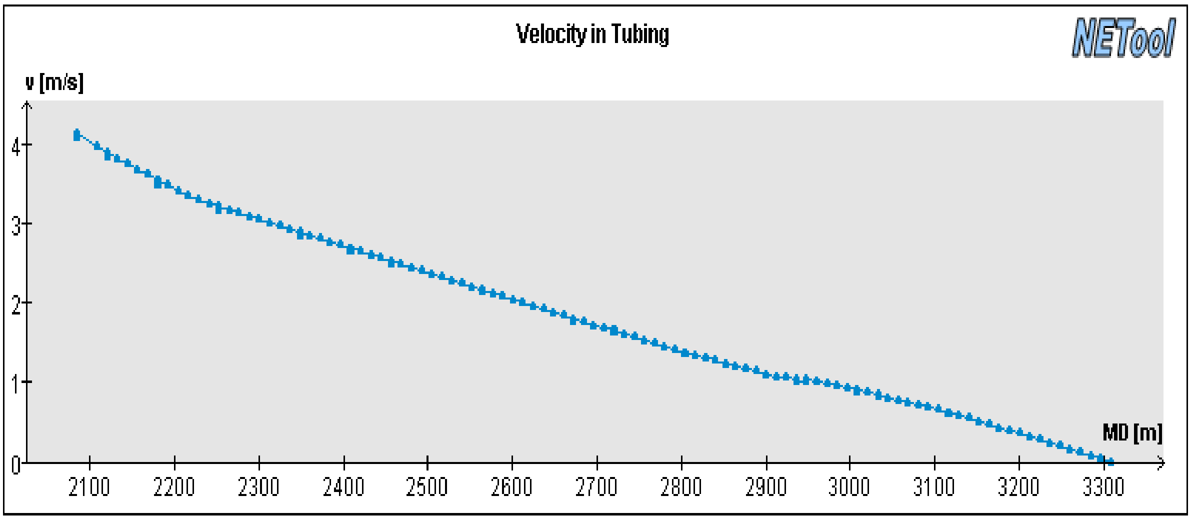


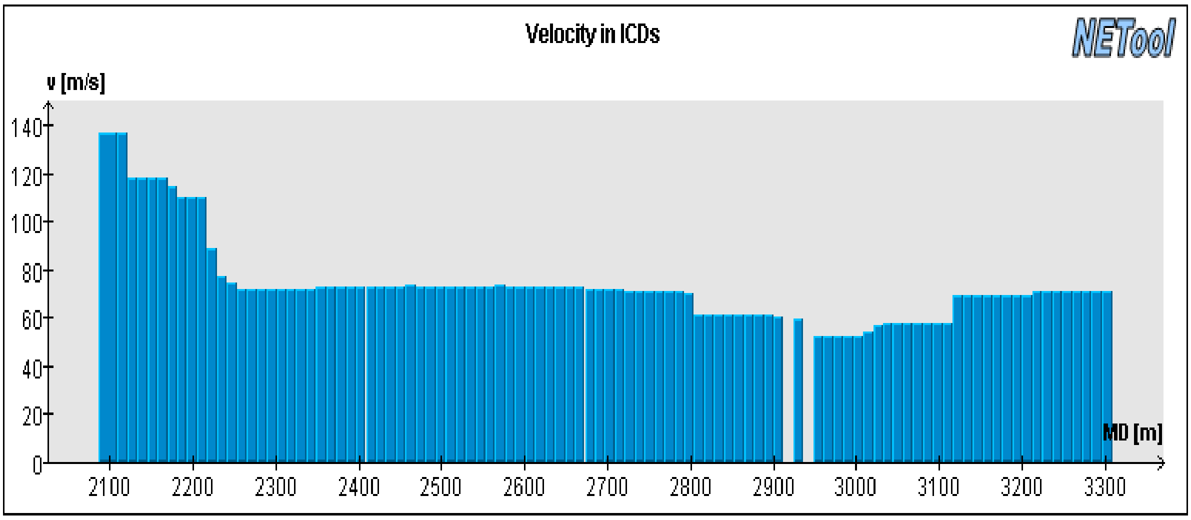
Annulus oil, gas and water flow rate along the wellbore.



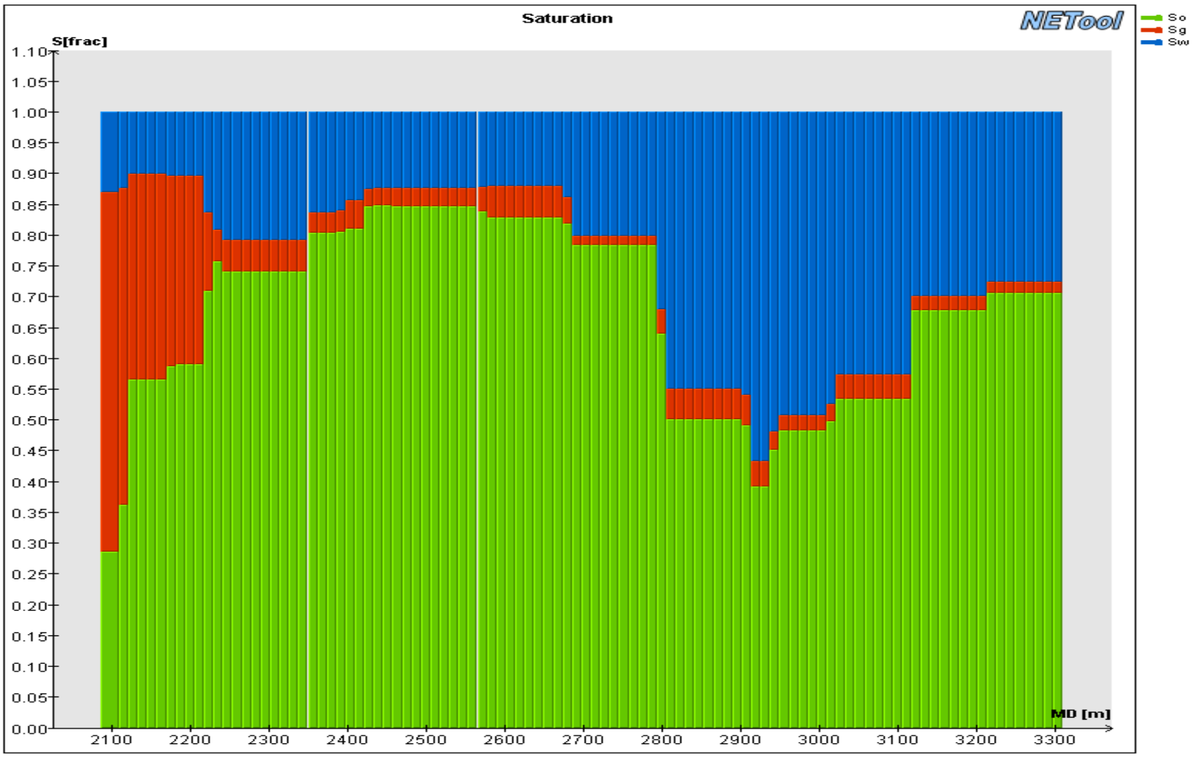
Tubing flow of oil, gas and water along the wellbore



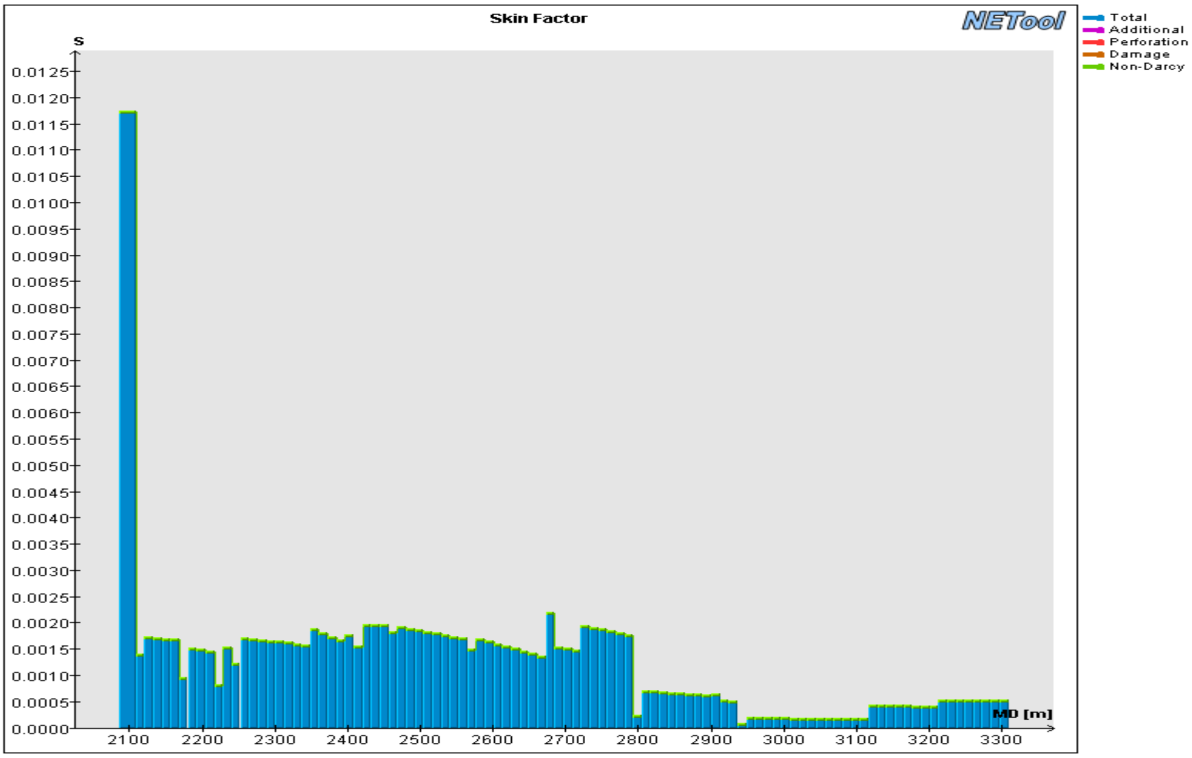




Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.6 Plots for well KP7, 1826 days, 2x4mm ICD

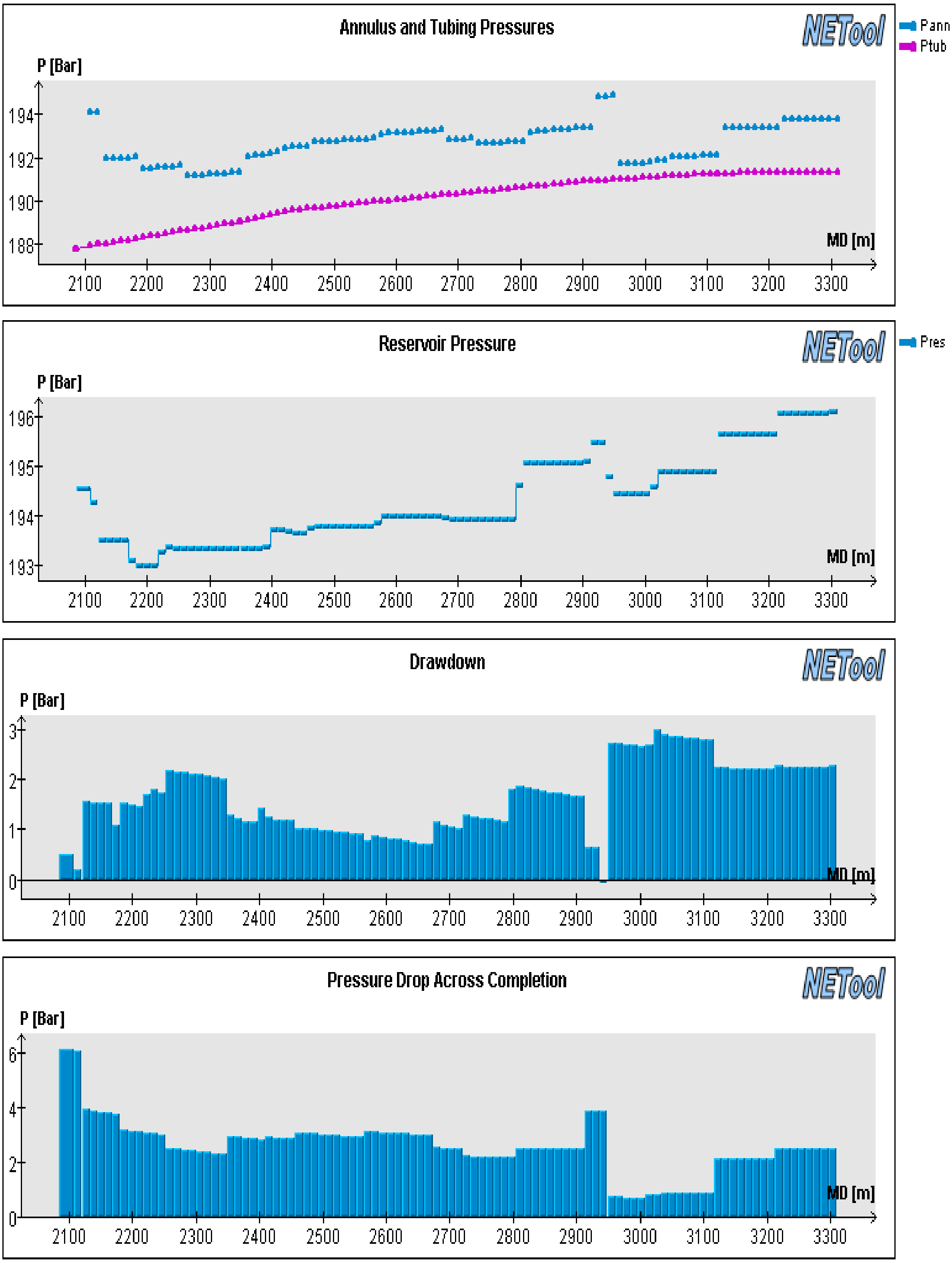
Completion overview for the reference case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

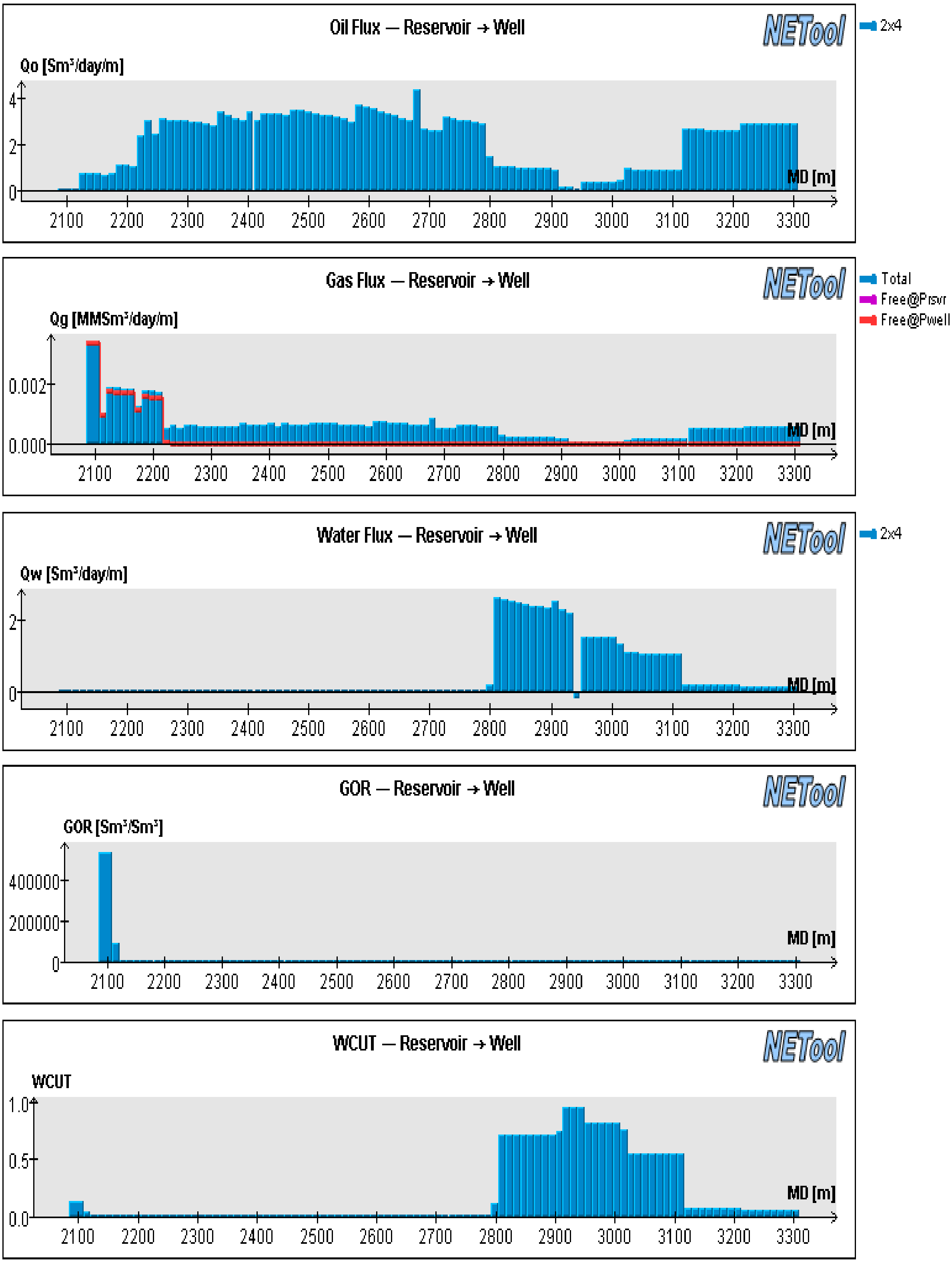
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	2	4	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	2	4	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	2	4	Yes	Yes	No	38	2457	12,0	Nozzle ICD	2	4	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	2	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	2	4	Yes	No	No	40	2481	12,0	Nozzle ICD	2	4	Yes	Yes	No
6	2133	12,0	Nozzle ICD	2	4	Yes	Yes	No	41	2493	12,0	Nozzle ICD	2	4	Yes	Yes	No
7	2145	12,0	Nozzle ICD	2	4	Yes	Yes	No	42	2505	12,0	Nozzle ICD	2	4	Yes	Yes	No
8	2157	12,0	Nozzle ICD	2	4	Yes	Yes	No	43	2517	12,0	Nozzle ICD	2	4	Yes	Yes	No
9	2169	11,7	Nozzle ICD	2	4	Yes	Yes	No	44	2529	12,0	Nozzle ICD	2	4	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	2	4	Yes	Yes	No
11	2181	12,0	Nozzle ICD	2	4	Yes	No	No	46	2553	11,7	Nozzle ICD	2	4	Yes	Yes	No
12	2193	12,0	Nozzle ICD	2	4	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	2	4	Yes	Yes	No	48	2565	12,0	Nozzle ICD	2	4	Yes	No	No
14	2217	12,0	Nozzle ICD	2	4	Yes	Yes	No	49	2577	12,0	Nozzle ICD	2	4	Yes	Yes	No
15	2229	12,0	Nozzle ICD	2	4	Yes	Yes	No	50	2589	12,0	Nozzle ICD	2	4	Yes	Yes	No
16	2241	11,7	Nozzle ICD	2	4	Yes	Yes	No	51	2601	12,0	Nozzle ICD	2	4	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	2	4	Yes	Yes	No
18	2253	12,0	Nozzle ICD	2	4	Yes	No	No	53	2625	12,0	Nozzle ICD	2	4	Yes	Yes	No
19	2265	12,0	Nozzle ICD	2	4	Yes	Yes	No	54	2637	12,0	Nozzle ICD	2	4	Yes	Yes	No
20	2277	12,0	Nozzle ICD	2	4	Yes	Yes	No	55	2649	12,0	Nozzle ICD	2	4	Yes	Yes	No
21	2289	12,0	Nozzle ICD	2	4	Yes	Yes	No	56	2661	12,0	Nozzle ICD	2	4	Yes	Yes	No
22	2301	12,0	Nozzle ICD	2	4	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	2	4	Yes	Yes	No	58	2673	11,7	Nozzle ICD	2	4	Yes	No	No
24	2325	12,0	Nozzle ICD	2	4	Yes	Yes	No	59	2685	12,0	Nozzle ICD	2	4	Yes	Yes	No
25	2337	12,0	Nozzle ICD	2	4	Yes	Yes	No	60	2697	12,0	Nozzle ICD	2	4	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	2	4	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	2	4	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	2	4	Yes	Yes	No	63	2721	12,0	Nozzle ICD	2	4	Yes	No	No
29	2373	12,0	Nozzle ICD	2	4	Yes	Yes	No	64	2733	12,0	Nozzle ICD	2	4	Yes	Yes	No
30	2385	12,0	Nozzle ICD	2	4	Yes	Yes	No	65	2745	12,0	Nozzle ICD	2	4	Yes	Yes	No
31	2397	11,7	Nozzle ICD	2	4	Yes	Yes	No	66	2757	12,0	Nozzle ICD	2	4	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	2	4	Yes	Yes	No
33	2409	12,0	Nozzle ICD	2	4	Yes	No	No	68	2781	12,0	Nozzle ICD	2	4	Yes	Yes	No
34	2421	12,0	Nozzle ICD	2	4	Yes	Yes	No	69	2793	11,7	Nozzle ICD	2	4	Yes	Yes	No
35	2433	12,0	Nozzle ICD	2	4	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	Nozzle ICD	2	4	Yes	No	No
72	2817	12,0	Nozzle ICD	2	4	Yes	Yes	No
73	2829	12,0	Nozzle ICD	2	4	Yes	Yes	No
74	2841	12,0	Nozzle ICD	2	4	Yes	Yes	No
75	2853	12,0	Nozzle ICD	2	4	Yes	Yes	No
76	2865	12,0	Nozzle ICD	2	4	Yes	Yes	No
77	2877	12,0	Nozzle ICD	2	4	Yes	Yes	No
78	2889	12,0	Nozzle ICD	2	4	Yes	Yes	No
79	2901	11,7	Nozzle ICD	2	4	Yes	Yes	No
80	2912,7	0,3	Packer	-	-	No	No	N/A
81	2913	12,0	Blank pipe	-	-	Yes	No	No
82	2925	12,0	Nozzle ICD	2	4	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A
85	2949	12,0	Nozzle ICD	2	4	Yes	No	No
86	2961	12,0	Nozzle ICD	2	4	Yes	Yes	No
87	2973	12,0	Nozzle ICD	2	4	Yes	Yes	No
88	2985	12,0	Nozzle ICD	2	4	Yes	Yes	No
89	2997	11,7	Nozzle ICD	2	4	Yes	Yes	No
90	3008,7	0,3	Packer	-	-	No	No	N/A
91	3009	12,0	Nozzle ICD	2	4	Yes	No	No
92	3021	12,0	Nozzle ICD	2	4	Yes	Yes	No
93	3033	0,3	Packer	-	-	No	No	N/A
94	3033,3	11,7	Nozzle ICD	2	4	Yes	No	No
95	3045	12,0	Nozzle ICD	2	4	Yes	Yes	No
96	3057	12,0	Nozzle ICD	2	4	Yes	Yes	No
97	3069	12,0	Nozzle ICD	2	4	Yes	Yes	No
98	3081	12,0	Nozzle ICD	2	4	Yes	Yes	No
99	3093	12,0	Nozzle ICD	2	4	Yes	Yes	No
100	3105	11,7	Nozzle ICD	2	4	Yes	Yes	No
101	3116,7	0,3	Packer	-	-	No	No	N/A

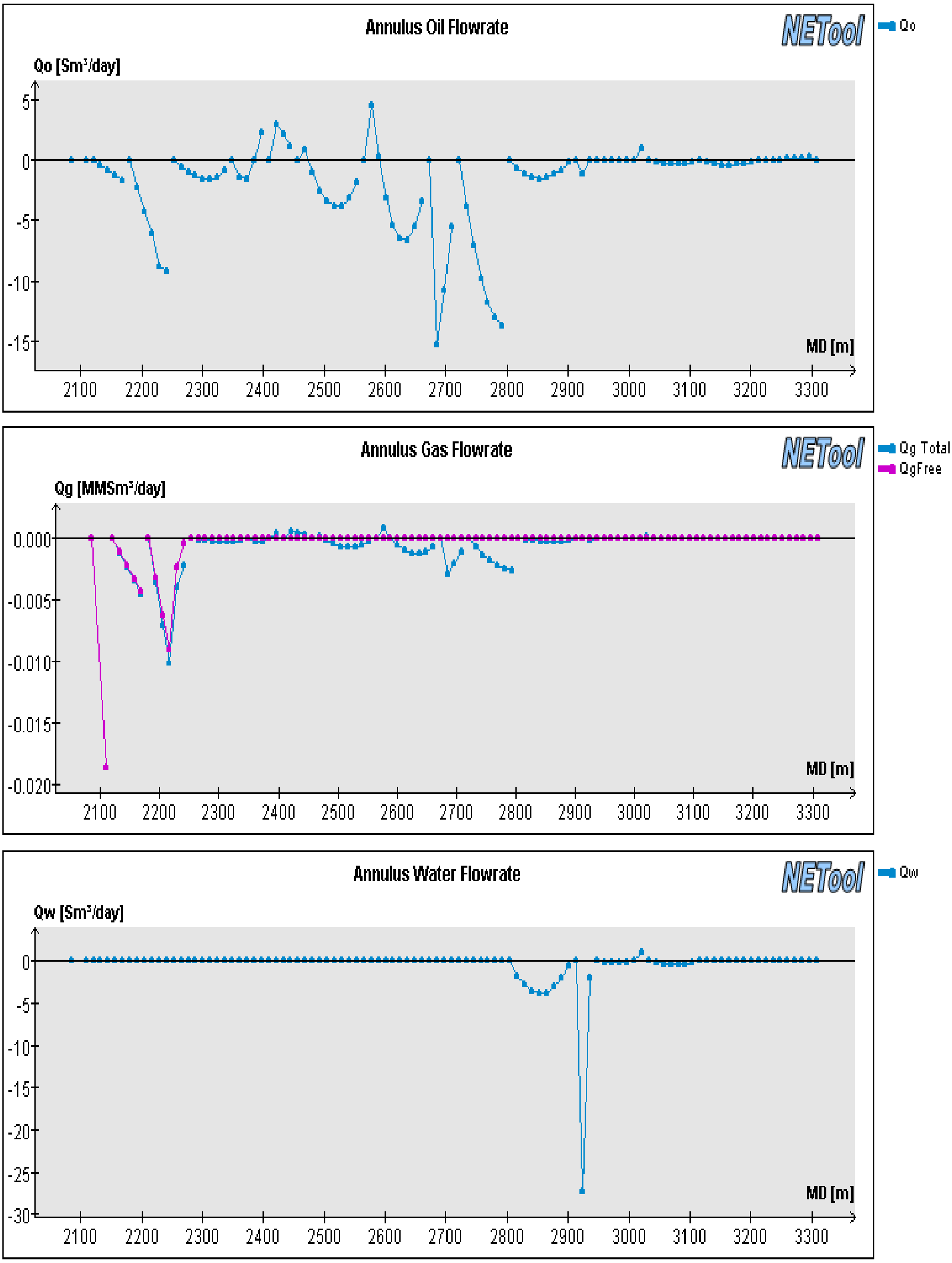
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	Nozzle ICD	2	4	Yes	No	No
103	3129	12,0	Nozzle ICD	2	4	Yes	Yes	No
104	3141	12,0	Nozzle ICD	2	4	Yes	Yes	No
105	3153	12,0	Nozzle ICD	2	4	Yes	Yes	No
106	3165	12,0	Nozzle ICD	2	4	Yes	Yes	No
107	3177	12,0	Nozzle ICD	2	4	Yes	Yes	No
108	3189	12,0	Nozzle ICD	2	4	Yes	Yes	No
109	3201	11,7	Nozzle ICD	2	4	Yes	Yes	No
110	3213	0,3	Packer	-	-	No	No	N/A
111	3213	12,0	Nozzle ICD	2	4	Yes	No	No
112	3225	12,0	Nozzle ICD	2	4	Yes	Yes	No
113	3237	12,0	Nozzle ICD	2	4	Yes	Yes	No
114	3249	12,0	Nozzle ICD	2	4	Yes	Yes	No
115	3261	12,0	Nozzle ICD	2	4	Yes	Yes	No
116	3273	12,0	Nozzle ICD	2	4	Yes	Yes	No
117	3285	12,0	Nozzle ICD	2	4	Yes	Yes	No
118	3297	12,4	Nozzle ICD	2	4	Yes	Yes	No
TOE	3309							



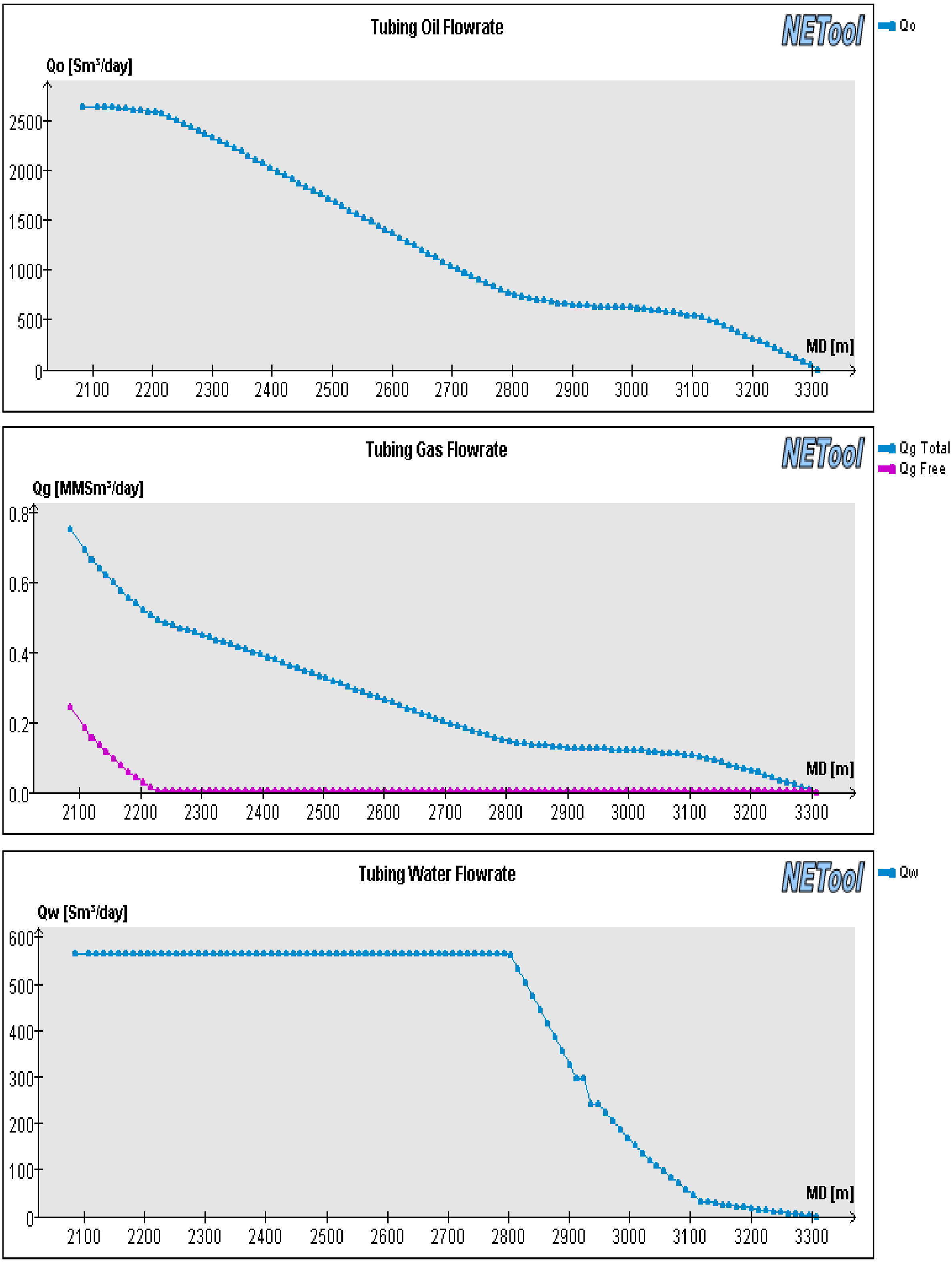
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



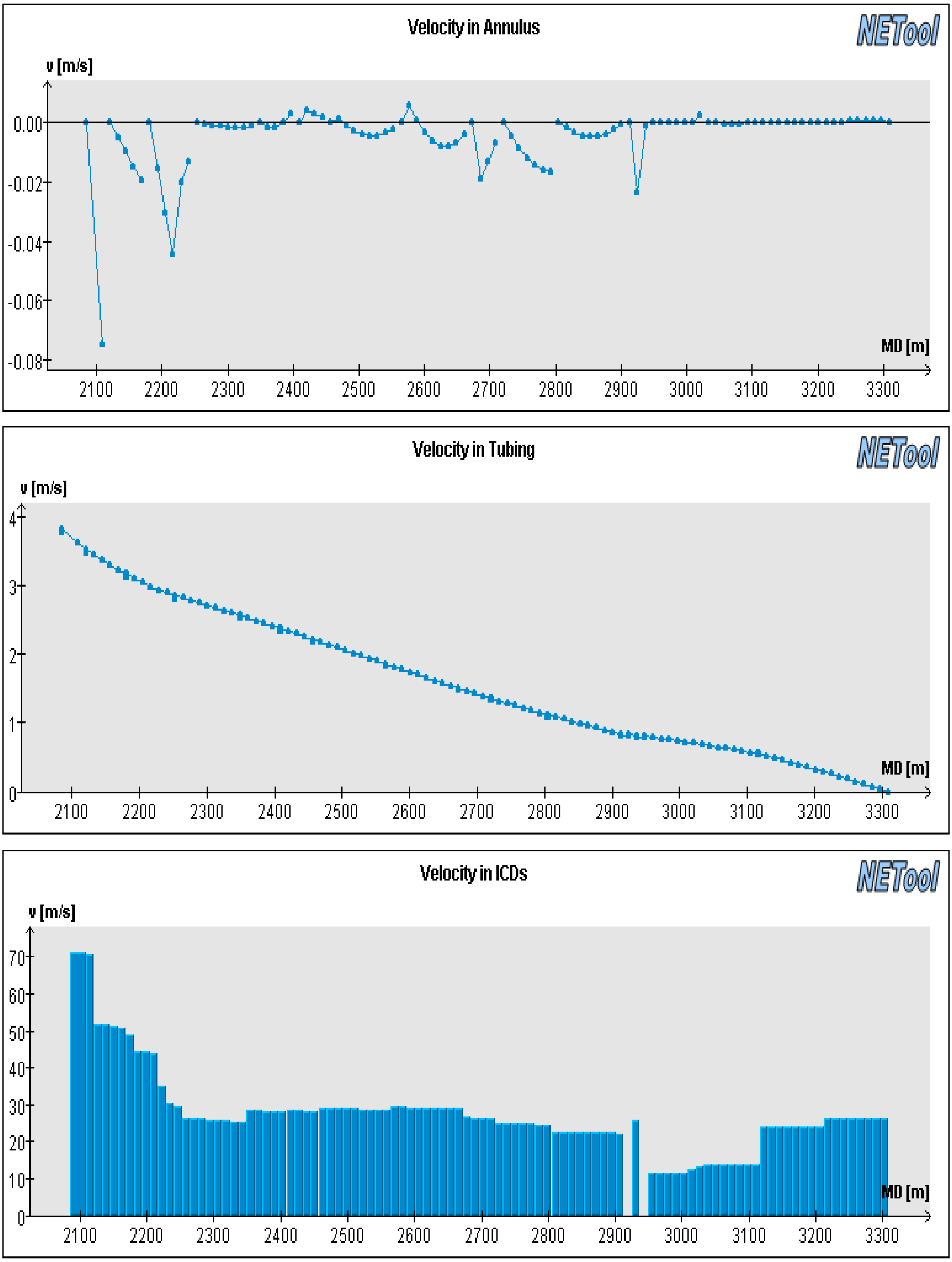
Influx of oil, gas and water from the reservoir and into the well along the wellbore



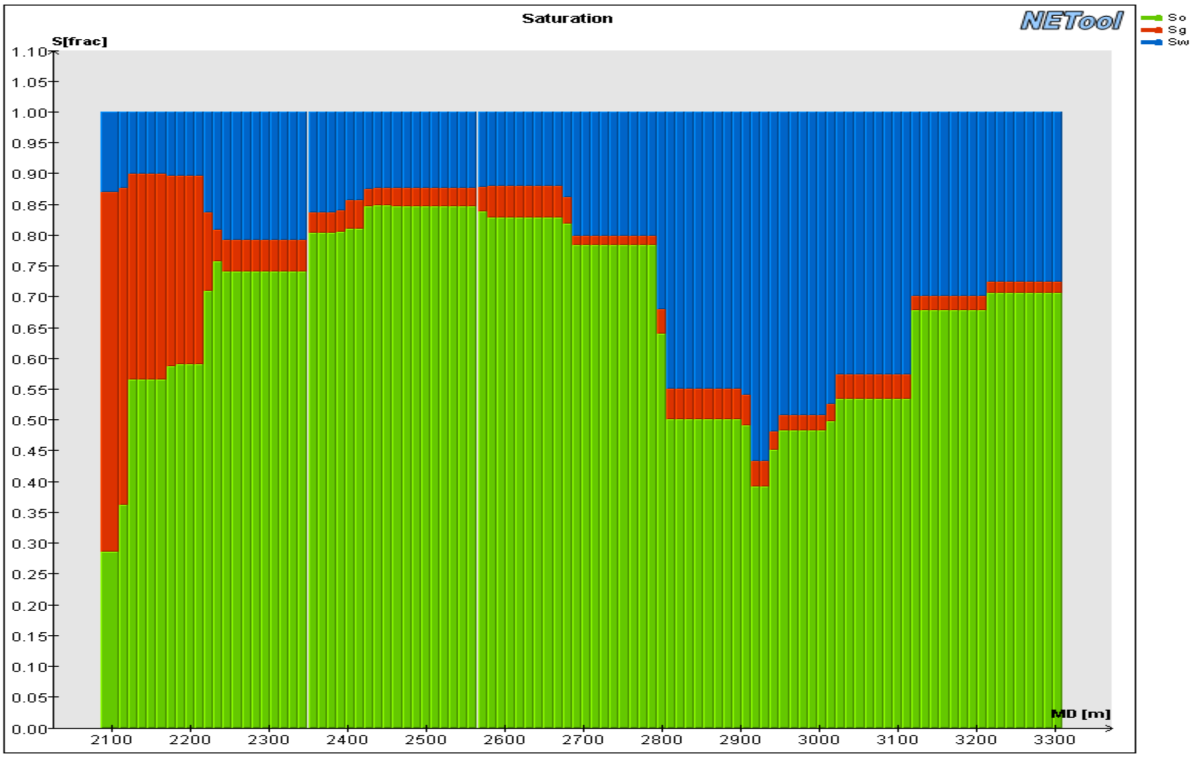
Annulus oil, gas and water flow rate along the wellbore.



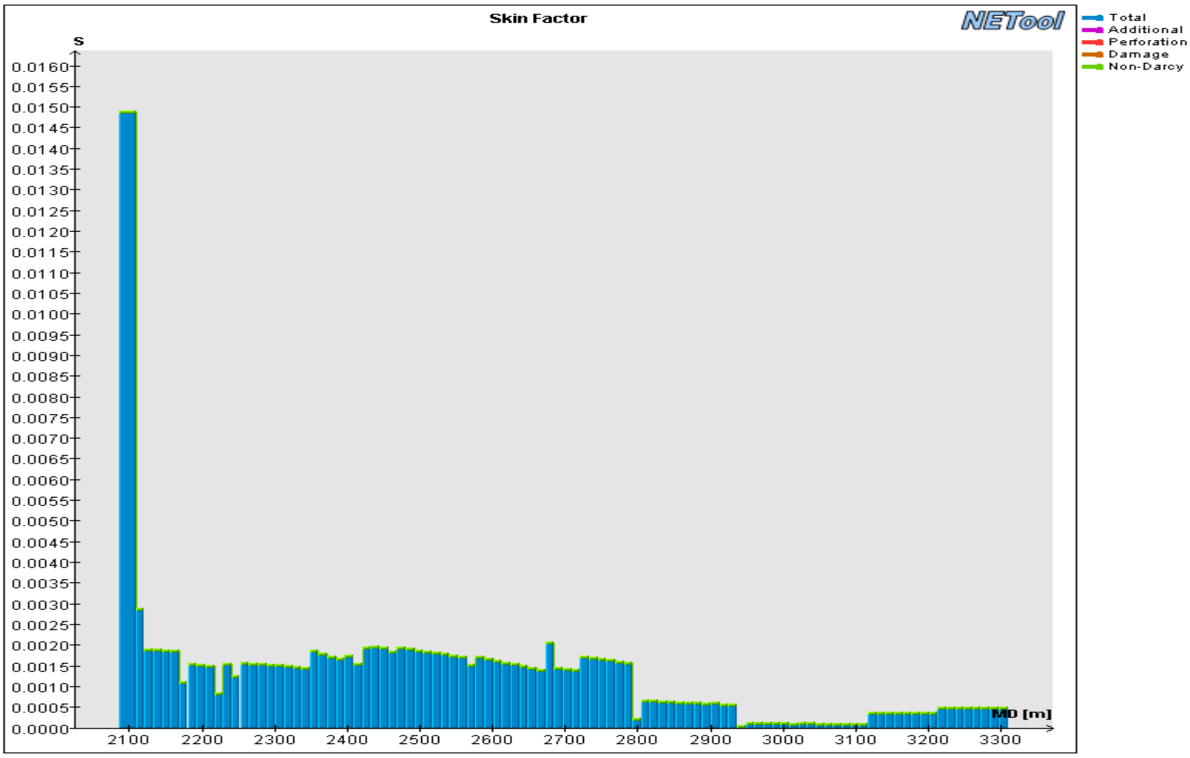
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

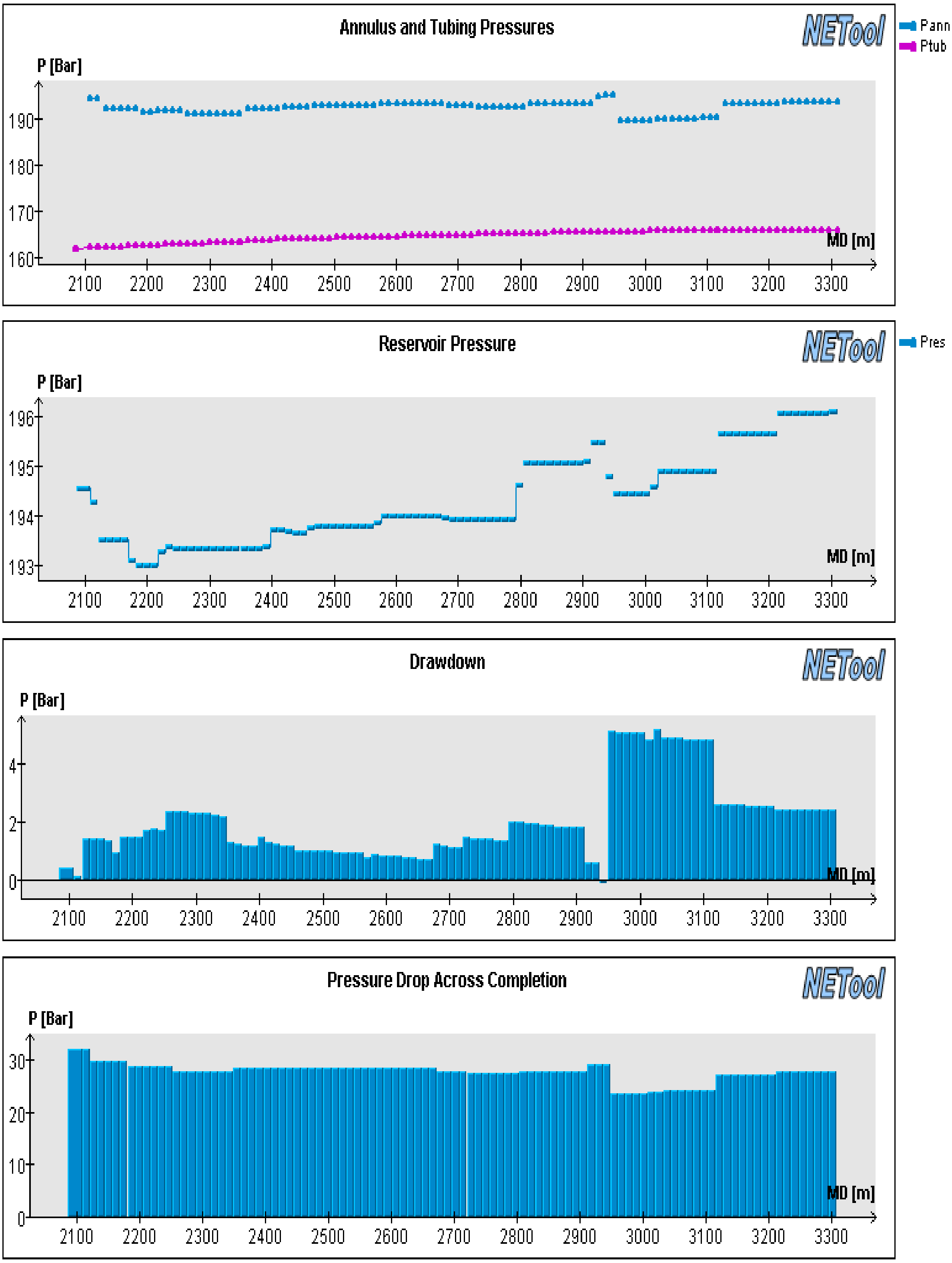
A.7 Plots for well KP7, 1826 days, 4x1,6mm ICD

Completion overview for the reference case:

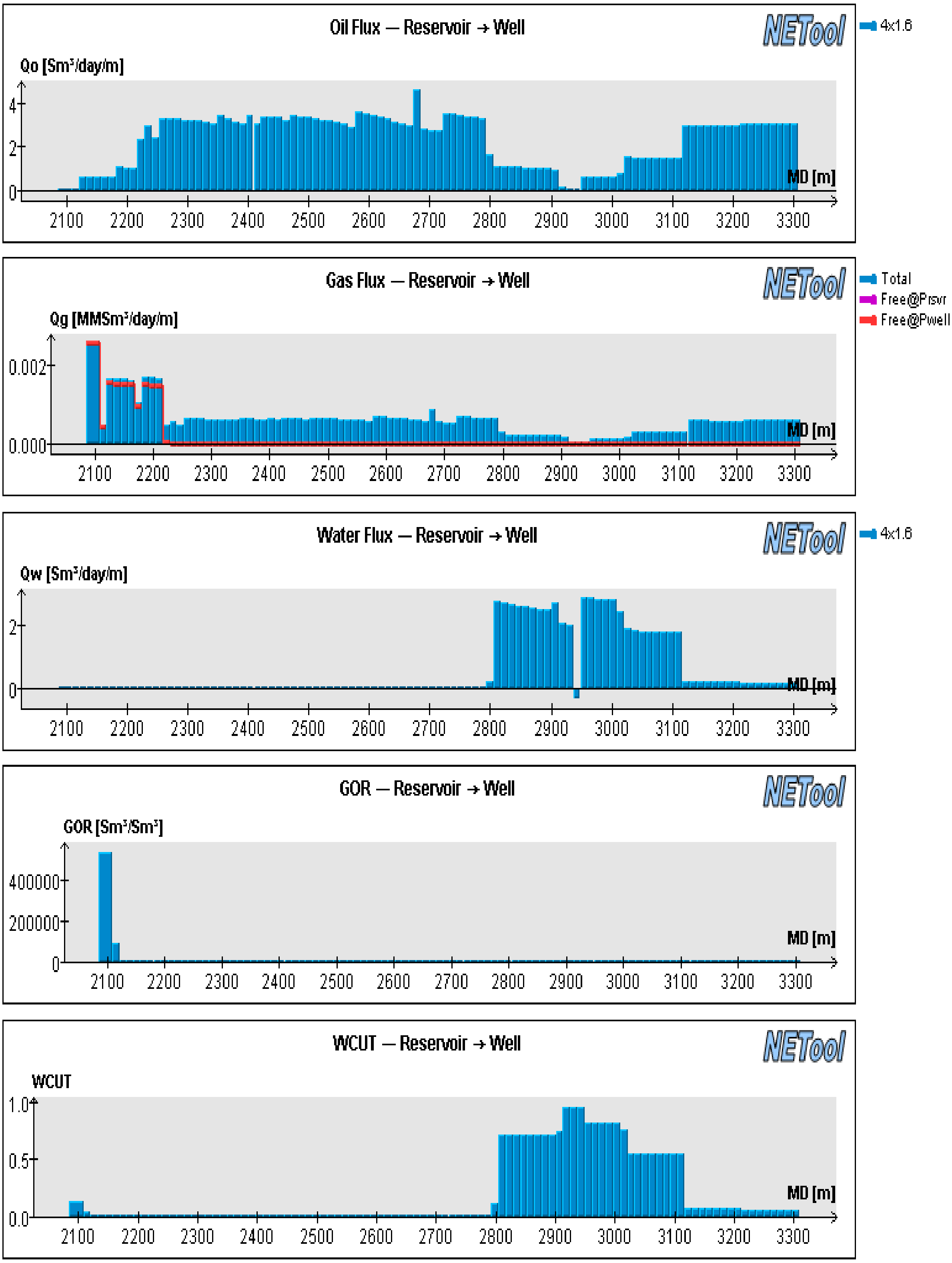
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2445	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No
2	2085,3	23,7	**Nozzle ICD**	4	1,6	Yes	No	No	**37**	2457	0,3	**Packer**	-	-	No	No	N/A
3	2109	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No	**38**	2457	12,0	**Nozzle ICD**	4	1,6	Yes	No	No
4	2120,7	0,3	**Packer**	-	-	No	No	N/A	**39**	2469	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
5	2121	12,0	**Nozzle ICD**	4	1,6	Yes	No	No	**40**	2481	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
6	2133	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**41**	2493	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
7	2145	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**42**	2505	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
8	2157	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**43**	2517	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
9	2169	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No	**44**	2529	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
10	2180,7	0,3	**Packer**	-	-	No	No	N/A	**45**	2541	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
11	2181	12,0	**Nozzle ICD**	4	1,6	Yes	No	No	**46**	2553	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No
12	2193	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**47**	2565	0,3	**Packer**	-	-	No	No	N/A
13	2205	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**48**	2565	12,0	**Nozzle ICD**	4	1,6	Yes	No	No
14	2217	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**49**	2577	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
15	2229	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**50**	2589	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
16	2241	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No	**51**	2601	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
17	2252,7	0,3	**Packer**	-	-	No	No	N/A	**52**	2613	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
18	2253	12,0	**Nozzle ICD**	4	1,6	Yes	No	No	**53**	2625	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
19	2265	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**54**	2637	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
20	2277	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**55**	2649	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
21	2289	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**56**	2661	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
22	2301	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**57**	2673	0,3	**Packer**	-	-	No	No	N/A
23	2313	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**58**	2673	11,7	**Nozzle ICD**	4	1,6	Yes	No	No
24	2325	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**59**	2685	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
25	2337	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**60**	2697	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
26	2349	0,3	**Packer**	-	-	No	No	N/A	**61**	2709	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No
27	2349,3	11,7	**Nozzle ICD**	4	1,6	Yes	No	No	**62**	2721	0,3	**Packer**	-	-	No	No	N/A
28	2361	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**63**	2721	12,0	**Nozzle ICD**	4	1,6	Yes	No	No
29	2373	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**64**	2733	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
30	2385	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**65**	2745	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
31	2397	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No	**66**	2757	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
32	2408,7	0,3	**Packer**	-	-	No	No	N/A	**67**	2769	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
33	2409	12,0	**Nozzle ICD**	4	1,6	Yes	No	No	**68**	2781	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No
34	2421	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**69**	2793	11,7	**Nozzle ICD**	4	1,6	Yes	Yes	No
35	2433	12,0	**Nozzle ICD**	4	1,6	Yes	Yes	No	**70**	2805	0,3	**Packer**	-	-	No	No	N/A

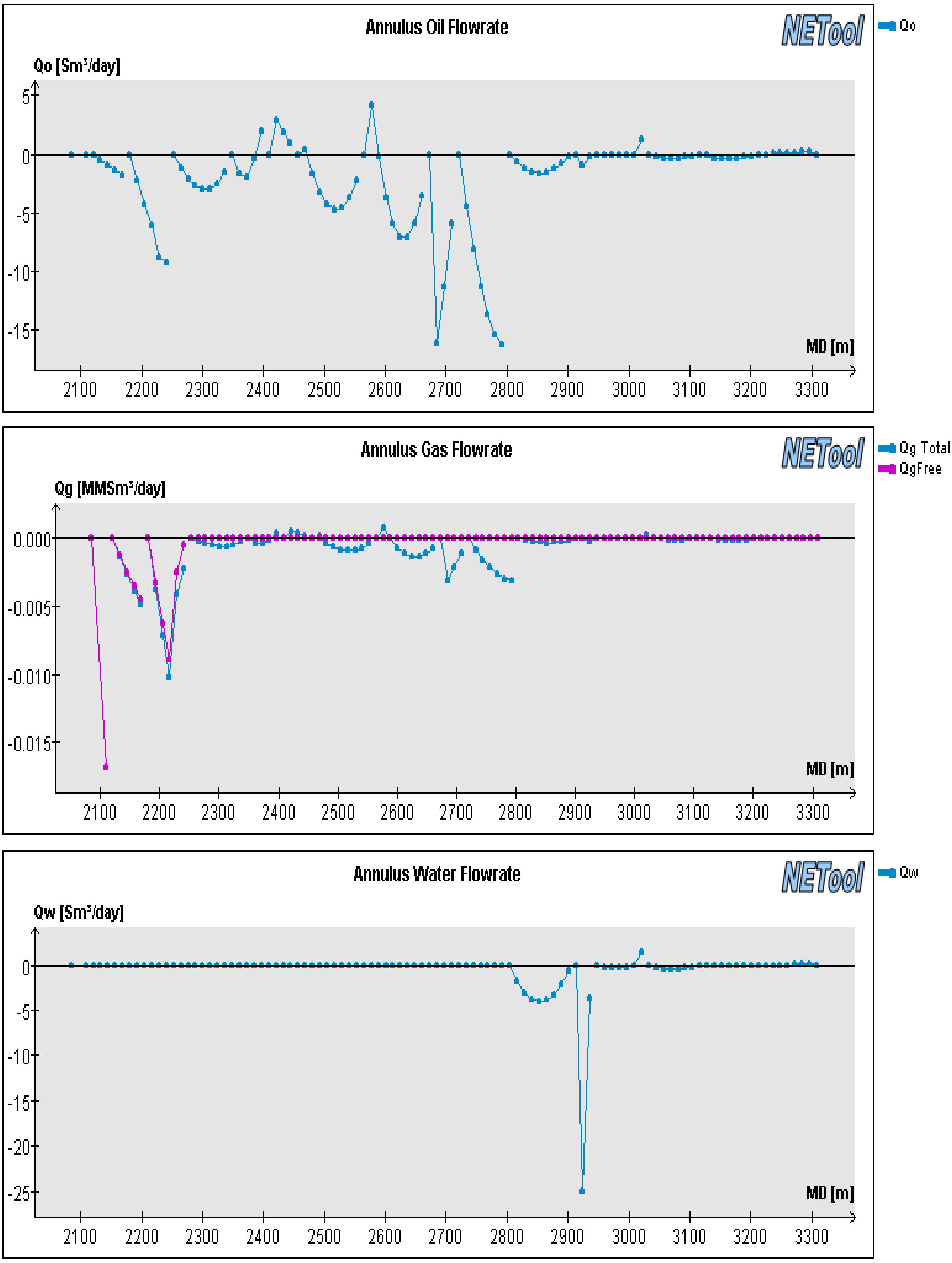
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	2805	12,0	Nozzle ICD	4	1,6	Yes	No	No	102	3117	12,0	Nozzle ICD	4	1,6	Yes	No	No
72	2817	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	103	3129	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
73	2829	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	104	3141	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
74	2841	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	105	3153	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
75	2853	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	106	3165	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
76	2865	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	107	3177	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
77	2877	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	108	3189	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
78	2889	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	109	3201	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
79	2901	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	110	3213	0,3	Packer	-	-	No	No	N/A
80	2912,7	0,3	Packer	-	-	No	No	N/A	111	3213	12,0	Nozzle ICD	4	1,6	Yes	No	No
81	2913	12,0	Blank pipe	-	-	Yes	No	No	112	3225	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
82	2925	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	113	3237	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No	114	3249	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A	115	3261	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
85	2949	12,0	Nozzle ICD	4	1,6	Yes	No	No	116	3273	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
86	2961	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	117	3285	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
87	2973	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	118	3297	12,4	Nozzle ICD	4	1,6	Yes	Yes	No
88	2985	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	TOE	3309							
89	2997	11,7	Nozzle ICD	4	1,6	Yes	Yes	No									
90	3008,7	0,3	Packer	-	-	No	No	N/A									
91	3009	12,0	Nozzle ICD	4	1,6	Yes	No	No									
92	3021	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
93	3033	0,3	Packer	-	-	No	No	N/A									
94	3033,3	11,7	Nozzle ICD	4	1,6	Yes	No	No									
95	3045	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
96	3057	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
97	3069	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
98	3081	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
99	3093	12,0	Nozzle ICD	4	1,6	Yes	Yes	No									
100	3105	11,7	Nozzle ICD	4	1,6	Yes	Yes	No									
101	3116,7	0,3	Packer	-	-	No	No	N/A									



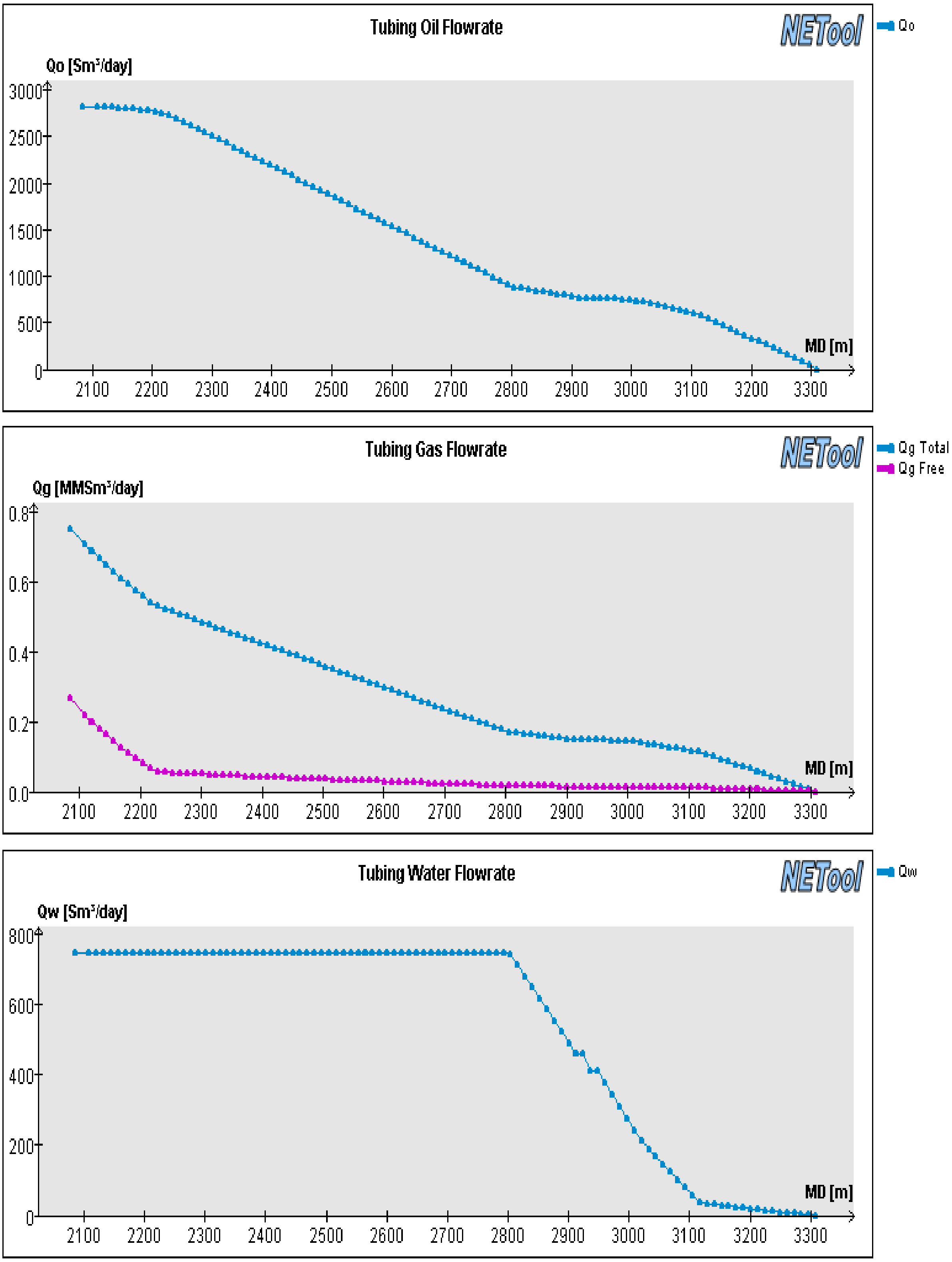
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



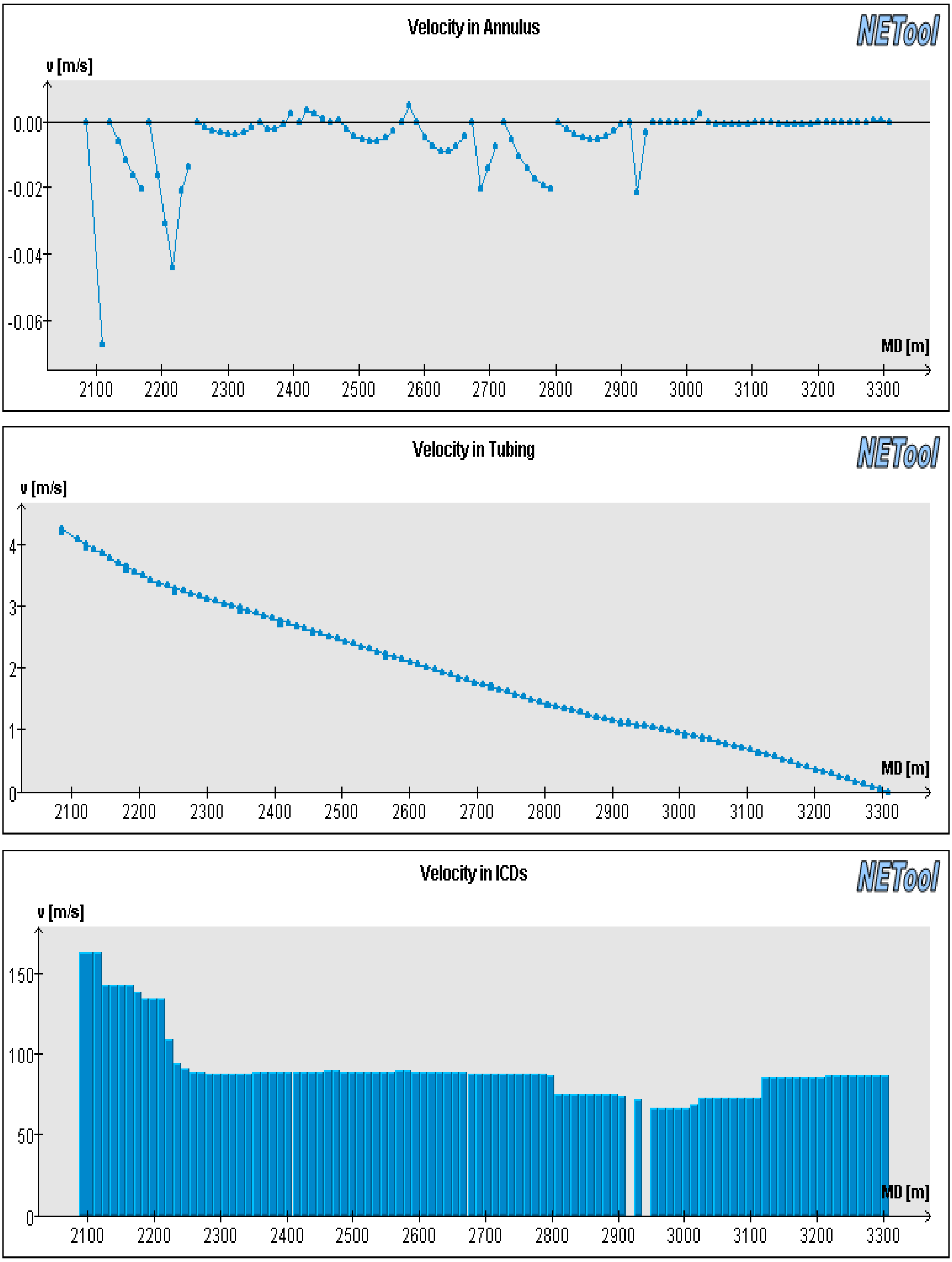
Influx of oil, gas and water from the reservoir and into the well along the wellbore



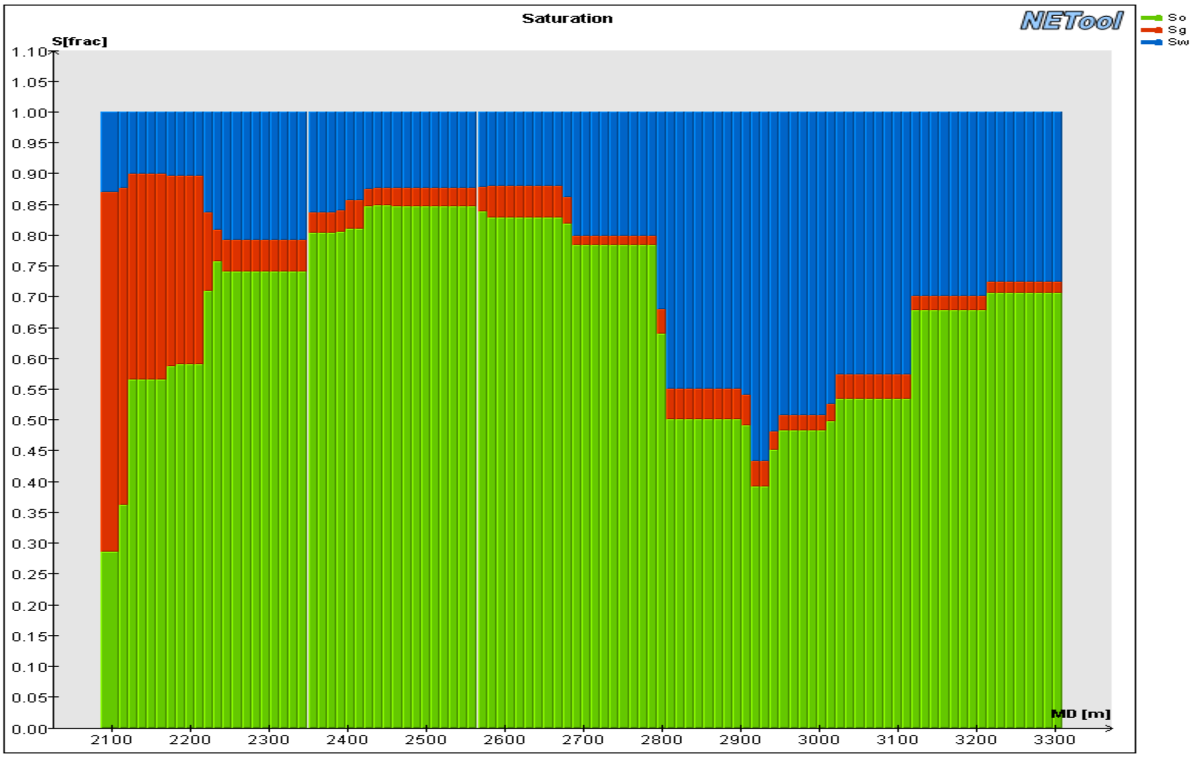
Annulus oil, gas and water flow rate along the wellbore.



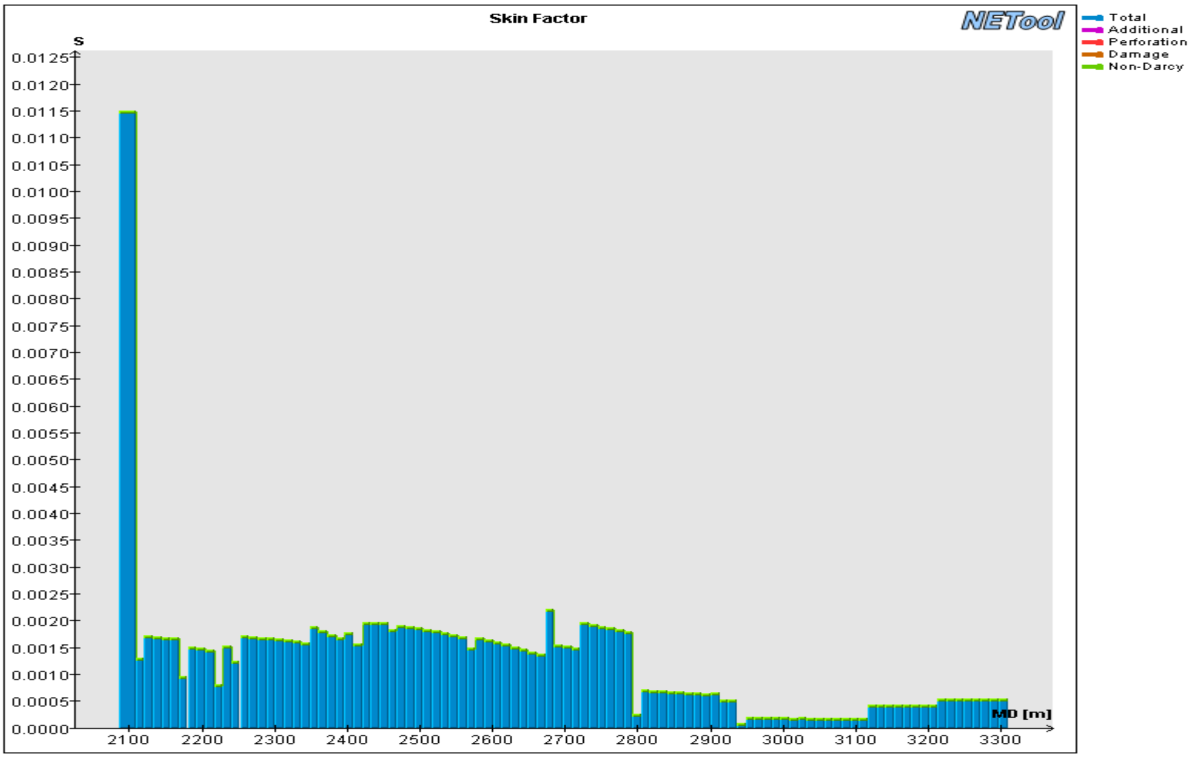
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.8 Plots for well KP7, 1826 days, 4x2,5mm ICD

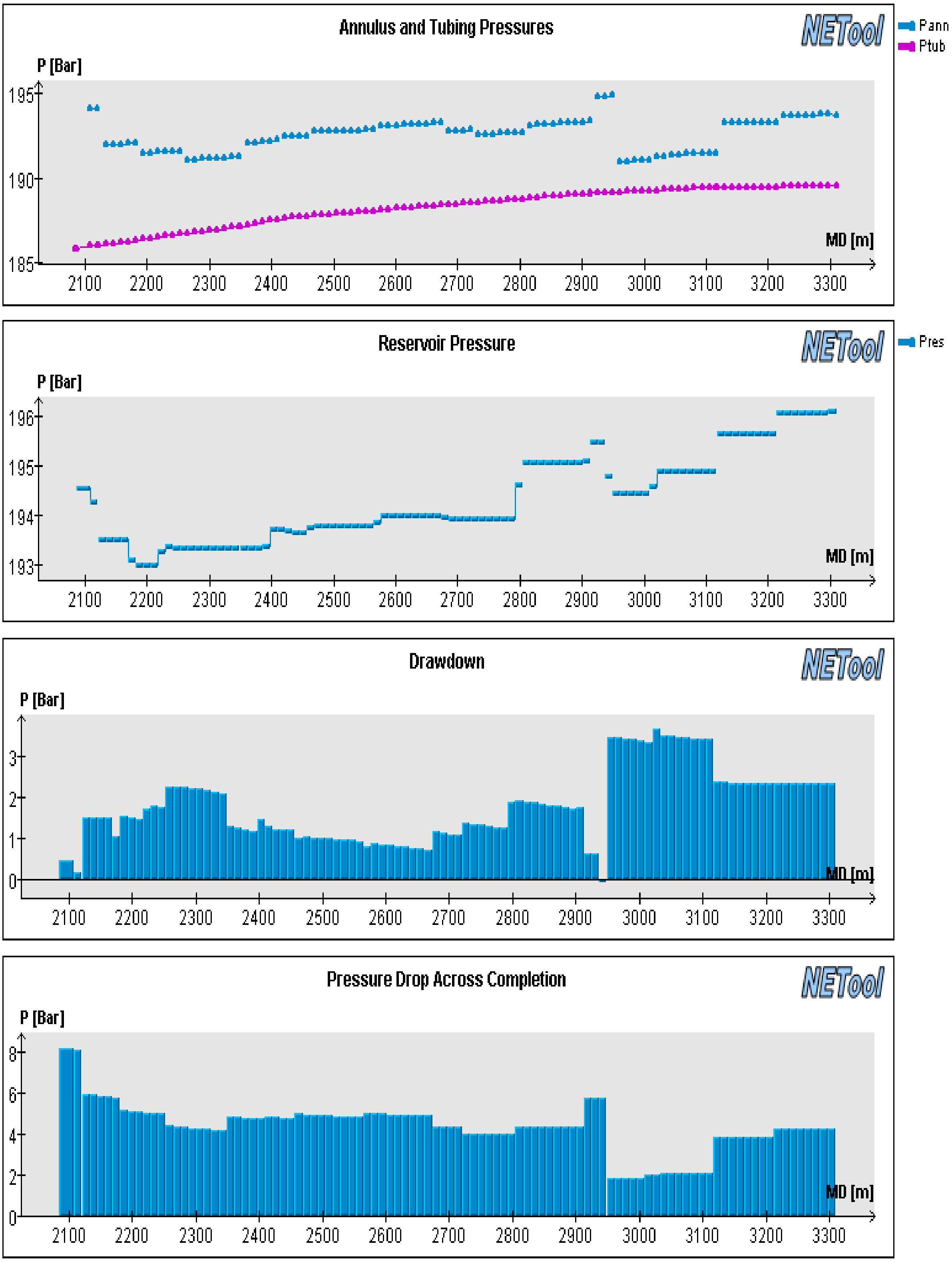
Completion overview for the reference case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

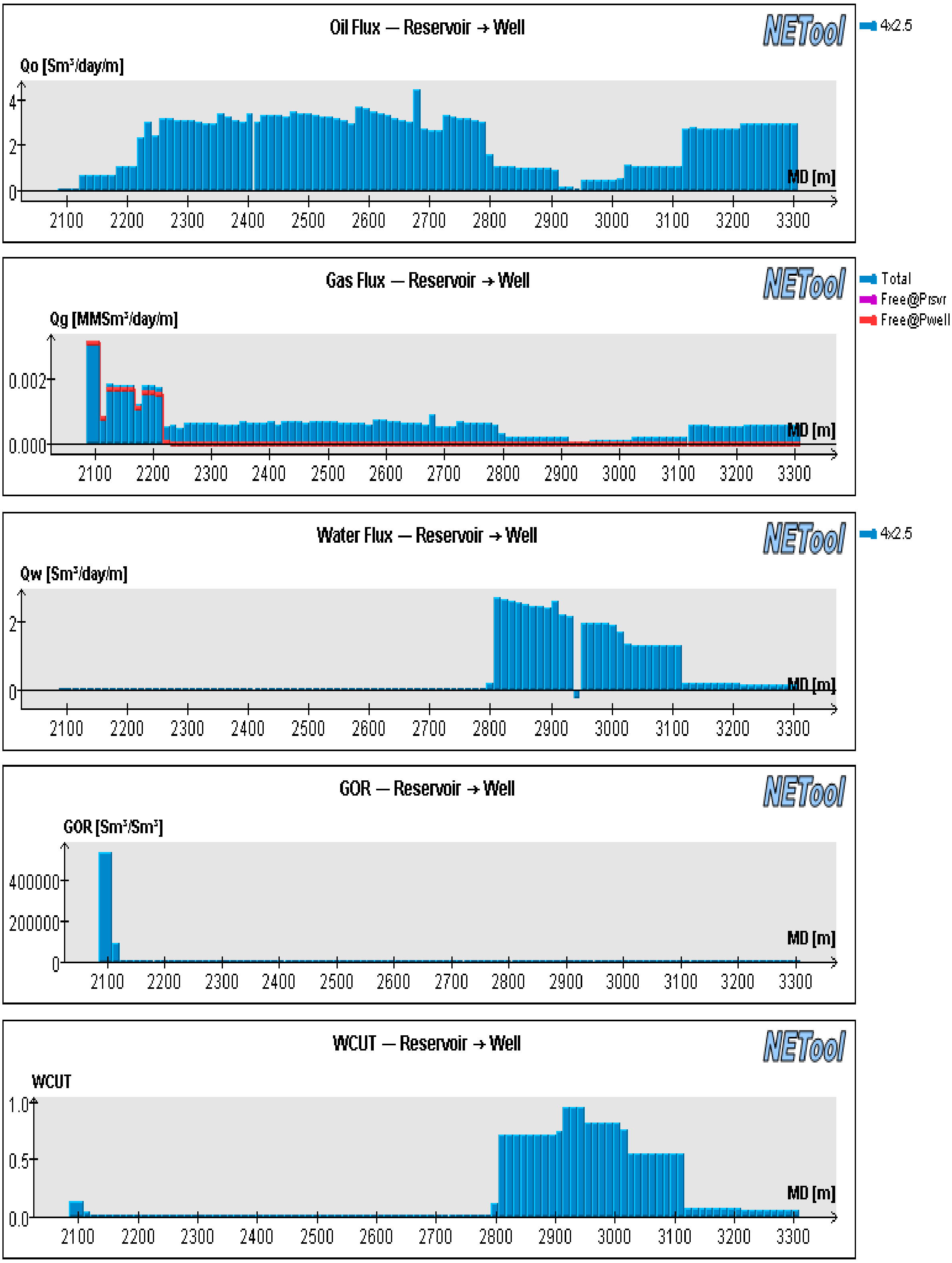
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	4	2,5	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	38	2457	12,0	Nozzle ICD	4	2,5	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	2,5	Yes	No	No	40	2481	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
6	2133	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	41	2493	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
7	2145	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	42	2505	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
8	2157	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	43	2517	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
9	2169	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	44	2529	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
11	2181	12,0	Nozzle ICD	4	2,5	Yes	No	No	46	2553	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
12	2193	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	48	2565	12,0	Nozzle ICD	4	2,5	Yes	No	No
14	2217	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	49	2577	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
15	2229	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	50	2589	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
16	2241	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	51	2601	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
18	2253	12,0	Nozzle ICD	4	2,5	Yes	No	No	53	2625	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
19	2265	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	54	2637	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
20	2277	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	55	2649	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
21	2289	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	56	2661	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
22	2301	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	58	2673	11,7	Nozzle ICD	4	2,5	Yes	No	No
24	2325	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	59	2685	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
25	2337	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	60	2697	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	4	2,5	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	63	2721	12,0	Nozzle ICD	4	2,5	Yes	No	No
29	2373	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	64	2733	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
30	2385	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	65	2745	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
31	2397	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	66	2757	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
33	2409	12,0	Nozzle ICD	4	2,5	Yes	No	No	68	2781	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
34	2421	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	69	2793	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
35	2433	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	**Nozzle ICD**	4	2,5	Yes	No	No
72	2817	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
73	2829	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
74	2841	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
75	2853	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
76	2865	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
77	2877	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
78	2889	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
79	2901	11,7	**Nozzle ICD**	4	2,5	Yes	Yes	No
80	2912,7	0,3	**Packer**	-	-	No	No	N/A
81	2913	12,0	**Blank pipe**	-	-	Yes	No	No
82	2925	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
83	2937	11,7	**Blank pipe**	-	-	Yes	Yes	No
84	2948,7	0,3	**Packer**	-	-	No	No	N/A
85	2949	12,0	**Nozzle ICD**	4	2,5	Yes	No	No
86	2961	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
87	2973	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
88	2985	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
89	2997	11,7	**Nozzle ICD**	4	2,5	Yes	Yes	No
90	3008,7	0,3	**Packer**	-	-	No	No	N/A
91	3009	12,0	**Nozzle ICD**	4	2,5	Yes	No	No
92	3021	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
93	3033	0,3	**Packer**	-	-	No	No	N/A
94	3033,3	11,7	**Nozzle ICD**	4	2,5	Yes	No	No
95	3045	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
96	3057	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
97	3069	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
98	3081	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
99	3093	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
100	3105	11,7	**Nozzle ICD**	4	2,5	Yes	Yes	No
101	3116,7	0,3	**Packer**	-	-	No	No	N/A

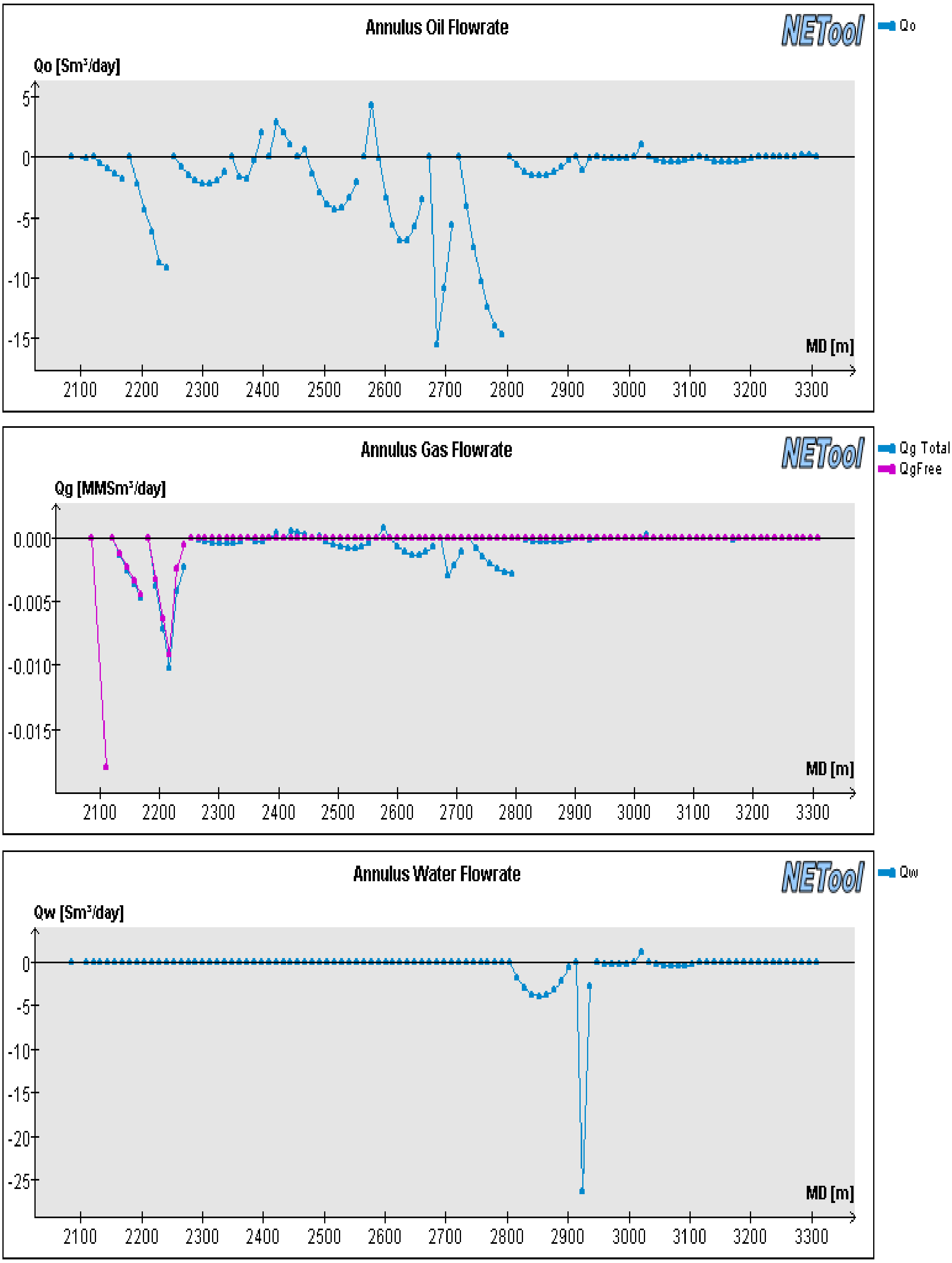
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	**Nozzle ICD**	4	2,5	Yes	No	No
103	3129	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
104	3141	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
105	3153	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
106	3165	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
107	3177	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
108	3189	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
109	3201	11,7	**Nozzle ICD**	4	2,5	Yes	Yes	No
110	3213	0,3	**Packer**	-	-	No	No	N/A
111	3213	12,0	**Nozzle ICD**	4	2,5	Yes	No	No
112	3225	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
113	3237	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
114	3249	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
115	3261	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
116	3273	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
117	3285	12,0	**Nozzle ICD**	4	2,5	Yes	Yes	No
118	3297	12,4	**Nozzle ICD**	4	2,5	Yes	Yes	No
TOE	3309							



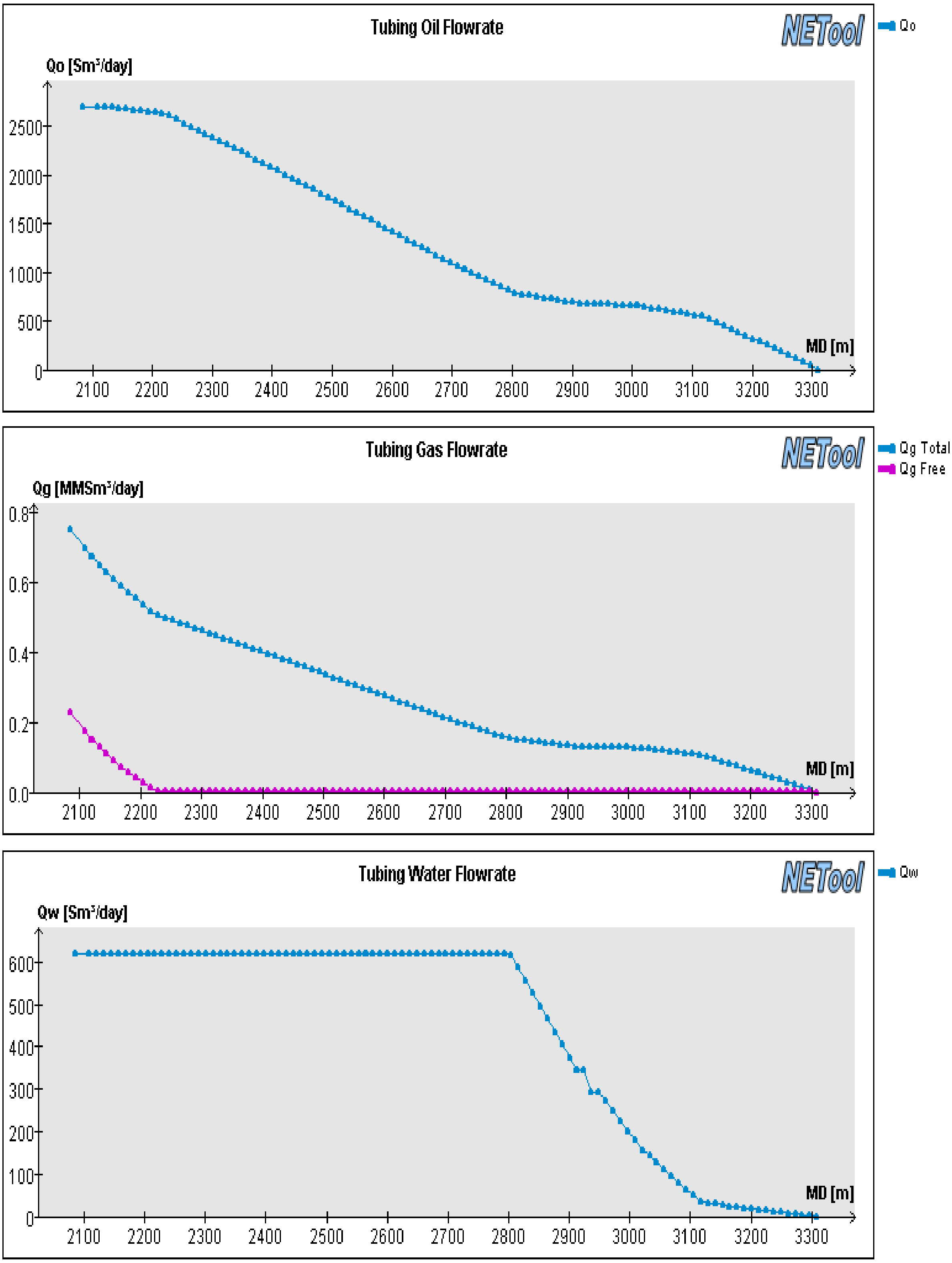
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



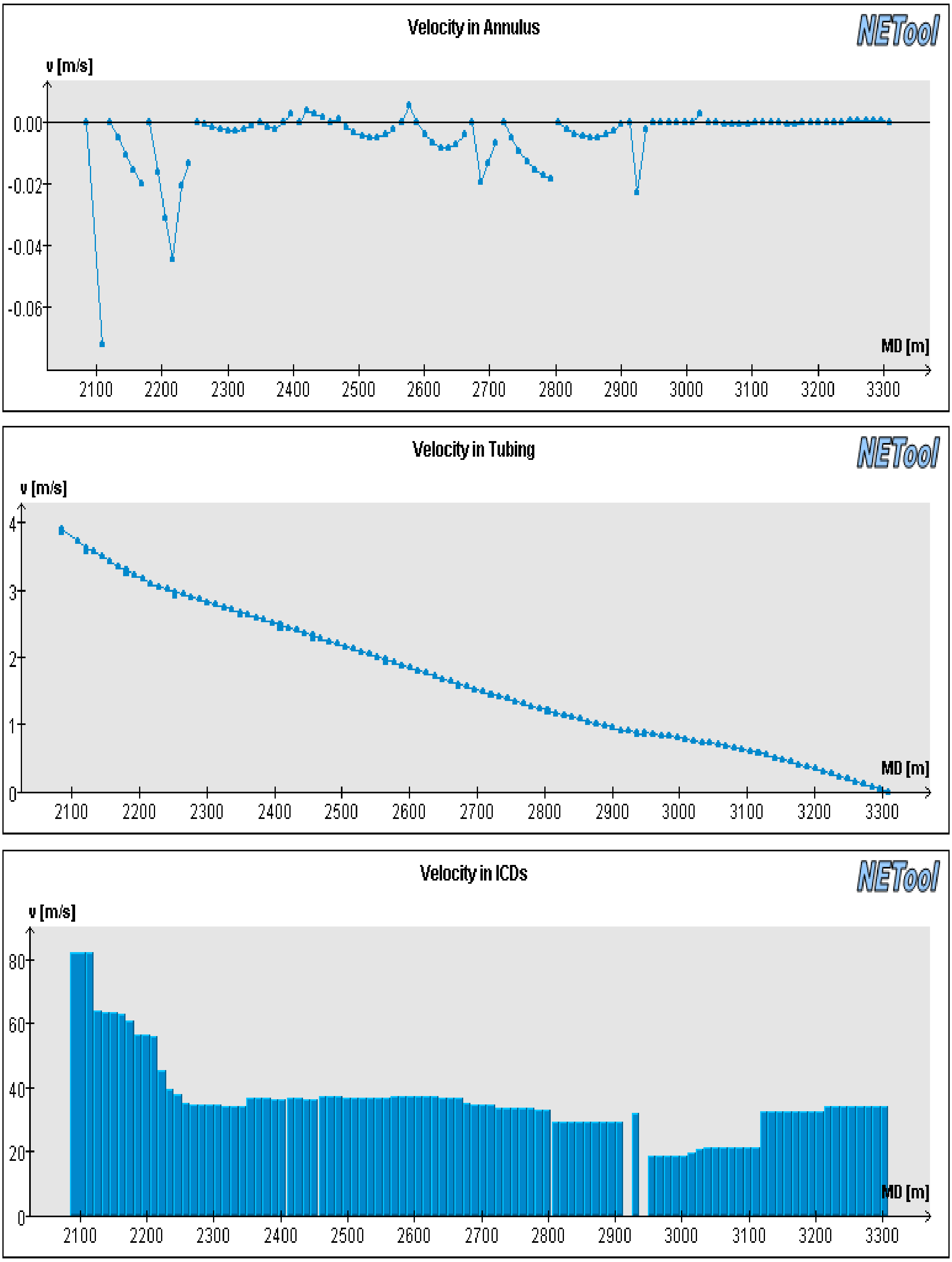
Influx of oil, gas and water from the reservoir and into the well along the wellbore



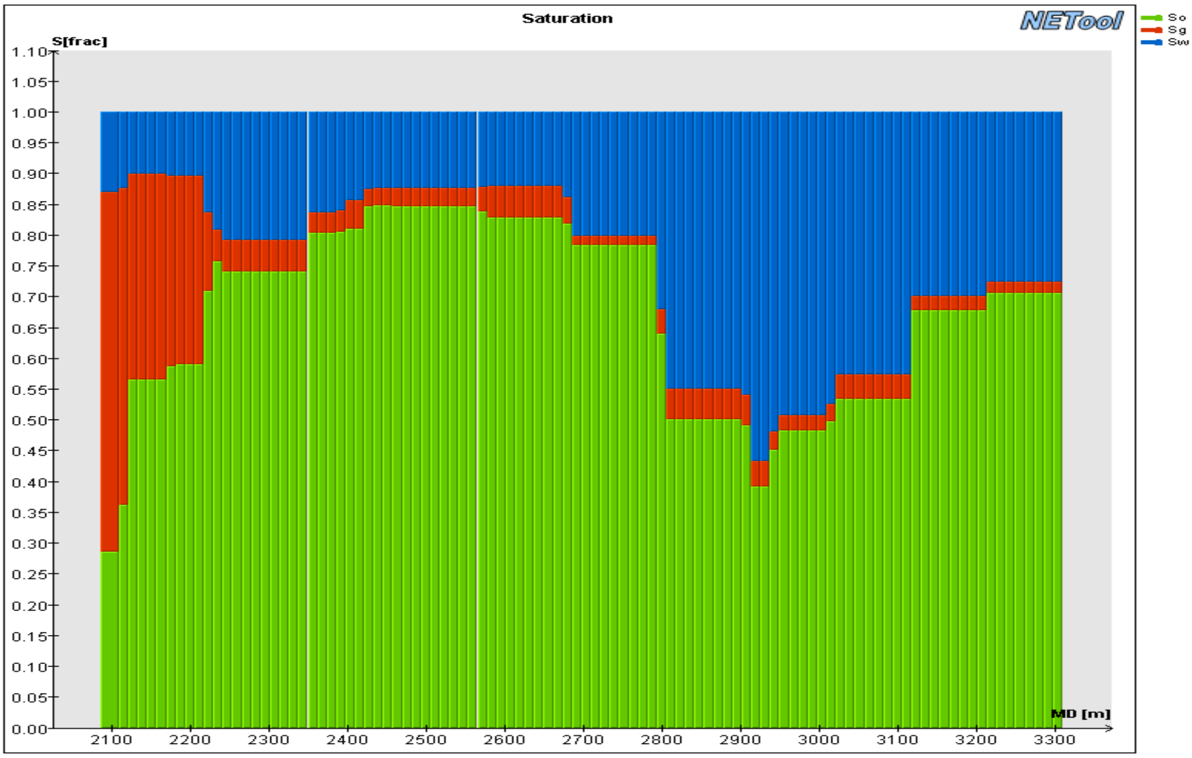
Annulus oil, gas and water flow rate along the wellbore.



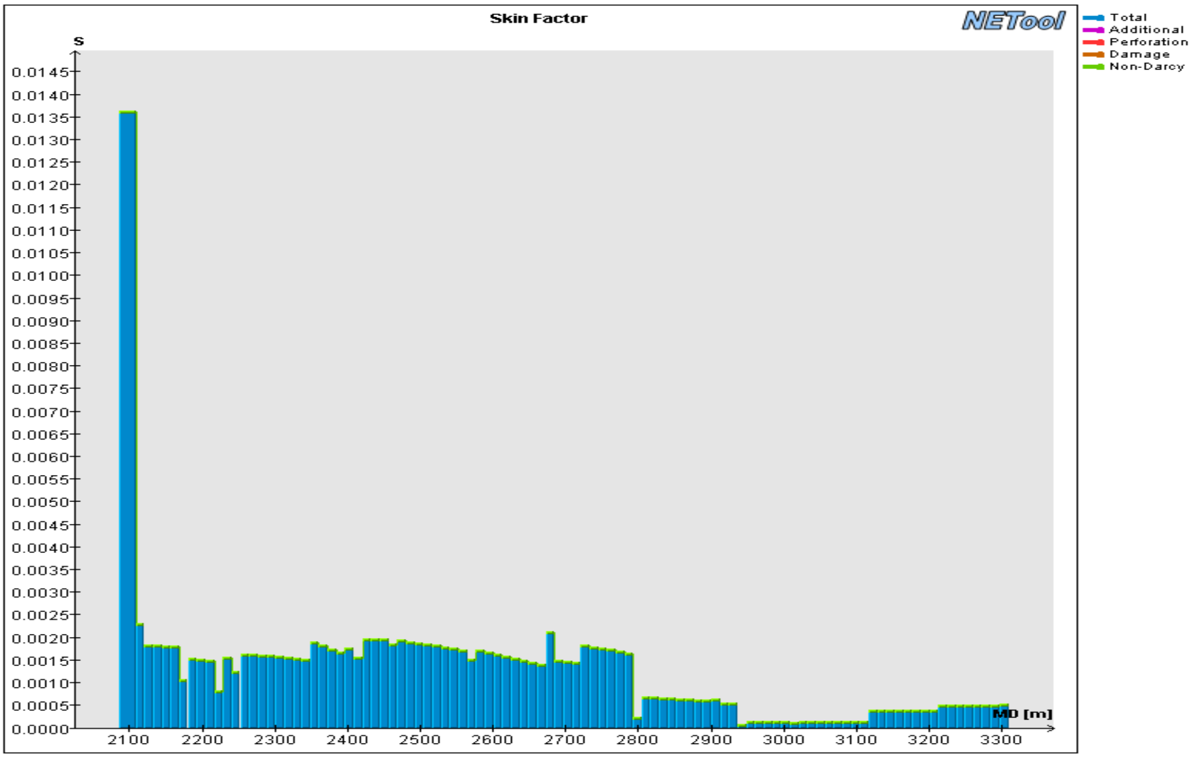
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.9 Plots for well KP7, 1826 days, 4x4mm ICD

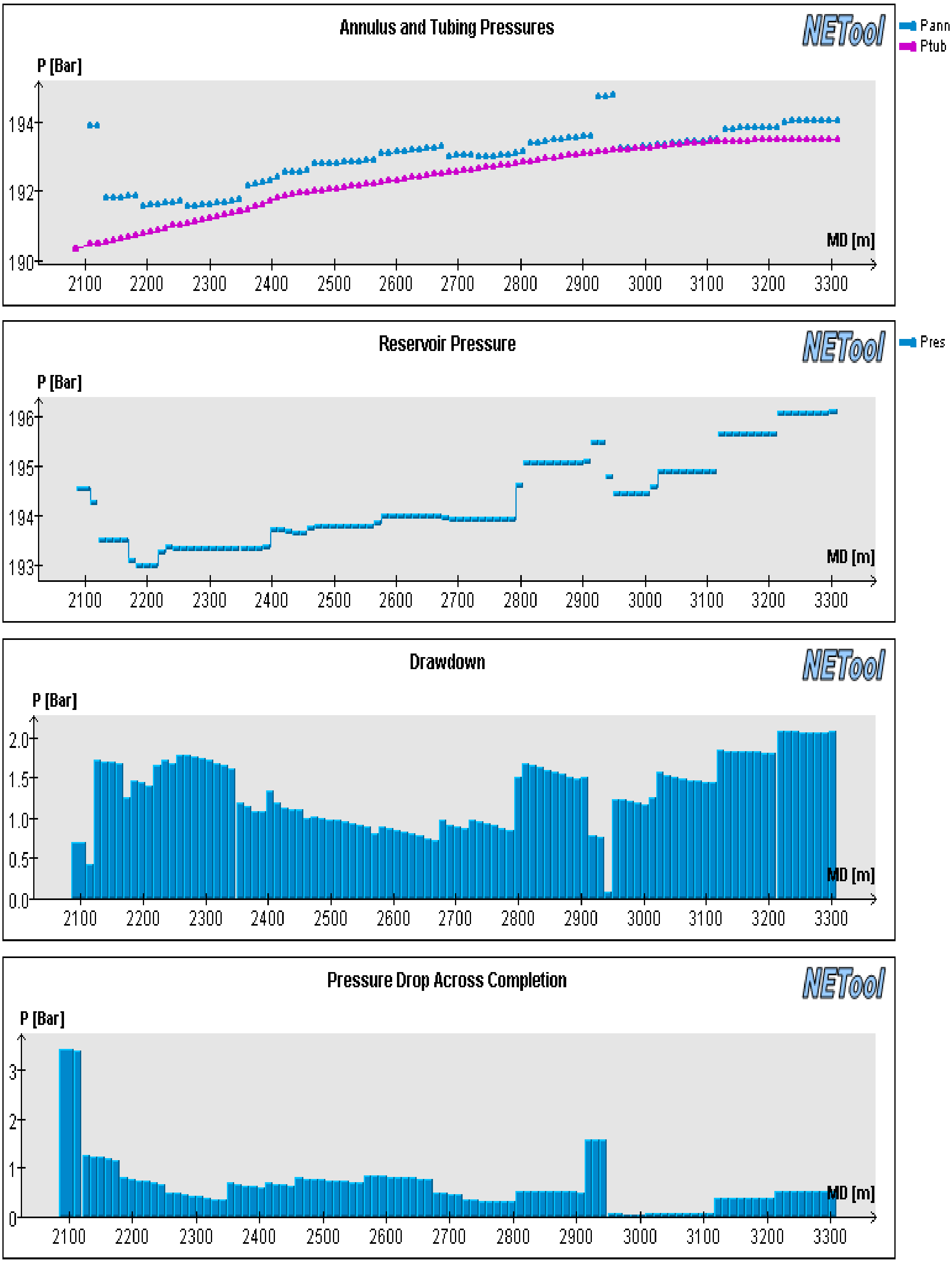
Completion overview for the reference case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

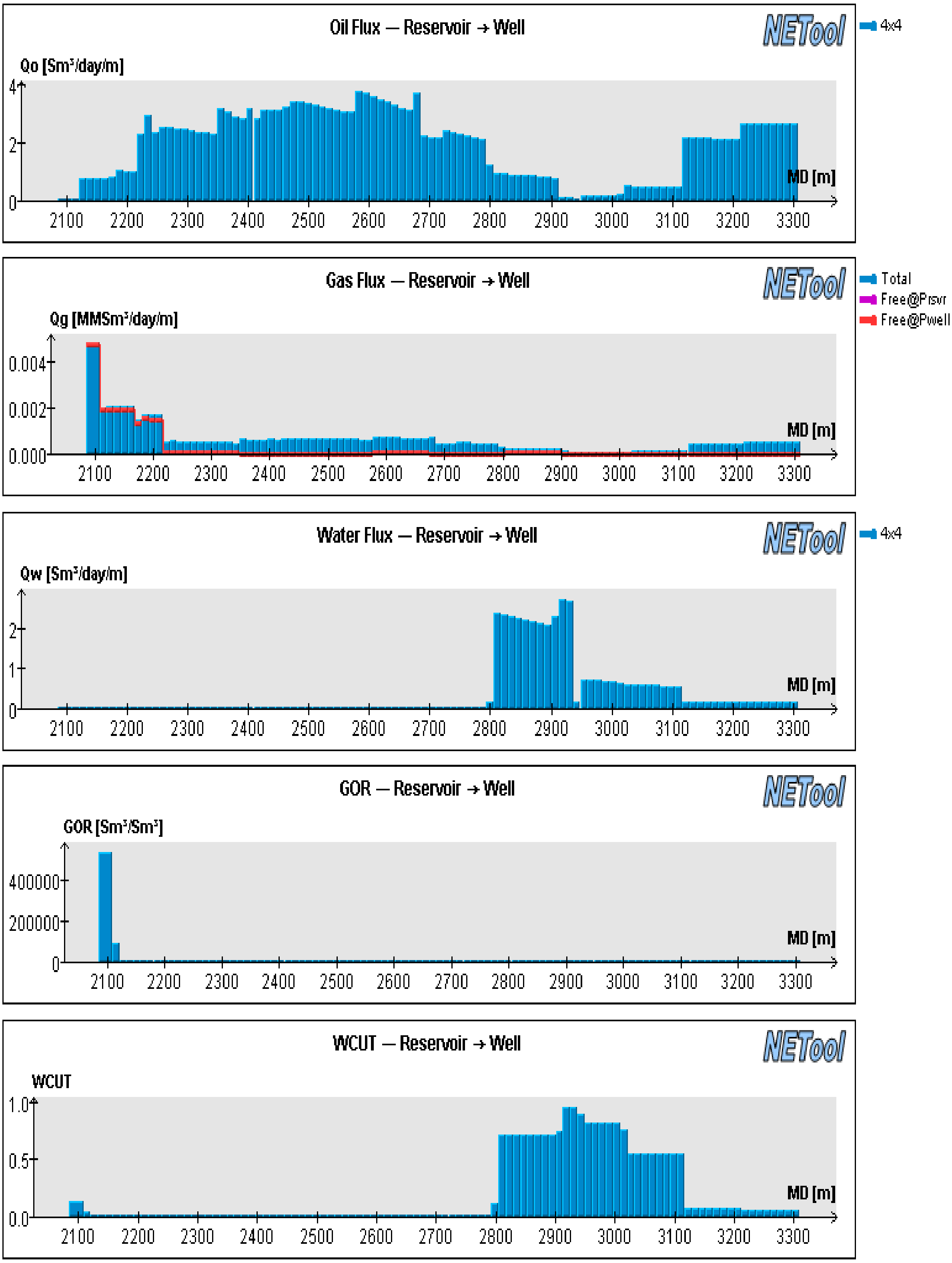
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	4	4	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	4	4	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	4	4	Yes	Yes	No	38	2457	12,0	Nozzle ICD	4	4	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	4	Yes	No	No	40	2481	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2133	12,0	Nozzle ICD	4	4	Yes	Yes	No	41	2493	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2145	12,0	Nozzle ICD	4	4	Yes	Yes	No	42	2505	12,0	Nozzle ICD	4	4	Yes	Yes	No
8	2157	12,0	Nozzle ICD	4	4	Yes	Yes	No	43	2517	12,0	Nozzle ICD	4	4	Yes	Yes	No
9	2169	11,7	Nozzle ICD	4	4	Yes	Yes	No	44	2529	12,0	Nozzle ICD	4	4	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	4	4	Yes	Yes	No
11	2181	12,0	Nozzle ICD	4	4	Yes	No	No	46	2553	11,7	Nozzle ICD	4	4	Yes	Yes	No
12	2193	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2565	12,0	Nozzle ICD	4	4	Yes	No	No
14	2217	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2577	12,0	Nozzle ICD	4	4	Yes	Yes	No
15	2229	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2589	12,0	Nozzle ICD	4	4	Yes	Yes	No
16	2241	11,7	Nozzle ICD	4	4	Yes	Yes	No	51	2601	12,0	Nozzle ICD	4	4	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	4	4	Yes	Yes	No
18	2253	12,0	Nozzle ICD	4	4	Yes	No	No	53	2625	12,0	Nozzle ICD	4	4	Yes	Yes	No
19	2265	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	2637	12,0	Nozzle ICD	4	4	Yes	Yes	No
20	2277	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	2649	12,0	Nozzle ICD	4	4	Yes	Yes	No
21	2289	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	2661	12,0	Nozzle ICD	4	4	Yes	Yes	No
22	2301	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	4	4	Yes	Yes	No	58	2673	11,7	Nozzle ICD	4	4	Yes	No	No
24	2325	12,0	Nozzle ICD	4	4	Yes	Yes	No	59	2685	12,0	Nozzle ICD	4	4	Yes	Yes	No
25	2337	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	2697	12,0	Nozzle ICD	4	4	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	4	4	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	4	4	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	2721	12,0	Nozzle ICD	4	4	Yes	No	No
29	2373	12,0	Nozzle ICD	4	4	Yes	Yes	No	64	2733	12,0	Nozzle ICD	4	4	Yes	Yes	No
30	2385	12,0	Nozzle ICD	4	4	Yes	Yes	No	65	2745	12,0	Nozzle ICD	4	4	Yes	Yes	No
31	2397	11,7	Nozzle ICD	4	4	Yes	Yes	No	66	2757	12,0	Nozzle ICD	4	4	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	4	4	Yes	Yes	No
33	2409	12,0	Nozzle ICD	4	4	Yes	No	No	68	2781	12,0	Nozzle ICD	4	4	Yes	Yes	No
34	2421	12,0	Nozzle ICD	4	4	Yes	Yes	No	69	2793	11,7	Nozzle ICD	4	4	Yes	Yes	No
35	2433	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	Nozzle ICD	4	4	Yes	No	No
72	2817	12,0	Nozzle ICD	4	4	Yes	Yes	No
73	2829	12,0	Nozzle ICD	4	4	Yes	Yes	No
74	2841	12,0	Nozzle ICD	4	4	Yes	Yes	No
75	2853	12,0	Nozzle ICD	4	4	Yes	Yes	No
76	2865	12,0	Nozzle ICD	4	4	Yes	Yes	No
77	2877	12,0	Nozzle ICD	4	4	Yes	Yes	No
78	2889	12,0	Nozzle ICD	4	4	Yes	Yes	No
79	2901	11,7	Nozzle ICD	4	4	Yes	Yes	No
80	2912,7	0,3	Packer	-	-	No	No	N/A
81	2913	12,0	Blank pipe	-	-	Yes	No	No
82	2925	12,0	Nozzle ICD	4	4	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A
85	2949	12,0	Nozzle ICD	4	4	Yes	No	No
86	2961	12,0	Nozzle ICD	4	4	Yes	Yes	No
87	2973	12,0	Nozzle ICD	4	4	Yes	Yes	No
88	2985	12,0	Nozzle ICD	4	4	Yes	Yes	No
89	2997	11,7	Nozzle ICD	4	4	Yes	Yes	No
90	3008,7	0,3	Packer	-	-	No	No	N/A
91	3009	12,0	Nozzle ICD	4	4	Yes	No	No
92	3021	12,0	Nozzle ICD	4	4	Yes	Yes	No
93	3033	0,3	Packer	-	-	No	No	N/A
94	3033,3	11,7	Nozzle ICD	4	4	Yes	No	No
95	3045	12,0	Nozzle ICD	4	4	Yes	Yes	No
96	3057	12,0	Nozzle ICD	4	4	Yes	Yes	No
97	3069	12,0	Nozzle ICD	4	4	Yes	Yes	No
98	3081	12,0	Nozzle ICD	4	4	Yes	Yes	No
99	3093	12,0	Nozzle ICD	4	4	Yes	Yes	No
100	3105	11,7	Nozzle ICD	4	4	Yes	Yes	No
101	3116,7	0,3	Packer	-	-	No	No	N/A

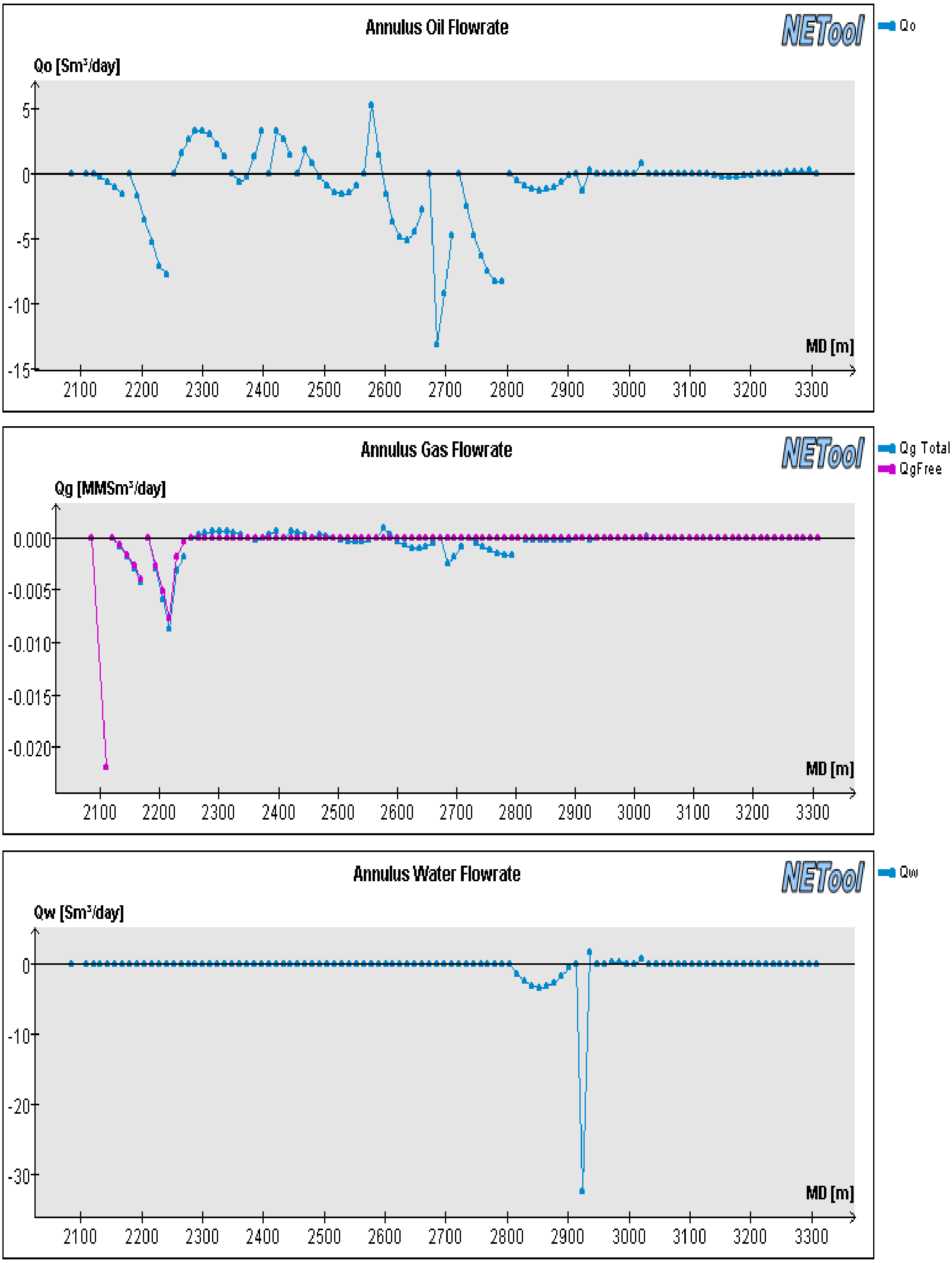
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	Nozzle ICD	4	4	Yes	No	No
103	3129	12,0	Nozzle ICD	4	4	Yes	Yes	No
104	3141	12,0	Nozzle ICD	4	4	Yes	Yes	No
105	3153	12,0	Nozzle ICD	4	4	Yes	Yes	No
106	3165	12,0	Nozzle ICD	4	4	Yes	Yes	No
107	3177	12,0	Nozzle ICD	4	4	Yes	Yes	No
108	3189	12,0	Nozzle ICD	4	4	Yes	Yes	No
109	3201	11,7	Nozzle ICD	4	4	Yes	Yes	No
110	3213	0,3	Packer	-	-	No	No	N/A
111	3213	12,0	Nozzle ICD	4	4	Yes	No	No
112	3225	12,0	Nozzle ICD	4	4	Yes	Yes	No
113	3237	12,0	Nozzle ICD	4	4	Yes	Yes	No
114	3249	12,0	Nozzle ICD	4	4	Yes	Yes	No
115	3261	12,0	Nozzle ICD	4	4	Yes	Yes	No
116	3273	12,0	Nozzle ICD	4	4	Yes	Yes	No
117	3285	12,0	Nozzle ICD	4	4	Yes	Yes	No
118	3297	12,4	Nozzle ICD	4	4	Yes	Yes	No
TOE	3309							



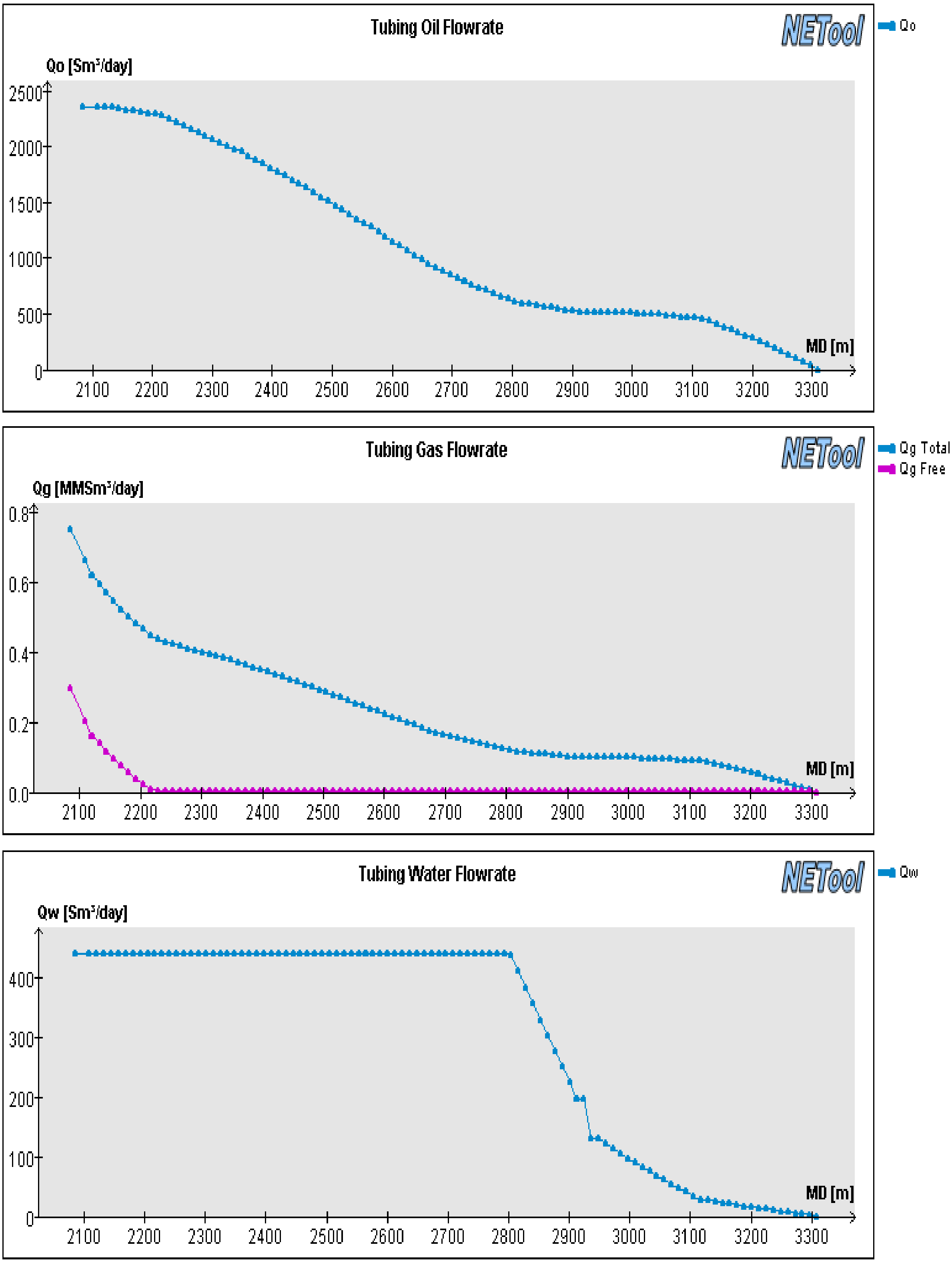
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



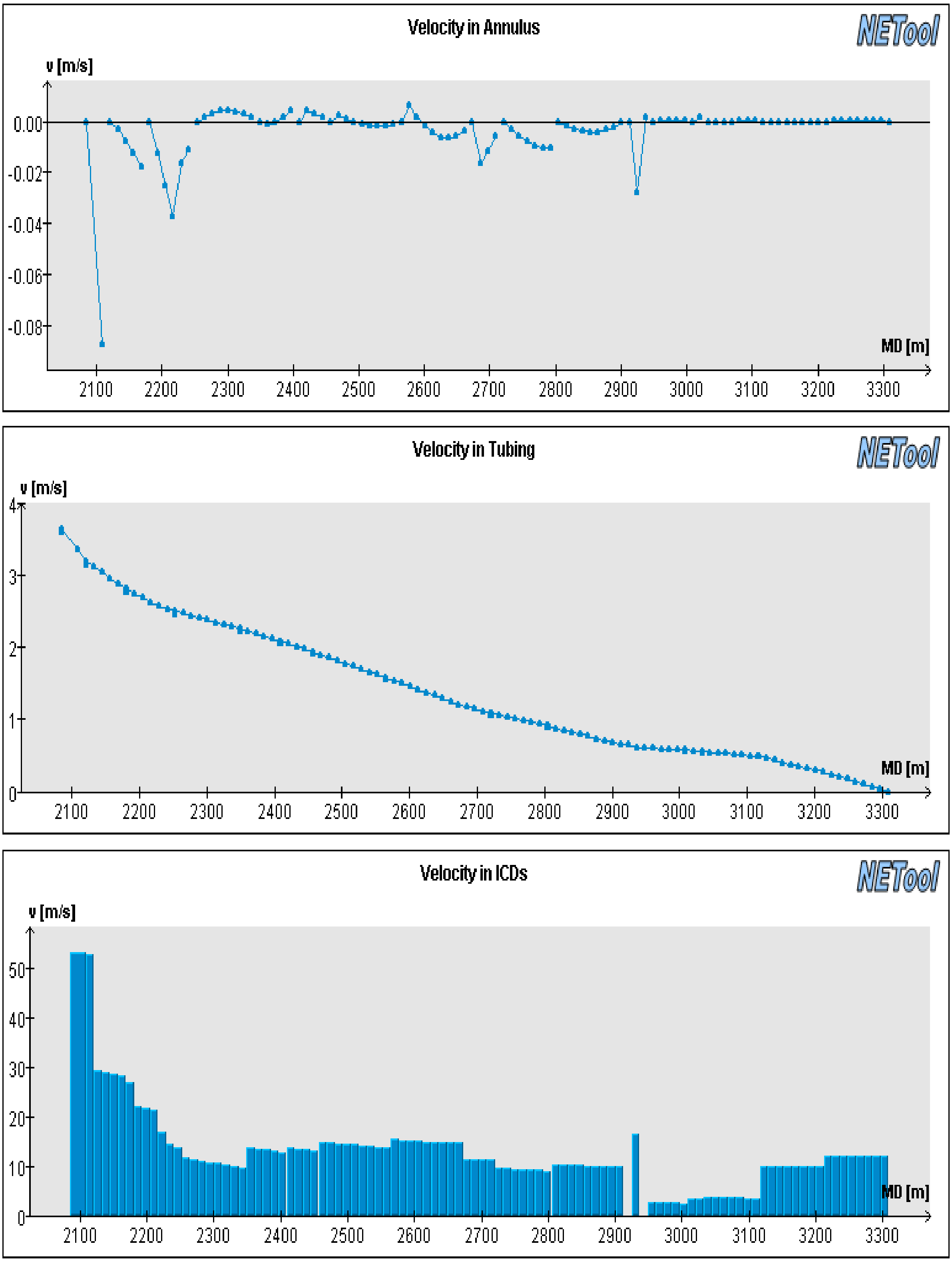
Influx of oil, gas and water from the reservoir and into the well along the wellbore



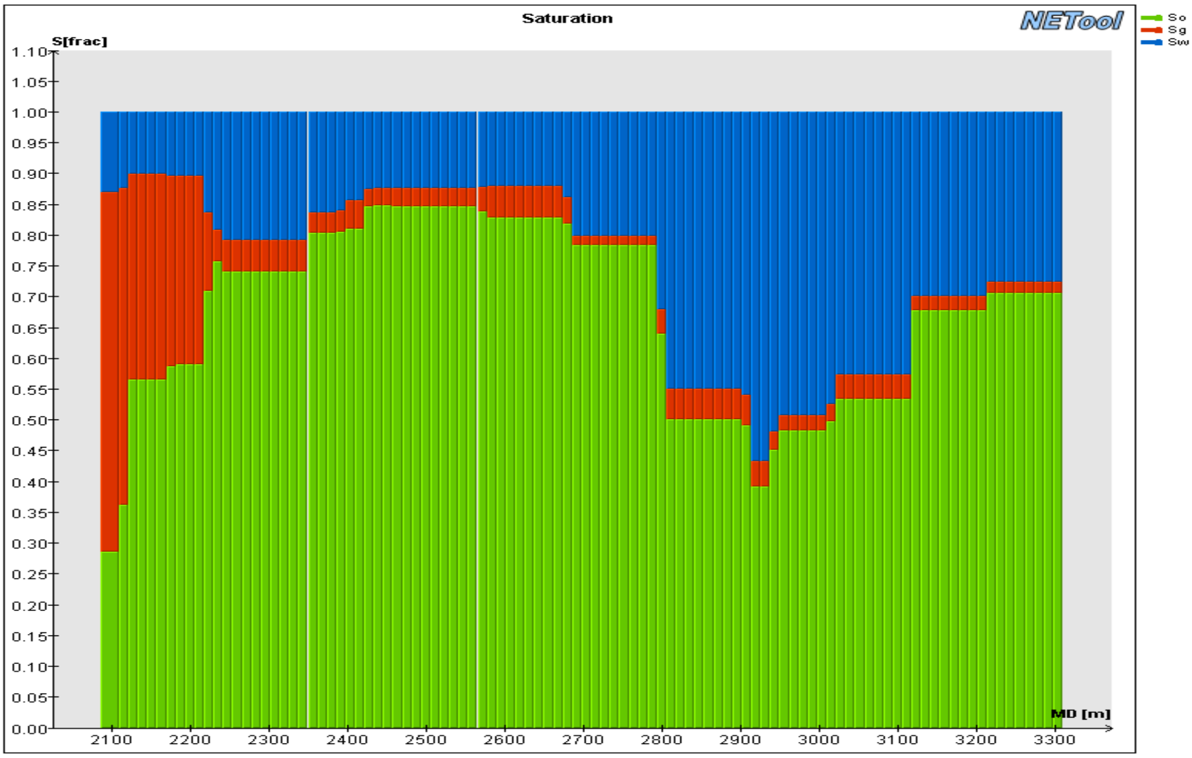
Annulus oil, gas and water flow rate along the wellbore.



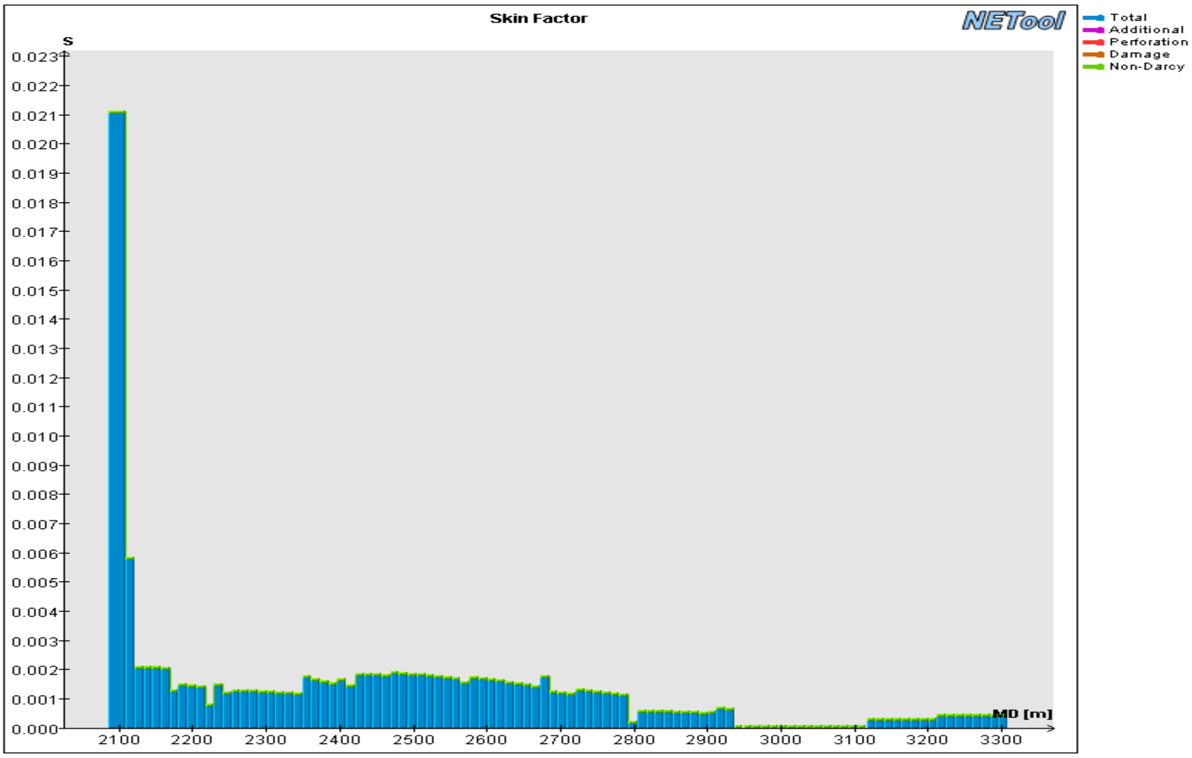
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.10 Plots for well KP7, 1826 days, Recommended solution, 4x4mm ICD and Blank pipe

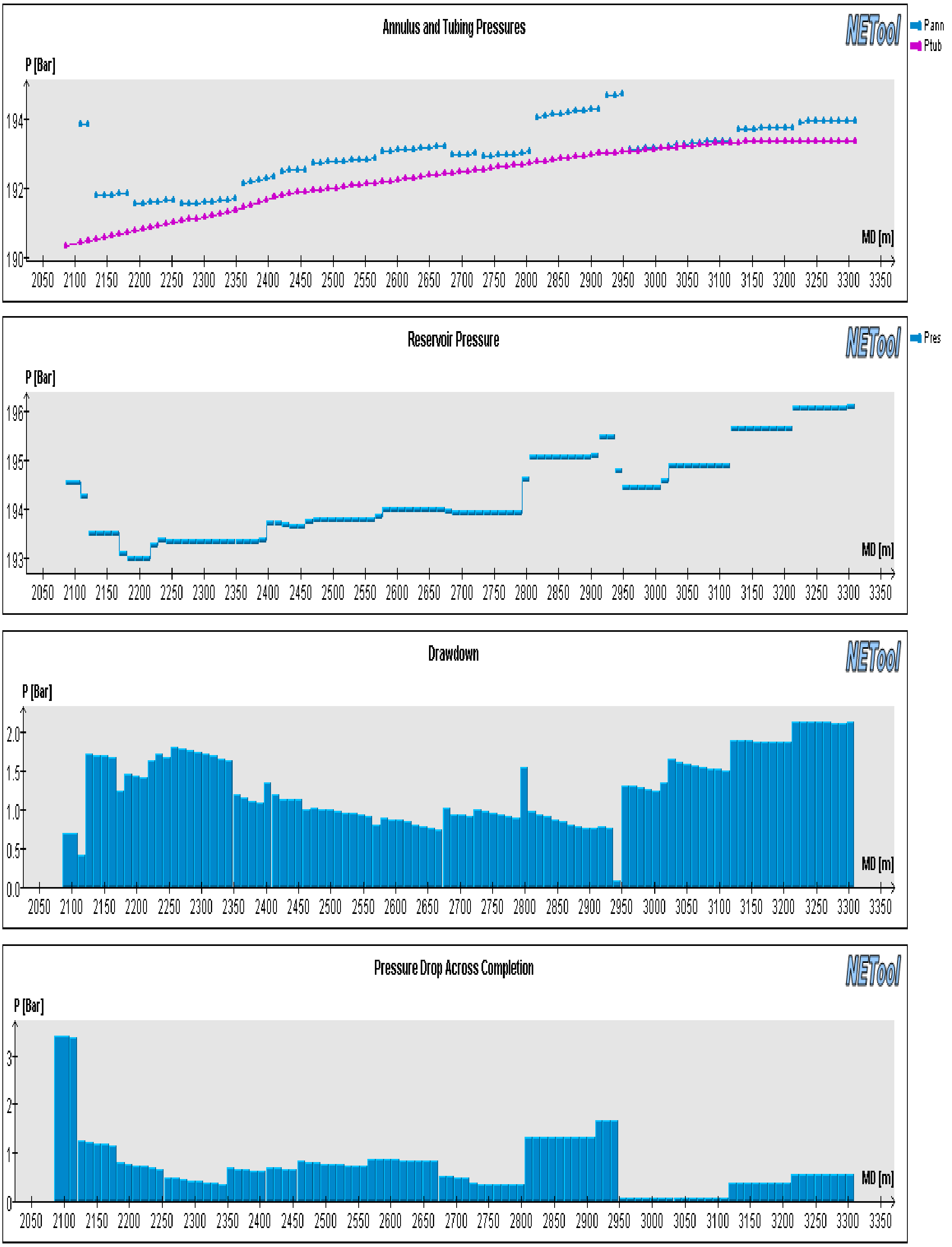
Completion overview for the case:

Reservoir section OD	8 ½"
Completion OD	6 5/8"
Completion ID	5,927"
Nozzle coefficient	0,953

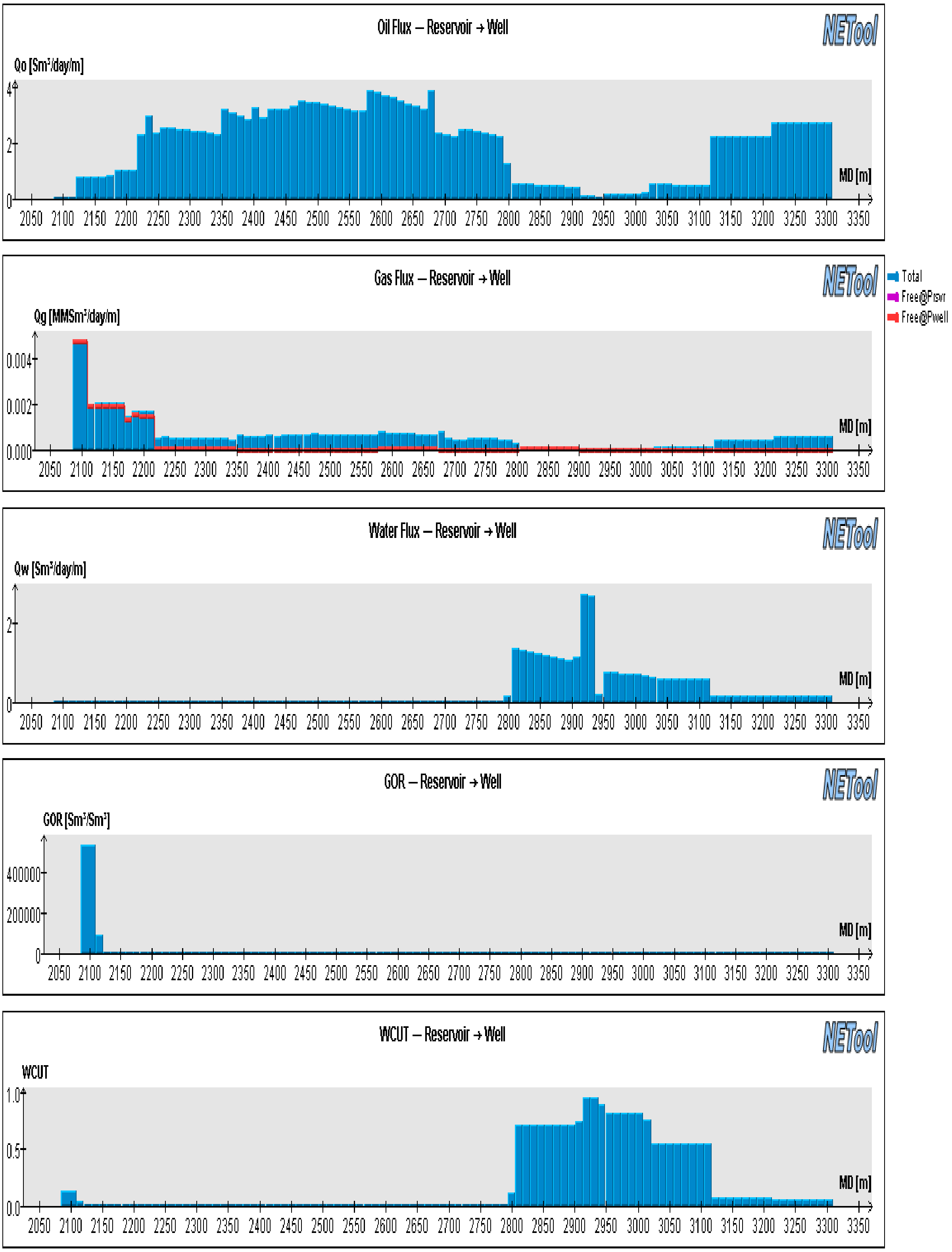
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	4	4	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	4	4	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	4	4	Yes	Yes	No	38	2457	12,0	Nozzle ICD	4	4	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	4	Yes	No	No	40	2481	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2133	12,0	Nozzle ICD	4	4	Yes	Yes	No	41	2493	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2145	12,0	Nozzle ICD	4	4	Yes	Yes	No	42	2505	12,0	Nozzle ICD	4	4	Yes	Yes	No
8	2157	12,0	Nozzle ICD	4	4	Yes	Yes	No	43	2517	12,0	Nozzle ICD	4	4	Yes	Yes	No
9	2169	11,7	Nozzle ICD	4	4	Yes	Yes	No	44	2529	12,0	Nozzle ICD	4	4	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	4	4	Yes	Yes	No
11	2181	12,0	Nozzle ICD	4	4	Yes	No	No	46	2553	11,7	Nozzle ICD	4	4	Yes	Yes	No
12	2193	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2565	12,0	Nozzle ICD	4	4	Yes	No	No
14	2217	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2577	12,0	Nozzle ICD	4	4	Yes	Yes	No
15	2229	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2589	12,0	Nozzle ICD	4	4	Yes	Yes	No
16	2241	11,7	Nozzle ICD	4	4	Yes	Yes	No	51	2601	12,0	Nozzle ICD	4	4	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	4	4	Yes	Yes	No
18	2253	12,0	Nozzle ICD	4	4	Yes	No	No	53	2625	12,0	Nozzle ICD	4	4	Yes	Yes	No
19	2265	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	2637	12,0	Nozzle ICD	4	4	Yes	Yes	No
20	2277	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	2649	12,0	Nozzle ICD	4	4	Yes	Yes	No
21	2289	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	2661	12,0	Nozzle ICD	4	4	Yes	Yes	No
22	2301	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	4	4	Yes	Yes	No	58	2673	11,7	Nozzle ICD	4	4	Yes	No	No
24	2325	12,0	Nozzle ICD	4	4	Yes	Yes	No	59	2685	12,0	Nozzle ICD	4	4	Yes	Yes	No
25	2337	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	2697	12,0	Nozzle ICD	4	4	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	4	4	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	4	4	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	2721	12,0	Nozzle ICD	4	4	Yes	No	No
29	2373	12,0	Nozzle ICD	4	4	Yes	Yes	No	64	2733	12,0	Nozzle ICD	4	4	Yes	Yes	No
30	2385	12,0	Nozzle ICD	4	4	Yes	Yes	No	65	2745	12,0	Nozzle ICD	4	4	Yes	Yes	No
31	2397	11,7	Nozzle ICD	4	4	Yes	Yes	No	66	2757	12,0	Nozzle ICD	4	4	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	4	4	Yes	Yes	No
33	2409	12,0	Nozzle ICD	4	4	Yes	No	No	68	2781	12,0	Nozzle ICD	4	4	Yes	Yes	No
34	2421	12,0	Nozzle ICD	4	4	Yes	Yes	No	69	2793	11,7	Nozzle ICD	4	4	Yes	Yes	No
35	2433	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	Blank pipe	-	-	Yes	No	No
72	2817	12,0	Nozzle ICD	4	4	Yes	Yes	No
73	2829	12,0	Blank pipe	-	-	Yes	Yes	No
74	2841	12,0	Blank pipe	-	-	Yes	Yes	No
75	2853	12,0	Nozzle ICD	4	4	Yes	Yes	No
76	2865	12,0	Blank pipe	-	-	Yes	Yes	No
77	2877	12,0	Blank pipe	-	-	Yes	Yes	No
78	2889	12,0	Nozzle ICD	4	4	Yes	Yes	No
79	2901	11,7	Blank pipe	-	-	Yes	Yes	No
80	2912,7	0,3	Packer	-	-	No	No	N/A
81	2913	12,0	Blank pipe	-	-	Yes	No	No
82	2925	12,0	Nozzle ICD	4	4	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A
85	2949	12,0	Nozzle ICD	4	4	Yes	No	No
86	2961	12,0	Nozzle ICD	4	4	Yes	Yes	No
87	2973	12,0	Nozzle ICD	4	4	Yes	Yes	No
88	2985	12,0	Nozzle ICD	4	4	Yes	Yes	No
89	2997	11,7	Nozzle ICD	4	4	Yes	Yes	No
90	3008,7	0,3	Packer	-	-	No	No	N/A
91	3009	12,0	Nozzle ICD	4	4	Yes	No	No
92	3021	12,0	Nozzle ICD	4	4	Yes	Yes	No
93	3033	0,3	Packer	-	-	No	No	N/A
94	3033,3	11,7	Nozzle ICD	4	4	Yes	No	No
95	3045	12,0	Nozzle ICD	4	4	Yes	Yes	No
96	3057	12,0	Nozzle ICD	4	4	Yes	Yes	No
97	3069	12,0	Nozzle ICD	4	4	Yes	Yes	No
98	3081	12,0	Nozzle ICD	4	4	Yes	Yes	No
99	3093	12,0	Nozzle ICD	4	4	Yes	Yes	No
100	3105	11,7	Nozzle ICD	4	4	Yes	Yes	No
101	3116,7	0,3	Packer	-	-	No	No	N/A

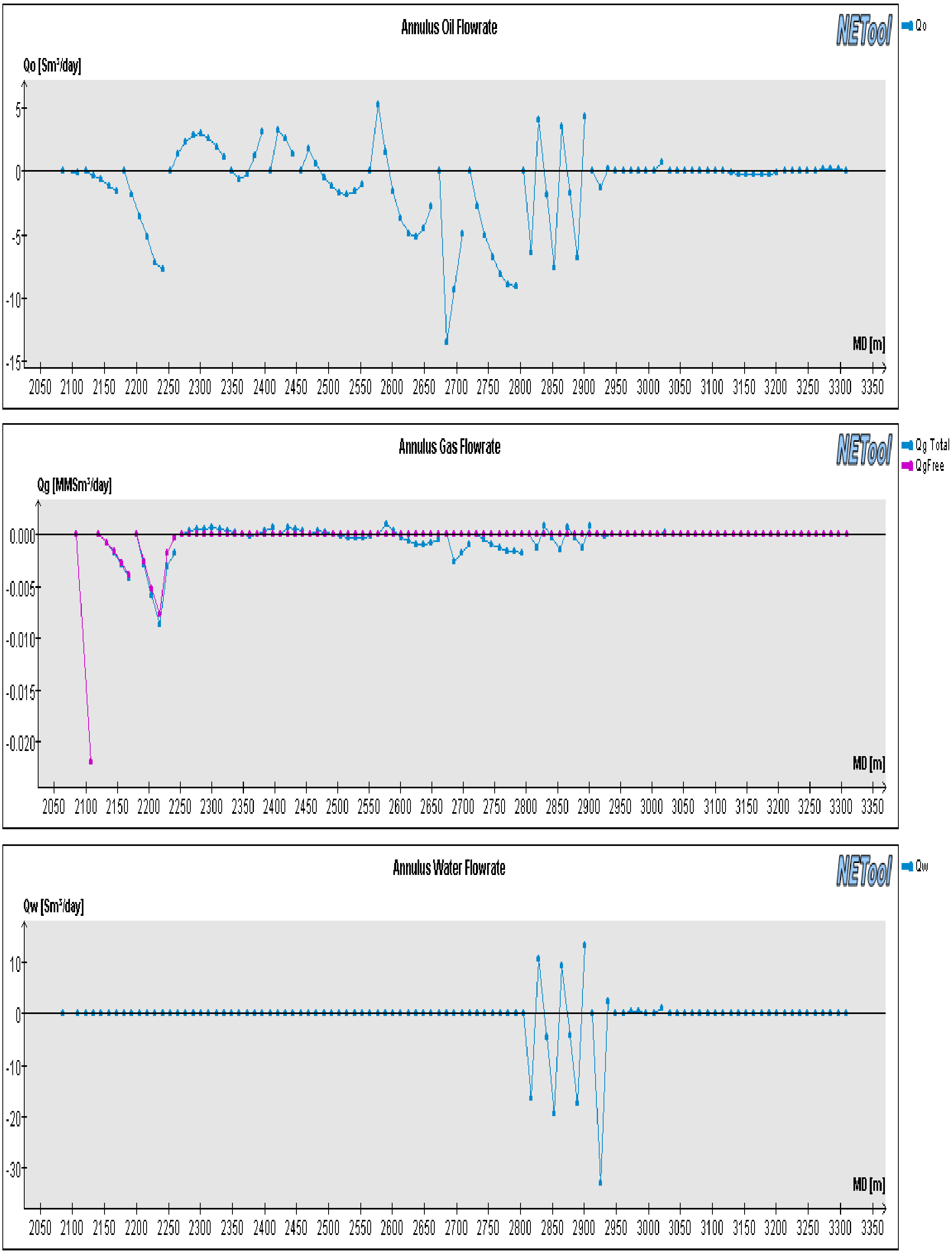
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	Nozzle ICD	4	4	Yes	No	No
103	3129	12,0	Nozzle ICD	4	4	Yes	Yes	No
104	3141	12,0	Nozzle ICD	4	4	Yes	Yes	No
105	3153	12,0	Nozzle ICD	4	4	Yes	Yes	No
106	3165	12,0	Nozzle ICD	4	4	Yes	Yes	No
107	3177	12,0	Nozzle ICD	4	4	Yes	Yes	No
108	3189	12,0	Nozzle ICD	4	4	Yes	Yes	No
109	3201	11,7	Nozzle ICD	4	4	Yes	Yes	No
110	3213	0,3	Packer	-	-	No	No	N/A
111	3213	12,0	Nozzle ICD	4	4	Yes	No	No
112	3225	12,0	Nozzle ICD	4	4	Yes	Yes	No
113	3237	12,0	Nozzle ICD	4	4	Yes	Yes	No
114	3249	12,0	Nozzle ICD	4	4	Yes	Yes	No
115	3261	12,0	Nozzle ICD	4	4	Yes	Yes	No
116	3273	12,0	Nozzle ICD	4	4	Yes	Yes	No
117	3285	12,0	Nozzle ICD	4	4	Yes	Yes	No
118	3297	12,4	Nozzle ICD	4	4	Yes	Yes	No
TOE	3309							



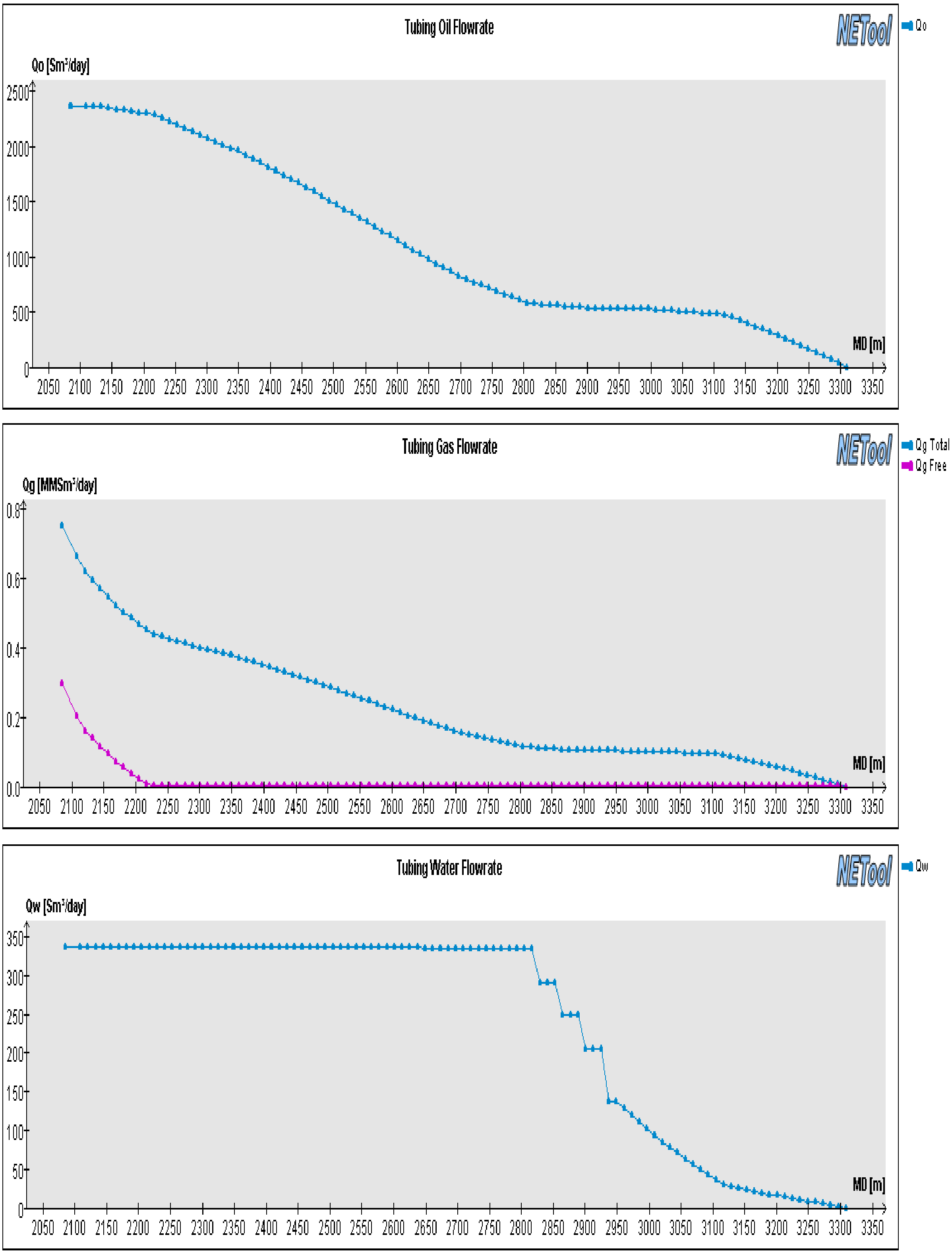
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



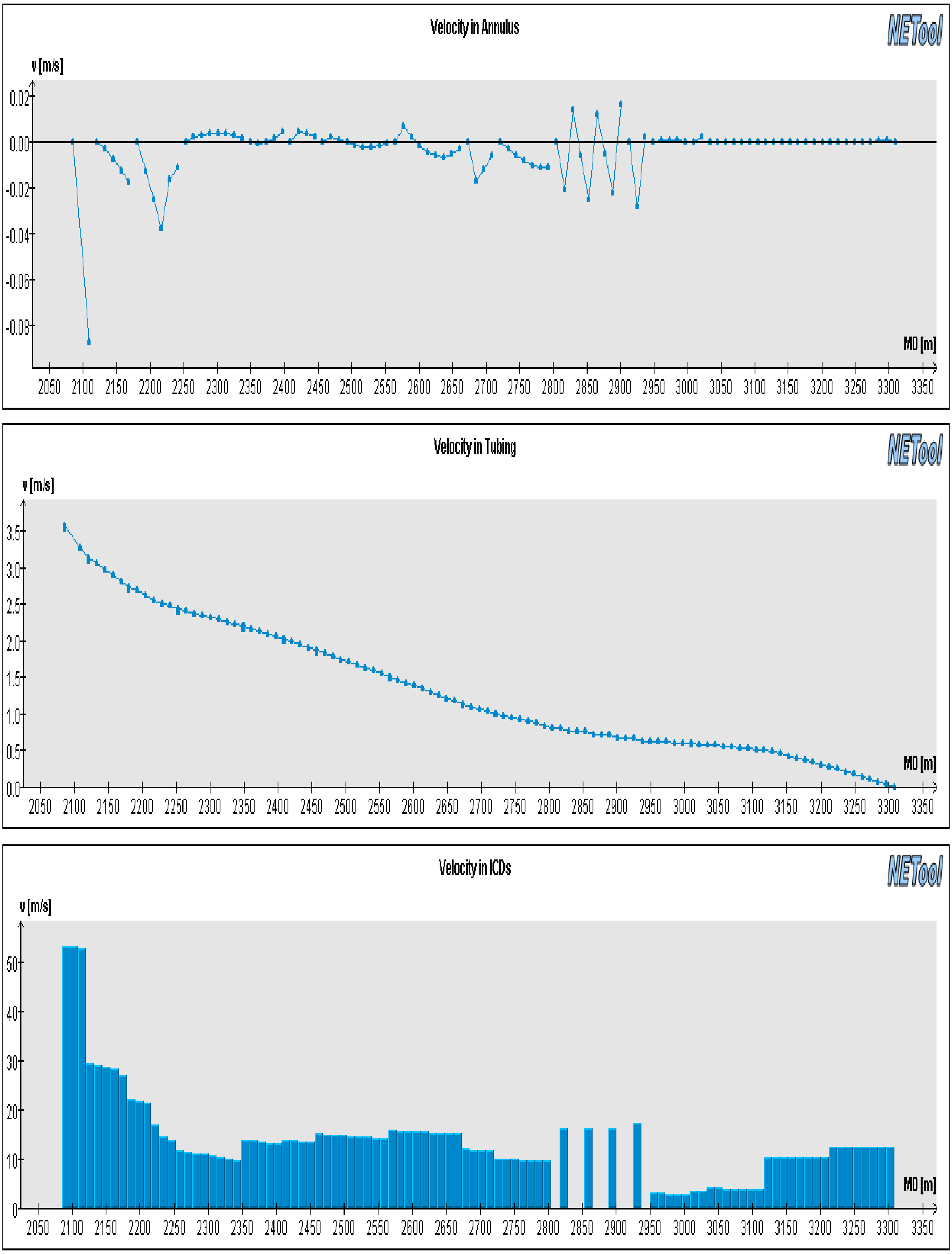
Influx of oil, gas and water from the reservoir and into the well along the wellbore



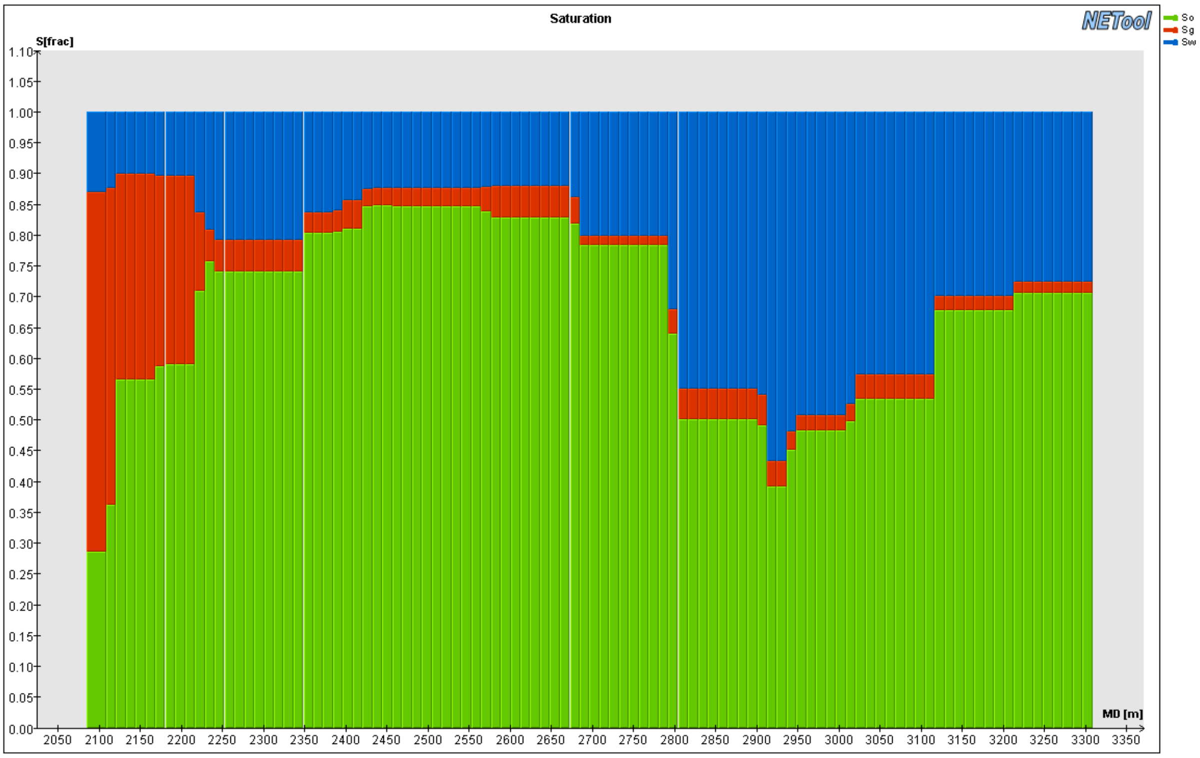
Annulus oil, gas and water flow rate along the wellbore



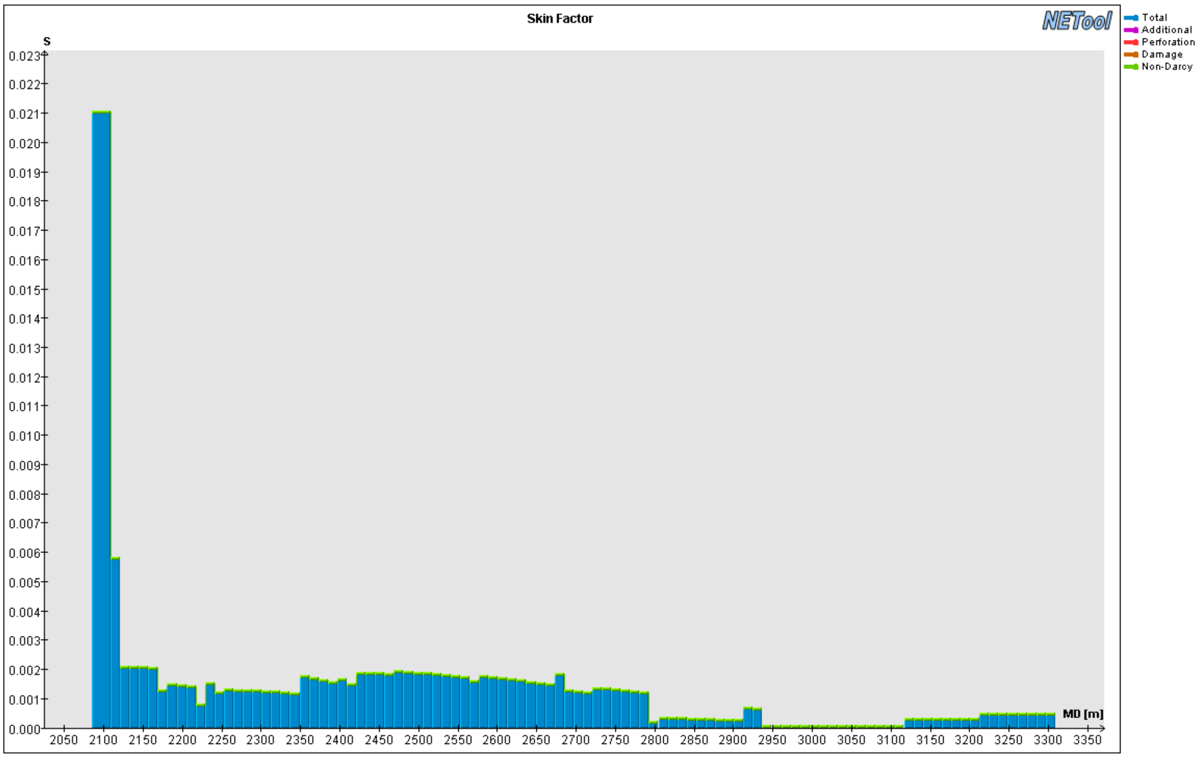
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.11 Plots for well KP7, 1826 days, Tailored solution, 4x4mm and 2x4mm ICD

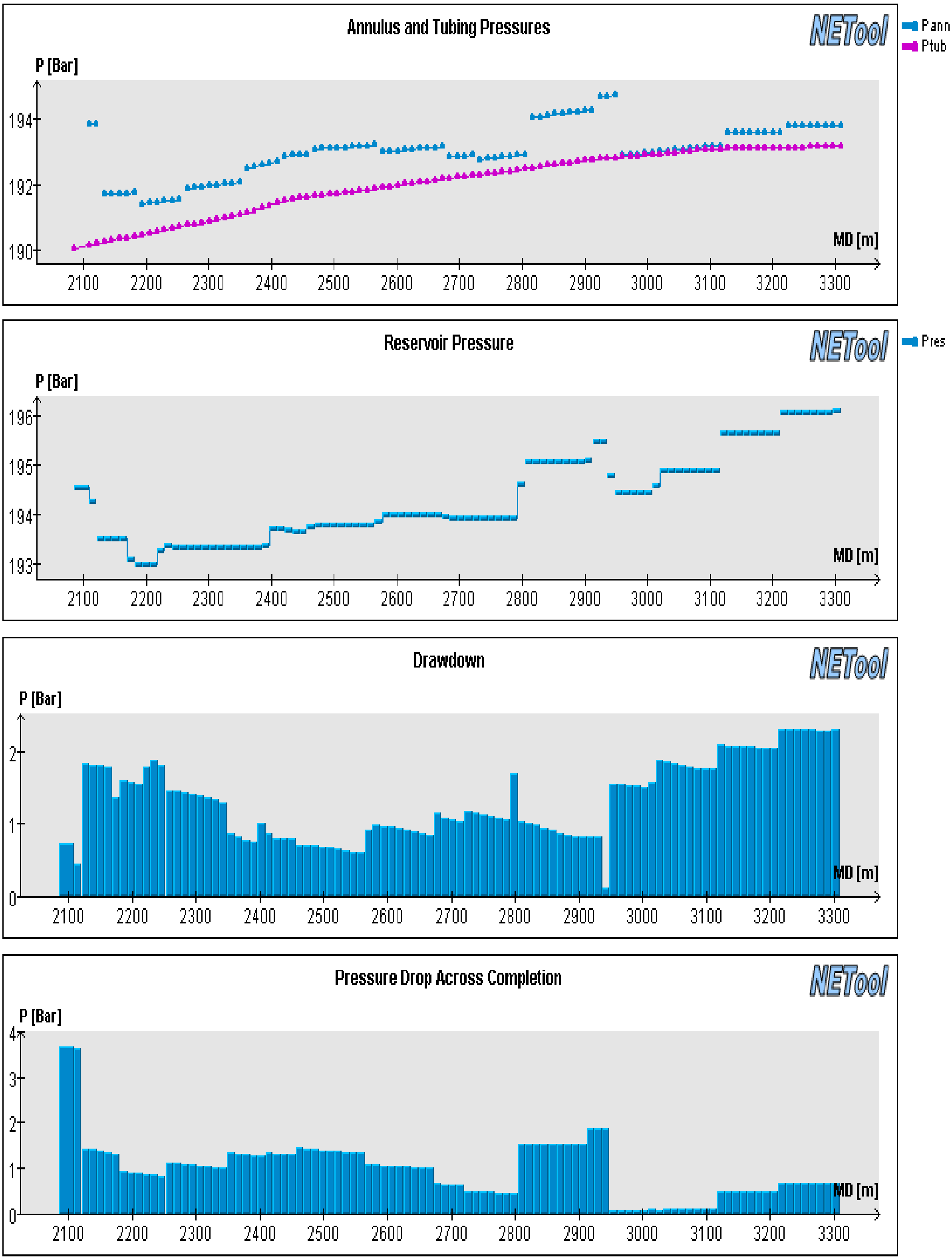
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

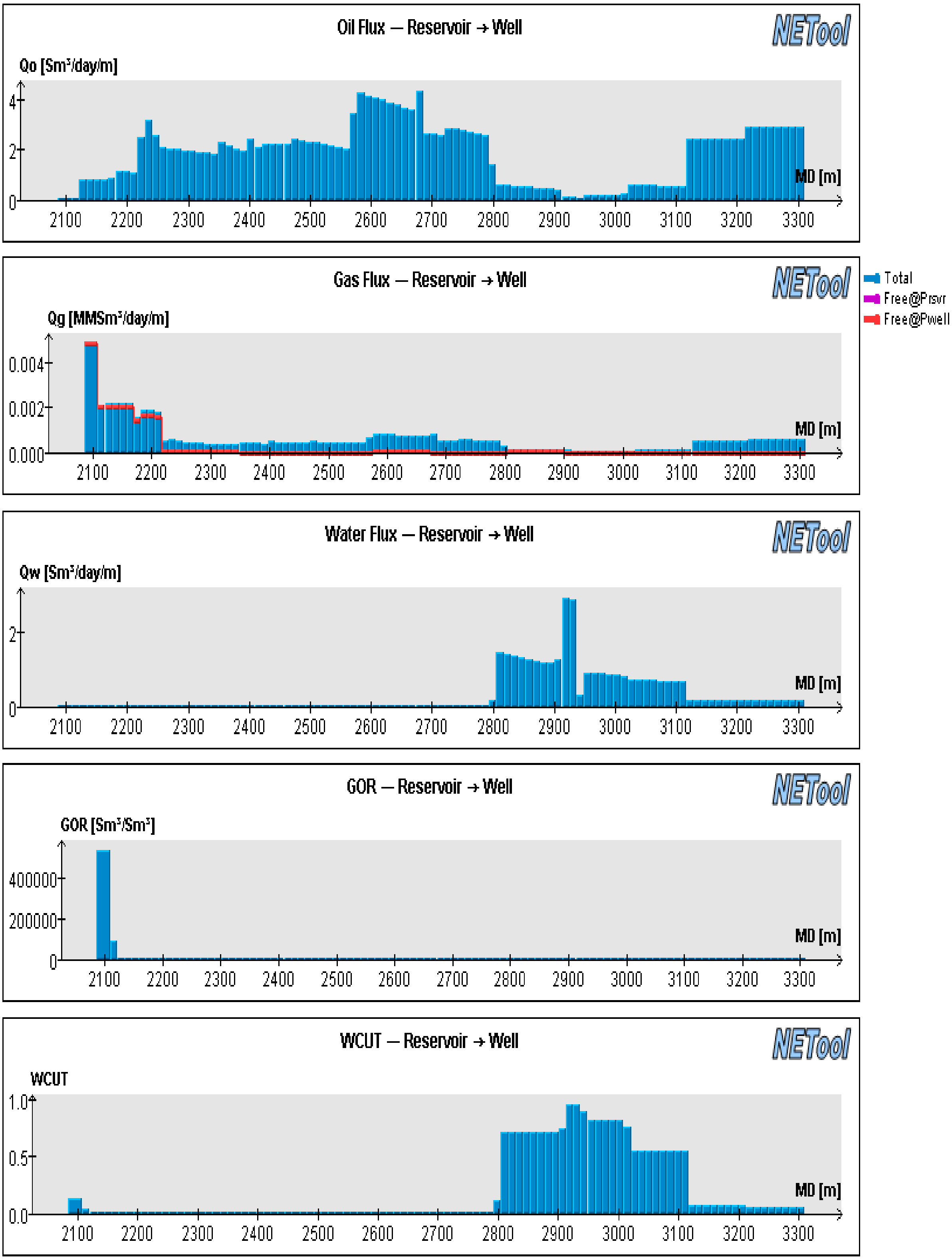
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2445	11,7	**Nozzle ICD**	2	4	Yes	Yes	No
2	2085,3	23,7	**Nozzle ICD**	4	4	Yes	No	No	**37**	2457	0,3	**Packer**	-	-	No	No	N/A
3	2109	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**38**	2457	12,0	**Nozzle ICD**	2	4	Yes	No	No
4	2120,7	0,3	**Packer**	-	-	No	No	N/A	**39**	2469	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
5	2121	12,0	**Nozzle ICD**	4	4	Yes	No	No	**40**	2481	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
6	2133	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**41**	2493	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
7	2145	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**42**	2505	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
8	2157	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**43**	2517	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
9	2169	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**44**	2529	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
10	2180,7	0,3	**Packer**	-	-	No	No	N/A	**45**	2541	12,0	**Nozzle ICD**	2	4	Yes	Yes	No
11	2181	12,0	**Nozzle ICD**	4	4	Yes	No	No	**46**	2553	11,7	**Nozzle ICD**	2	4	Yes	Yes	No
12	2193	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**47**	2565	0,3	**Packer**	-	-	No	No	N/A
13	2205	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**48**	2565	12,0	**Nozzle ICD**	4	4	Yes	No	No
14	2217	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**49**	2577	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
15	2229	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**50**	2589	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
16	2241	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**51**	2601	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
17	2252,7	0,3	**Packer**	-	-	No	No	N/A	**52**	2613	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
18	2253	12,0	**Nozzle ICD**	2	4	Yes	No	No	**53**	2625	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
19	2265	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**54**	2637	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
20	2277	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**55**	2649	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
21	2289	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**56**	2661	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
22	2301	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**57**	2673	0,3	**Packer**	-	-	No	No	N/A
23	2313	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**58**	2673	11,7	**Nozzle ICD**	4	4	Yes	No	No
24	2325	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**59**	2685	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
25	2337	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**60**	2697	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
26	2349	0,3	**Packer**	-	-	No	No	N/A	**61**	2709	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
27	2349,3	11,7	**Nozzle ICD**	2	4	Yes	No	No	**62**	2721	0,3	**Packer**	-	-	No	No	N/A
28	2361	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**63**	2721	12,0	**Nozzle ICD**	4	4	Yes	No	No
29	2373	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**64**	2733	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
30	2385	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**65**	2745	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
31	2397	11,7	**Nozzle ICD**	2	4	Yes	Yes	No	**66**	2757	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
32	2408,7	0,3	**Packer**	-	-	No	No	N/A	**67**	2769	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
33	2409	12,0	**Nozzle ICD**	2	4	Yes	No	No	**68**	2781	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
34	2421	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**69**	2793	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
35	2433	12,0	**Nozzle ICD**	2	4	Yes	Yes	No	**70**	2805	0,3	**Packer**	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	Blank pipe	-	-	Yes	No	No
72	2817	12,0	Nozzle ICD	4	4	Yes	Yes	No
73	2829	12,0	Blank pipe	-	-	Yes	Yes	No
74	2841	12,0	Blank pipe	-	-	Yes	Yes	No
75	2853	12,0	Nozzle ICD	4	4	Yes	Yes	No
76	2865	12,0	Blank pipe	-	-	Yes	Yes	No
77	2877	12,0	Blank pipe	-	-	Yes	Yes	No
78	2889	12,0	Nozzle ICD	4	4	Yes	Yes	No
79	2901	11,7	Blank pipe	-	-	Yes	Yes	No
80	2912,7	0,3	Packer	-	-	No	No	N/A
81	2913	12,0	Blank pipe	-	-	Yes	No	No
82	2925	12,0	Nozzle ICD	4	4	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A
85	2949	12,0	Nozzle ICD	4	4	Yes	No	No
86	2961	12,0	Nozzle ICD	4	4	Yes	Yes	No
87	2973	12,0	Nozzle ICD	4	4	Yes	Yes	No
88	2985	12,0	Nozzle ICD	4	4	Yes	Yes	No
89	2997	11,7	Nozzle ICD	4	4	Yes	Yes	No
90	3008,7	0,3	Packer	-	-	No	No	N/A
91	3009	12,0	Nozzle ICD	4	4	Yes	No	No
92	3021	12,0	Nozzle ICD	4	4	Yes	Yes	No
93	3033	0,3	Packer	-	-	No	No	N/A
94	3033,3	11,7	Nozzle ICD	4	4	Yes	No	No
95	3045	12,0	Nozzle ICD	4	4	Yes	Yes	No
96	3057	12,0	Nozzle ICD	4	4	Yes	Yes	No
97	3069	12,0	Nozzle ICD	4	4	Yes	Yes	No
98	3081	12,0	Nozzle ICD	4	4	Yes	Yes	No
99	3093	12,0	Nozzle ICD	4	4	Yes	Yes	No
100	3105	11,7	Nozzle ICD	4	4	Yes	Yes	No
101	3116,7	0,3	Packer	-	-	No	No	N/A

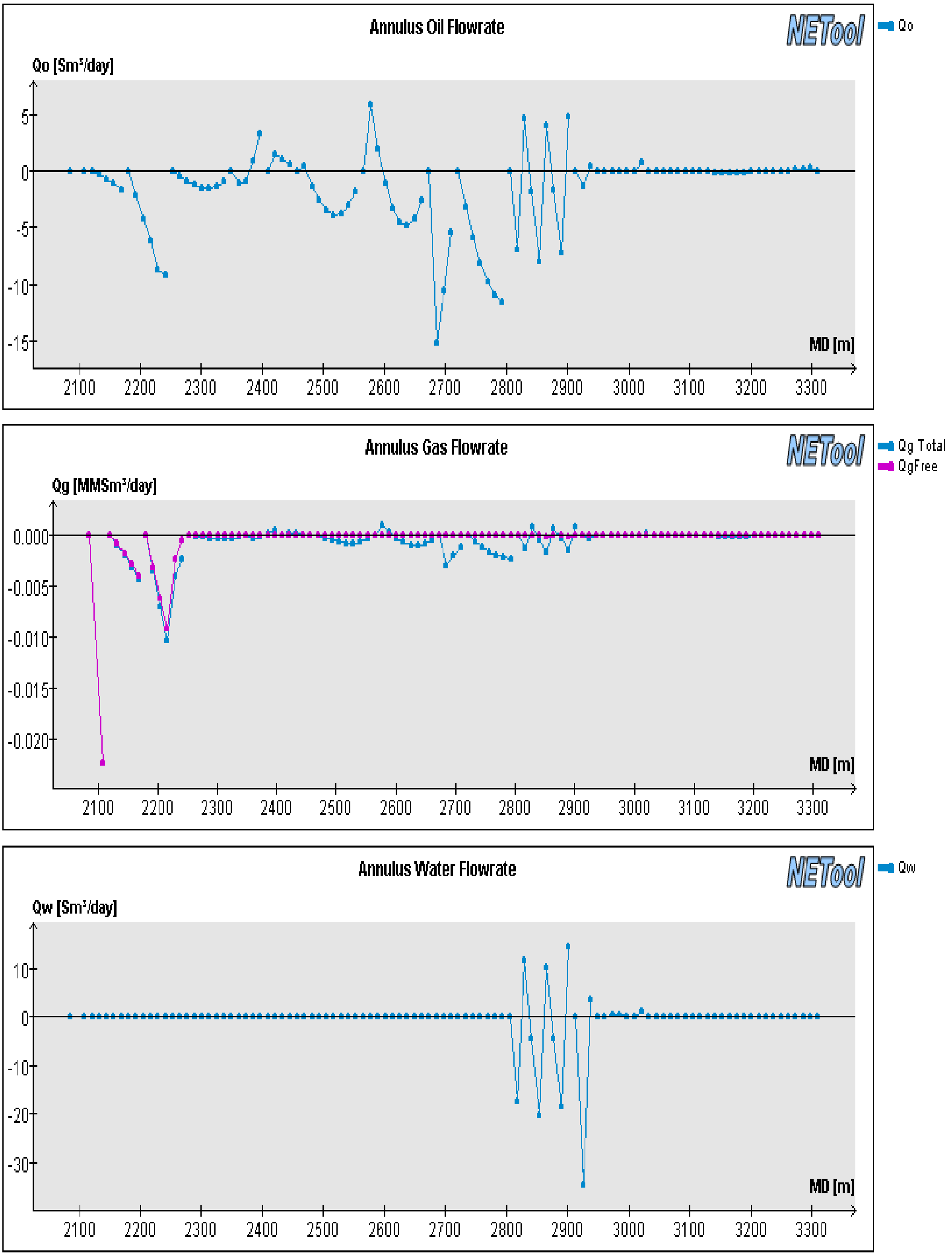
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	Nozzle ICD	4	4	Yes	No	No
103	3129	12,0	Nozzle ICD	4	4	Yes	Yes	No
104	3141	12,0	Nozzle ICD	4	4	Yes	Yes	No
105	3153	12,0	Nozzle ICD	4	4	Yes	Yes	No
106	3165	12,0	Nozzle ICD	4	4	Yes	Yes	No
107	3177	12,0	Nozzle ICD	4	4	Yes	Yes	No
108	3189	12,0	Nozzle ICD	4	4	Yes	Yes	No
109	3201	11,7	Nozzle ICD	4	4	Yes	Yes	No
110	3213	0,3	Packer	-	-	No	No	N/A
111	3213	12,0	Nozzle ICD	4	4	Yes	No	No
112	3225	12,0	Nozzle ICD	4	4	Yes	Yes	No
113	3237	12,0	Nozzle ICD	4	4	Yes	Yes	No
114	3249	12,0	Nozzle ICD	4	4	Yes	Yes	No
115	3261	12,0	Nozzle ICD	4	4	Yes	Yes	No
116	3273	12,0	Nozzle ICD	4	4	Yes	Yes	No
117	3285	12,0	Nozzle ICD	4	4	Yes	Yes	No
118	3297	12,4	Nozzle ICD	4	4	Yes	Yes	No
TOE	3309							



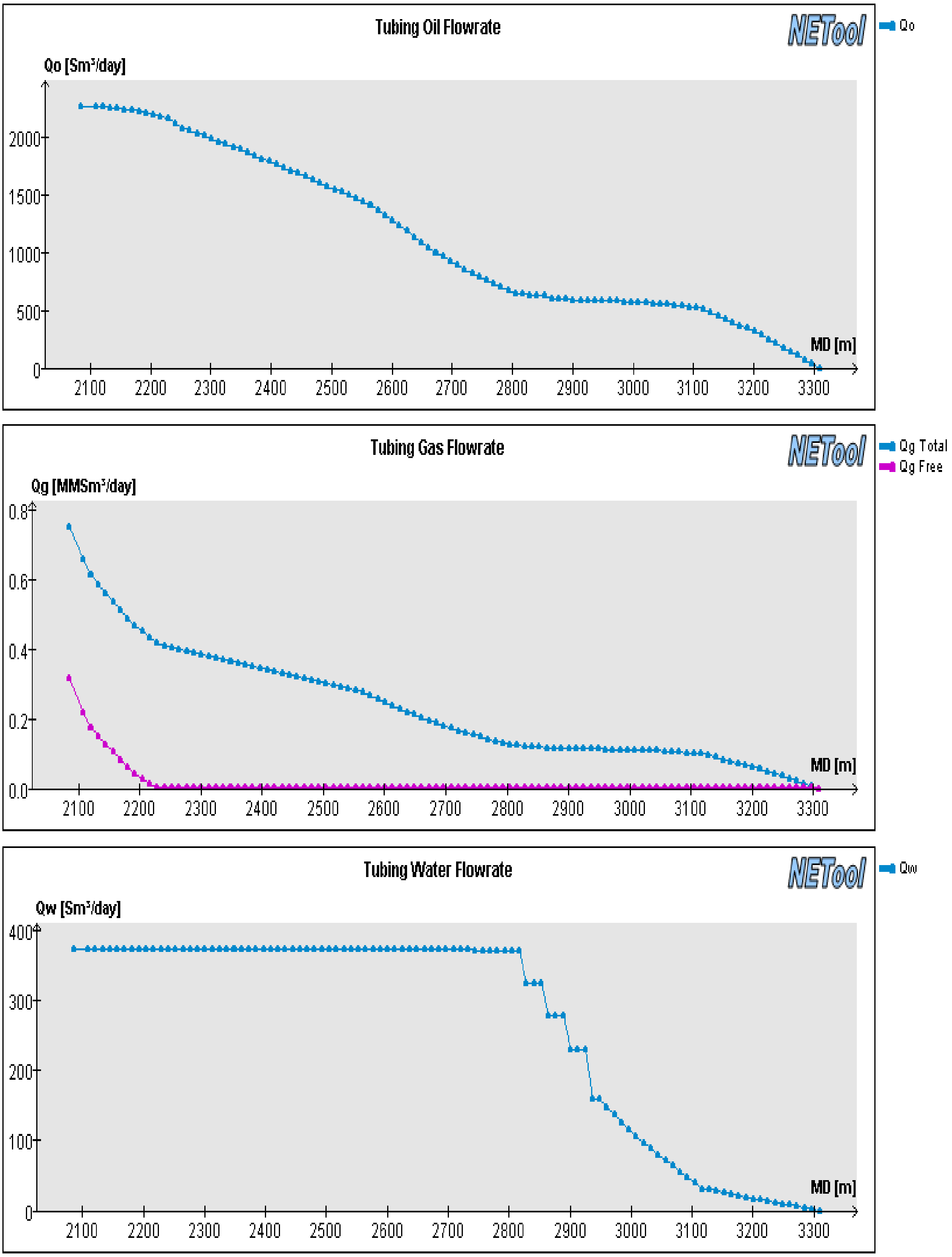
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



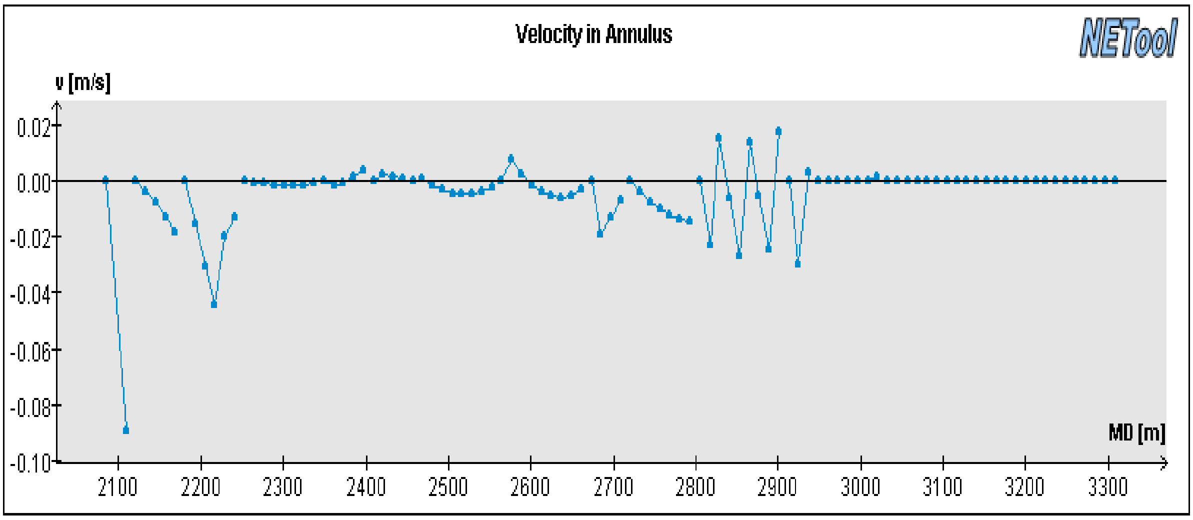
Influx of oil, gas and water from the reservoir and into the well along the wellbore

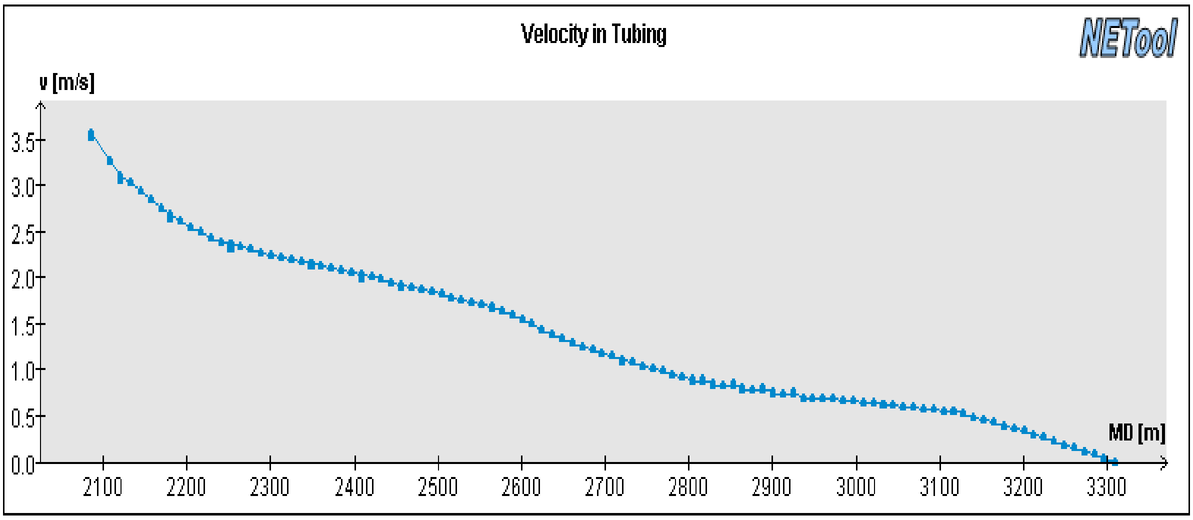


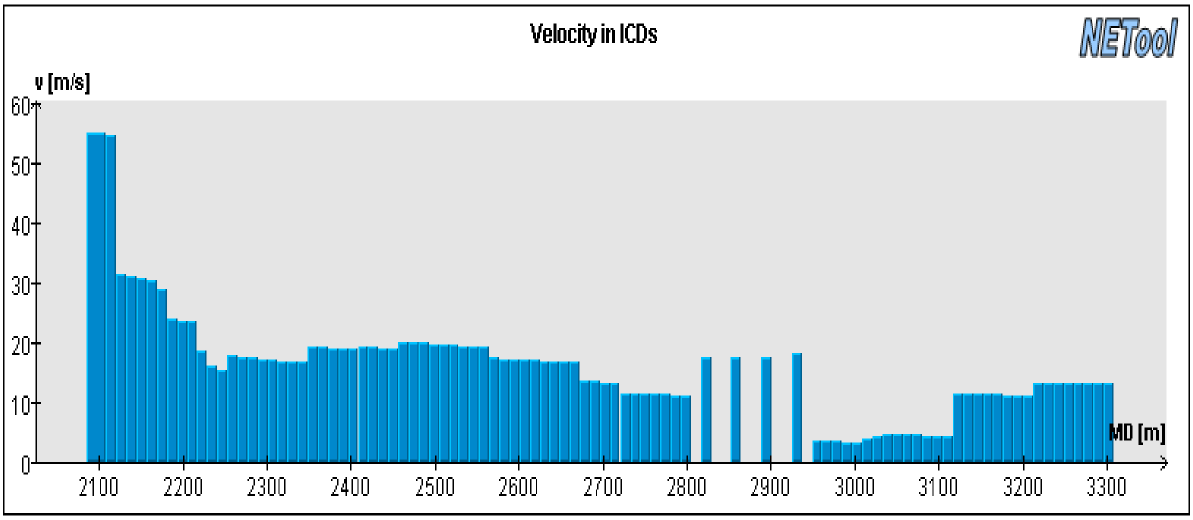
Annulus oil, gas and water flow rate along the wellbore



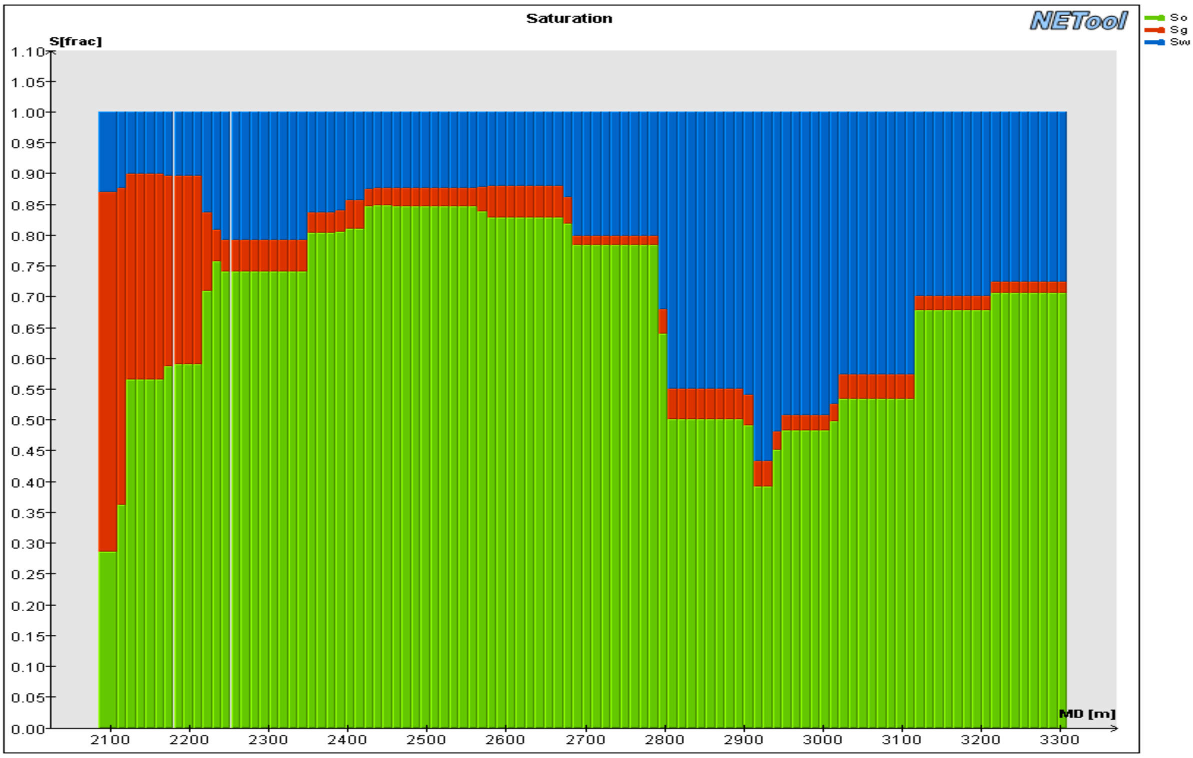
Tubing flow of oil, gas and water along the wellbore



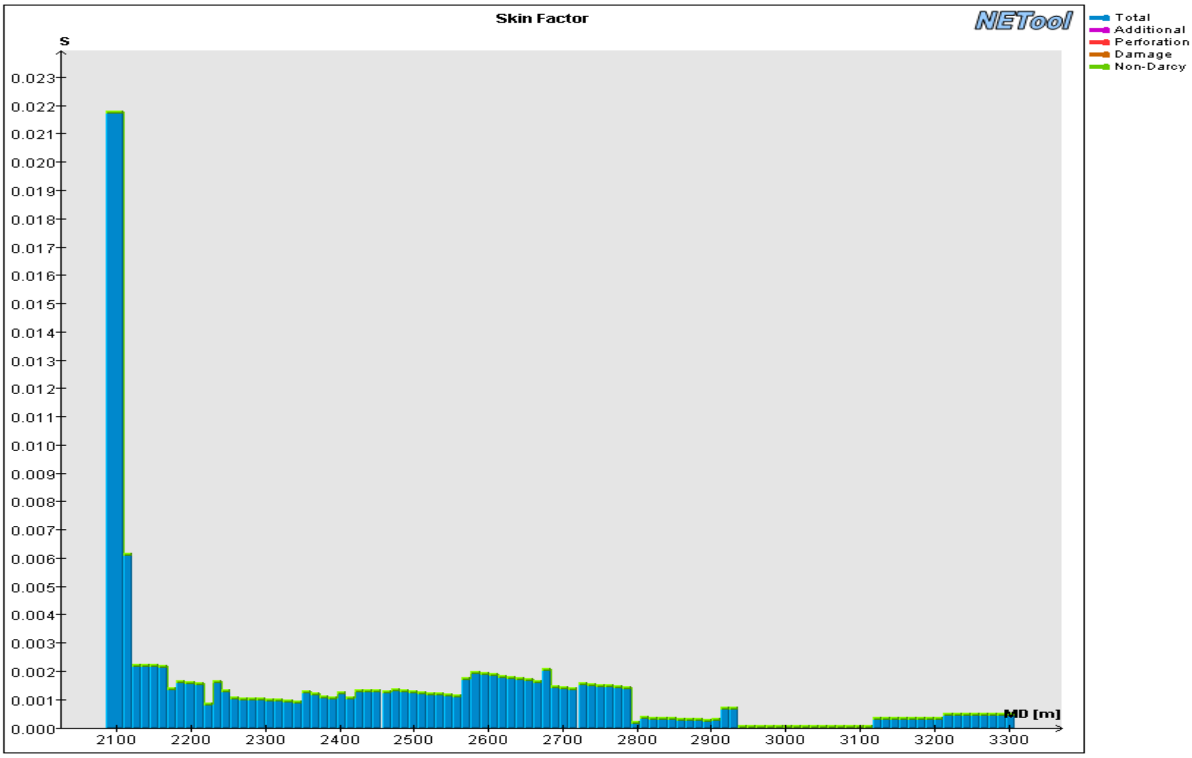




Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.12 Plots for well KP7, 1826 days, Practical case, 4x4mm ICD

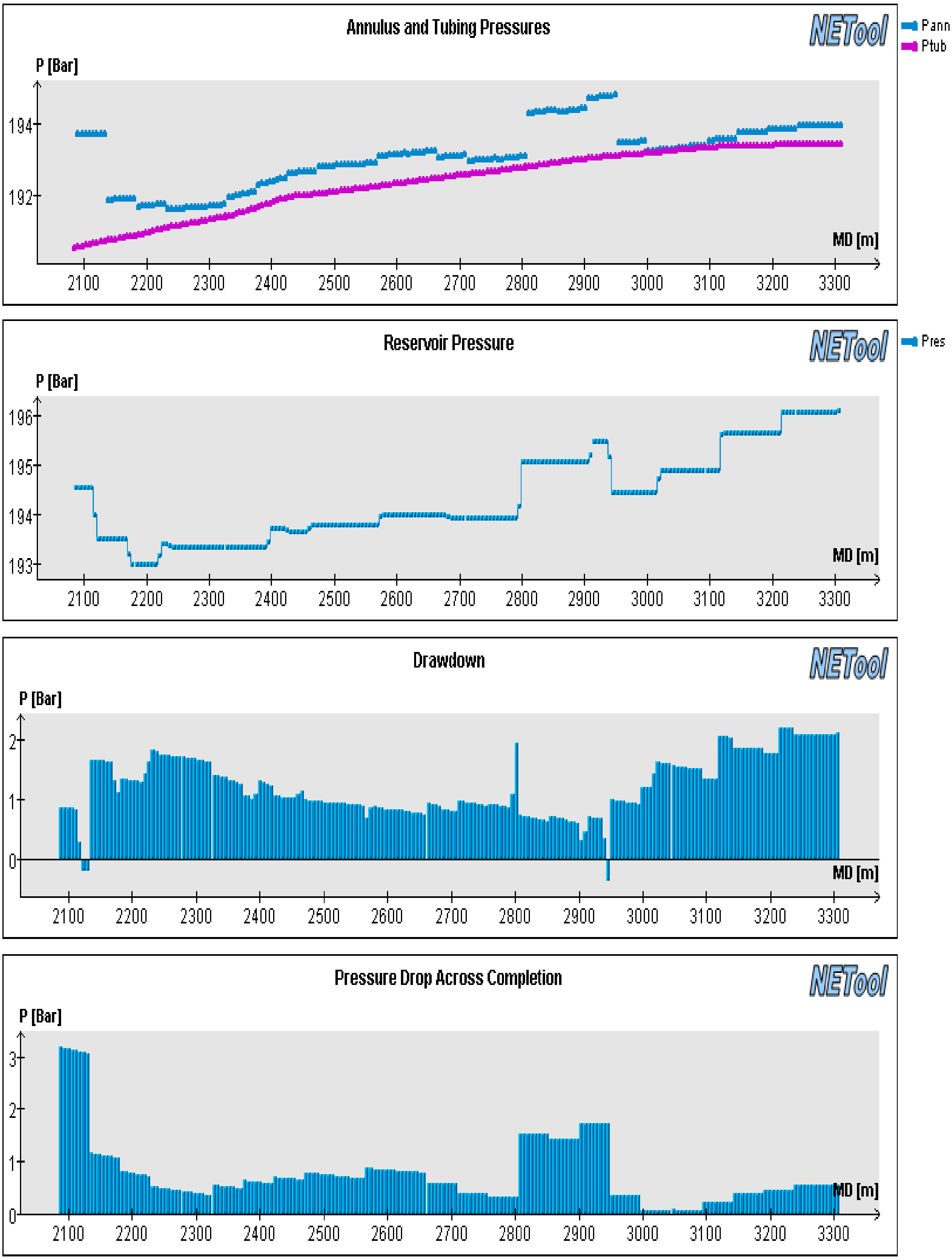
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

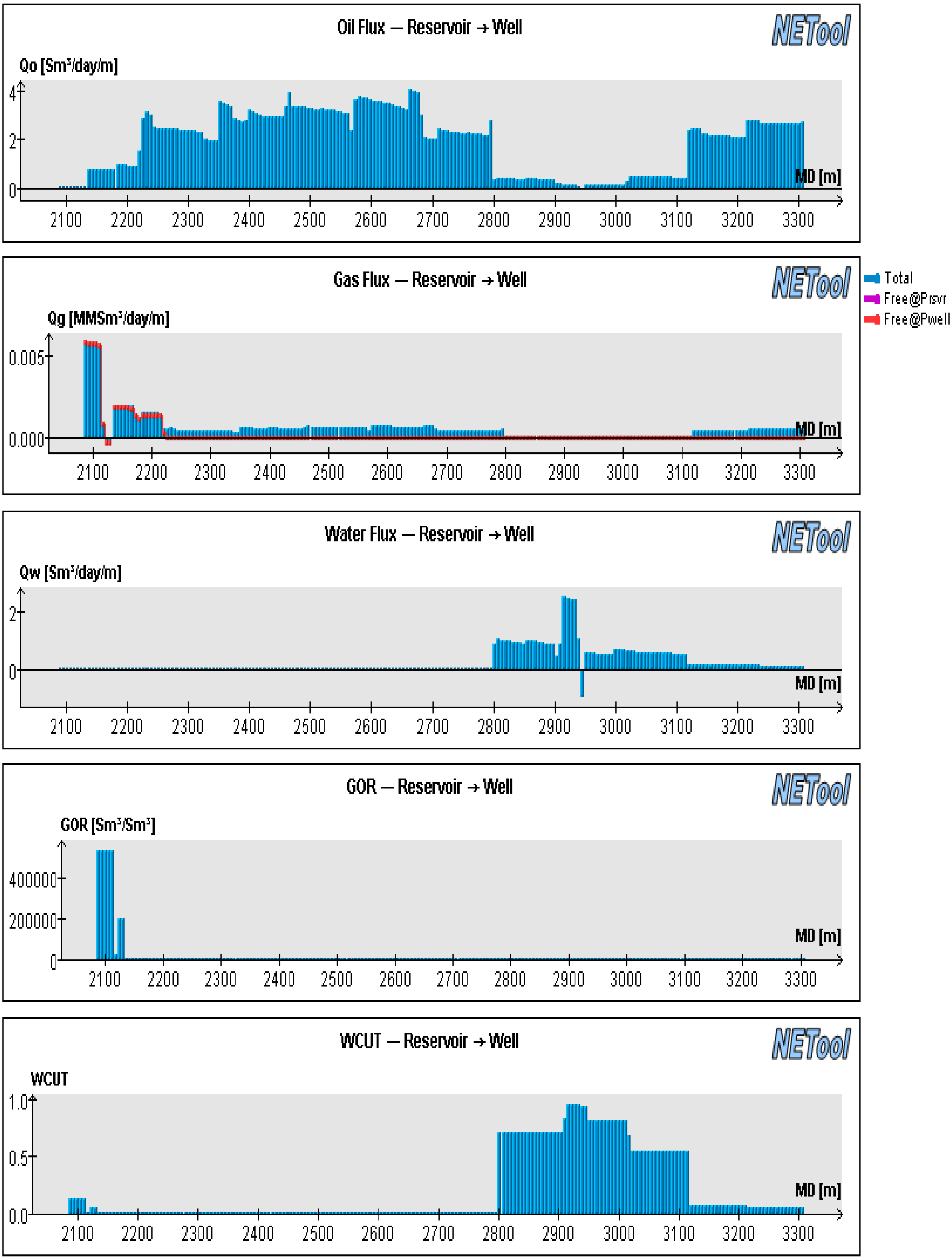
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2421	0,3	Packer	-	-	No	No	N/A
2	2085,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	37	2421	11,7	Nozzle ICD	4	4	Yes	Yes	No
3	2097	12,0	Nozzle ICD	4	4	Yes	Yes	No	38	2433,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2109	12,0	Nozzle ICD	4	4	Yes	Yes	No	39	2445	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	4	Yes	Yes	No	40	2457	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2133	0,3	Packer	-	-	No	No	N/A	41	2469	0,3	Packer	-	-	No	No	N/A
7	2133,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	42	2469	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2145	12,0	Nozzle ICD	4	4	Yes	Yes	No	43	2481	12,0	Nozzle ICD	4	4	Yes	Yes	No
9	2157	12,0	Nozzle ICD	4	4	Yes	Yes	No	44	2493	12,0	Nozzle ICD	4	4	Yes	Yes	No
10	2169	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2505	12,0	Nozzle ICD	4	4	Yes	Yes	No
11	2181	0,3	Packer	-	-	No	No	N/A	46	2517	0,3	Packer	-	-	No	No	N/A
12	2181,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	47	2517	11,7	Nozzle ICD	4	4	Yes	Yes	No
13	2193	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2529	12,0	Nozzle ICD	4	4	Yes	Yes	No
14	2205	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2541	12,0	Nozzle ICD	4	4	Yes	Yes	No
15	2217	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2553	12,0	Nozzle ICD	4	4	Yes	Yes	No
16	2229	0,3	Packer	-	-	No	No	N/A	51	2565	0,3	Packer	-	-	No	No	N/A
17	2229,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2565	11,7	Nozzle ICD	4	4	Yes	Yes	No
18	2241	12,0	Nozzle ICD	4	4	Yes	Yes	No	53	2577	12,0	Nozzle ICD	4	4	Yes	Yes	No
19	2253	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	2589	12,0	Nozzle ICD	4	4	Yes	Yes	No
20	2265	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	2601	12,0	Nozzle ICD	4	4	Yes	Yes	No
21	2277	0,3	Packer	-	-	No	No	N/A	56	2613	0,3	Packer	-	-	No	No	N/A
22	2277,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	57	2613	11,7	Nozzle ICD	4	4	Yes	Yes	No
23	2289	12,0	Nozzle ICD	4	4	Yes	Yes	No	58	2625	11,7	Nozzle ICD	4	4	Yes	Yes	No
24	2301	12,0	Nozzle ICD	4	4	Yes	Yes	No	59	2637	12,0	Nozzle ICD	4	4	Yes	Yes	No
25	2313	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	2649	12,0	Nozzle ICD	4	4	Yes	Yes	No
26	2325	0,3	Packer	-	-	No	No	N/A	61	2661	0,3	Packer	-	-	No	No	N/A
27	2325,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	62	2661	11,7	Nozzle ICD	4	4	Yes	Yes	No
28	2337	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	2673	12,0	Nozzle ICD	4	4	Yes	Yes	No
29	2349	12,0	Nozzle ICD	4	4	Yes	Yes	No	64	2685	12,0	Nozzle ICD	4	4	Yes	Yes	No
30	2361	12,0	Nozzle ICD	4	4	Yes	Yes	No	65	2697	12,0	Nozzle ICD	4	4	Yes	Yes	No
31	2373	0,3	Packer	-	-	No	No	N/A	66	2709	0,3	Packer	-	-	No	No	N/A
32	2373,3	11,7	Nozzle ICD	4	4	Yes	Yes	No	67	2709	11,7	Nozzle ICD	4	4	Yes	Yes	No
33	2385	12,0	Nozzle ICD	4	4	Yes	Yes	No	68	2721	12,0	Nozzle ICD	4	4	Yes	Yes	No
34	2397	12,0	Nozzle ICD	4	4	Yes	Yes	No	69	2733	12,0	Nozzle ICD	4	4	Yes	Yes	No
35	2409	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	2745	12,0	Nozzle ICD	4	4	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2756,7	0,3	**Packer**	-	-	No	No	N/A
72	2757	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
73	2768,7	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
74	2780,7	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
75	2792,7	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
76	2804,7	0,3	**Packer**	-	-	No	No	N/A
77	2805	11,7	**Blank pipe**	-	-	Yes	Yes	No
78	2816,7	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
79	2828,7	12,0	**Blank pipe**	-	-	Yes	Yes	No
80	2840,7	0,3	**Blank pipe**	-	-	No	No	N/A
81	2841	0,3	**Packer**	-	-	No	No	N/A
82	2841,3	11,7	**Blank pipe**	-	-	Yes	Yes	No
83	2853	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
84	2865	12,0	**Blank pipe**	-	-	No	No	N/A
85	2877	12,0	**Blank pipe**	-	-	Yes	No	No
86	2889	0,3	**Packer**	-	-	No	No	N/A
87	2889,3	11,7	**Blank pipe**	-	-	Yes	Yes	No
88	2901	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
89	2913	12,0	**Blank pipe**	-	-	Yes	Yes	No
90	2925	12,0	**Blank pipe**	-	-	No	No	N/A
91	2937	0,3	**Packer**	-	-	No	No	N/A
92	2937,3	11,7	**Blank pipe**	-	-	Yes	Yes	No
93	2949	12,0	**Nozzle ICD**	4	4	No	No	N/A
94	2961	12,0	**Blank pipe**	-	-	Yes	No	No
95	2973	12,0	**Blank pipe**	-	-	Yes	Yes	No
96	2985	0,3	**Packer**	-	-	No	No	N/A
97	2985,3	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
98	2997	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
99	3009	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
100	3021	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
101	3033	0,3	**Packer**	-	-	No	No	N/A

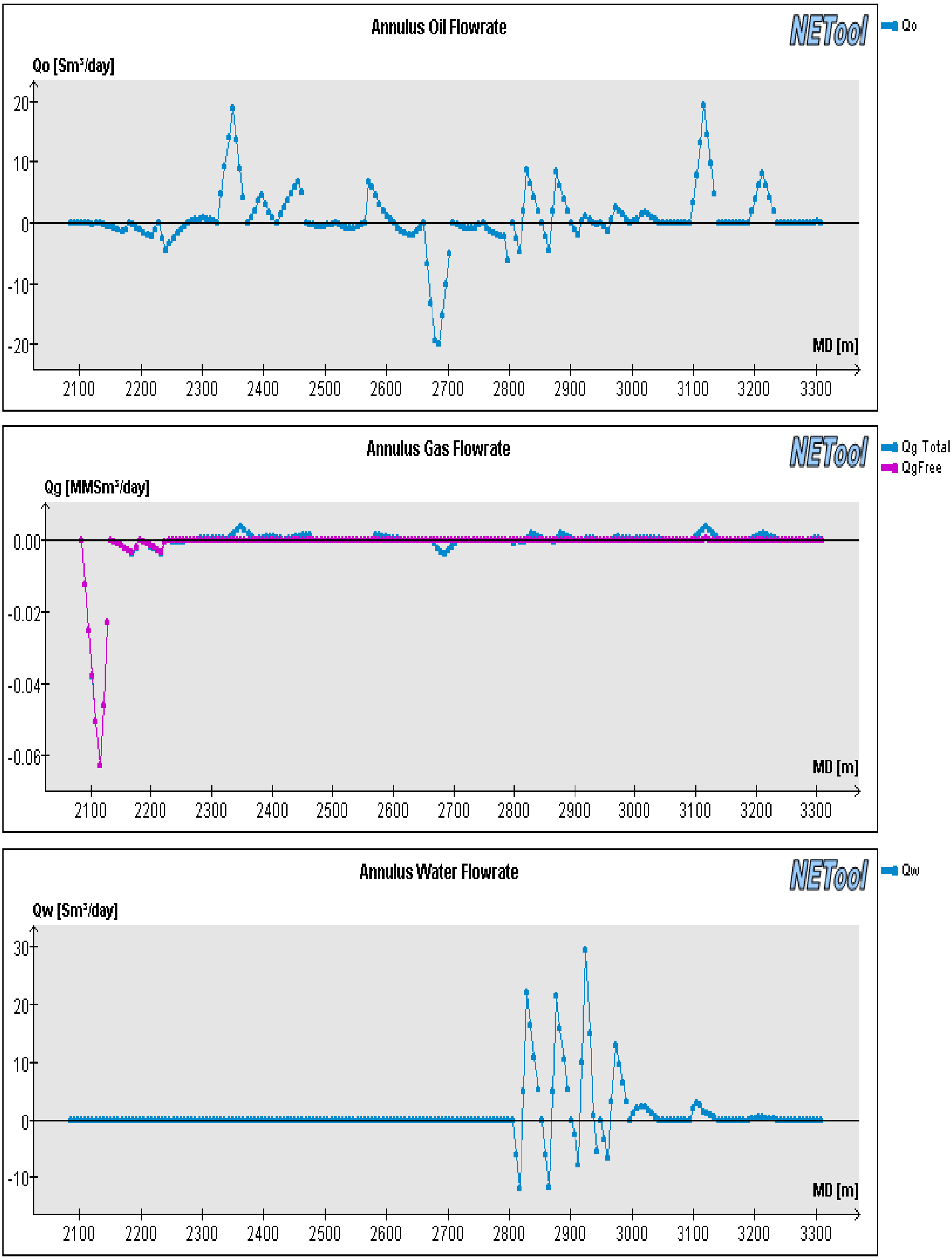
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3033,3	12,0	**Nozzle ICD**	4	4	Yes	No	No
103	3045,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
104	3057,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
105	3069,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
106	3081,3	0,3	**Packer**	-	-	No	No	N/A
107	3081,6	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
108	3093,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
109	3105,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
110	3117,3	12,0	**Nozzle ICD**	4	4	No	No	N/A
111	3129,3	0,3	**Packer**	-	-	No	No	N/A
112	3129,6	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
113	3141,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
114	3153,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
115	3165,3	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
116	3177,3	0,3	**Packer**	-	-	No	No	N/A
117	3177,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
118	3189,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
119	3201,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
120	3213,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
121	3225,6	0,3	**Packer**	-	-	No	No	N/A
122	3225,9	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
123	3237,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
124	3249,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
125	3261,6	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
126	3273,6	0,3	**Packer**	-	-	No	No	N/A
127	3273,9	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
128	3285,6	12	**Nozzle ICD**	4	4	Yes	Yes	No
129	3297,6	12,4	**Nozzle ICD**	4	4	Yes	Yes	No
TOE	3310,0							



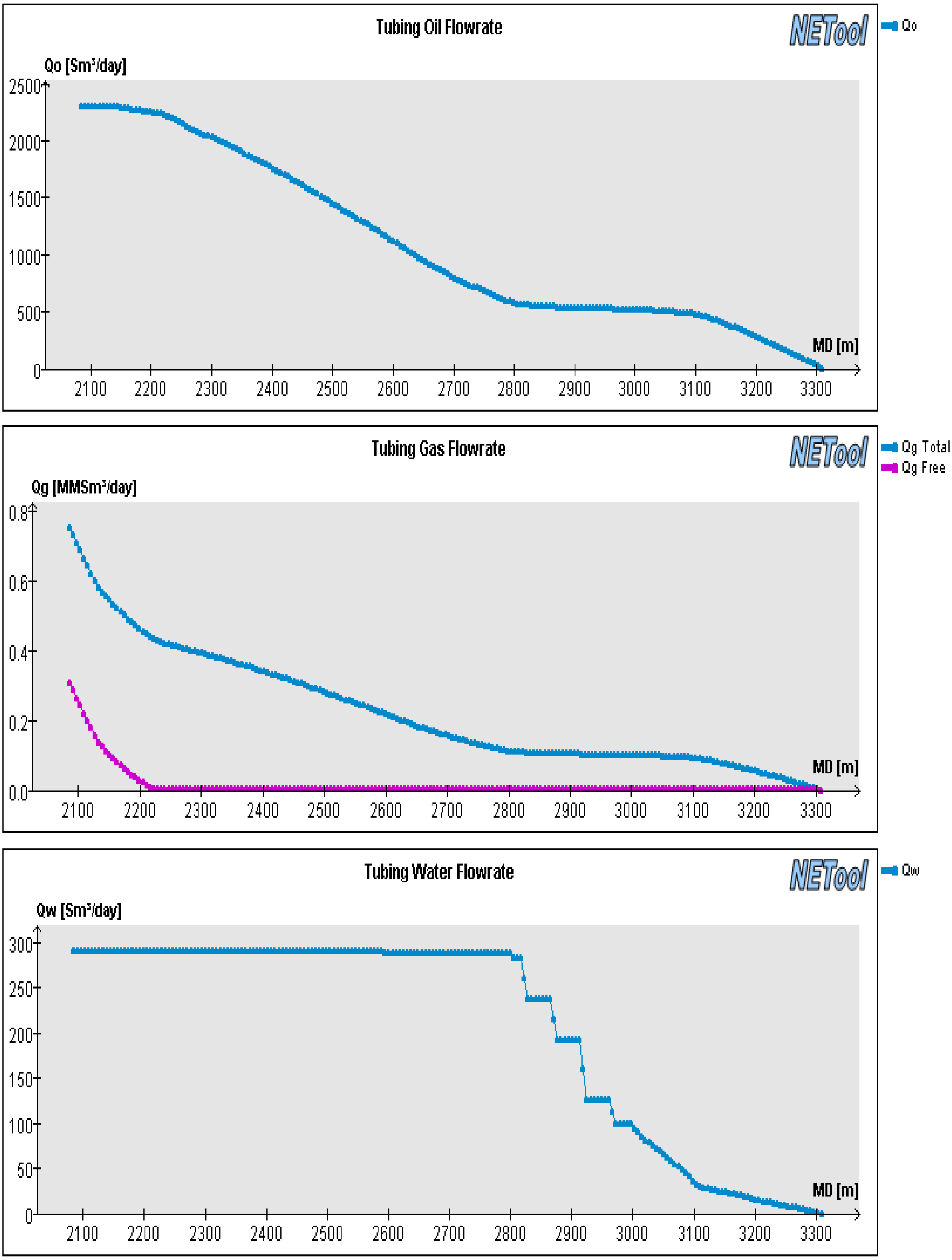
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



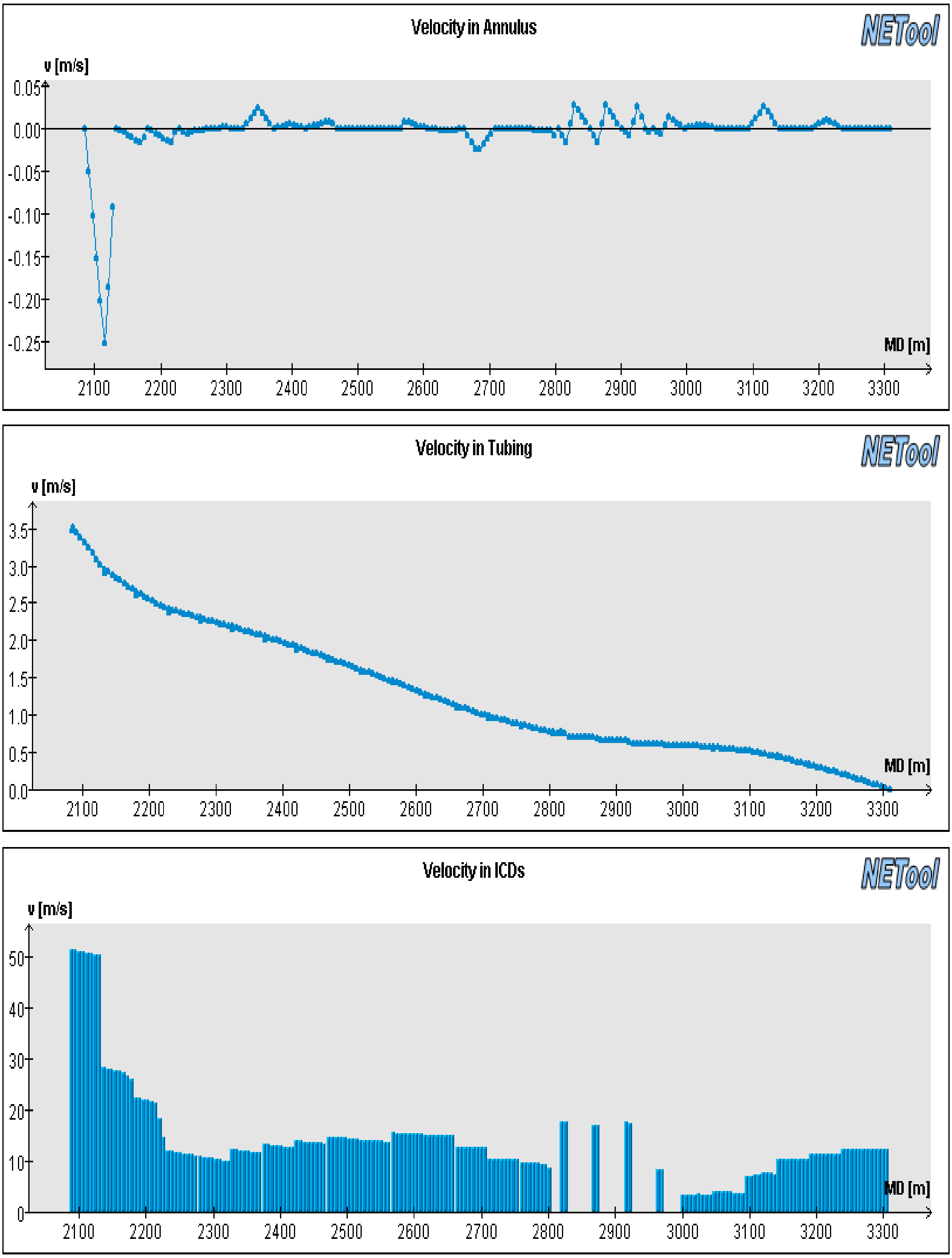
Influx of oil, gas and water from the reservoir and into the well along the wellbore



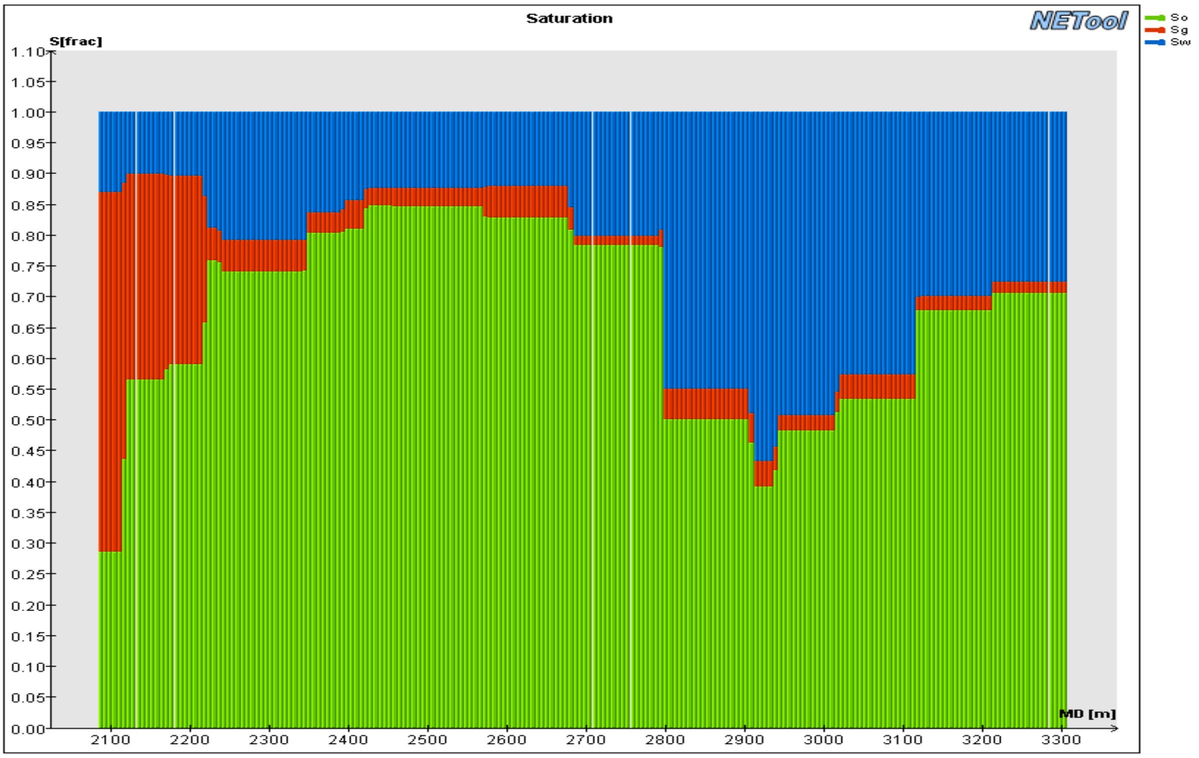
Annulus oil, gas and water flow rate along the wellbore



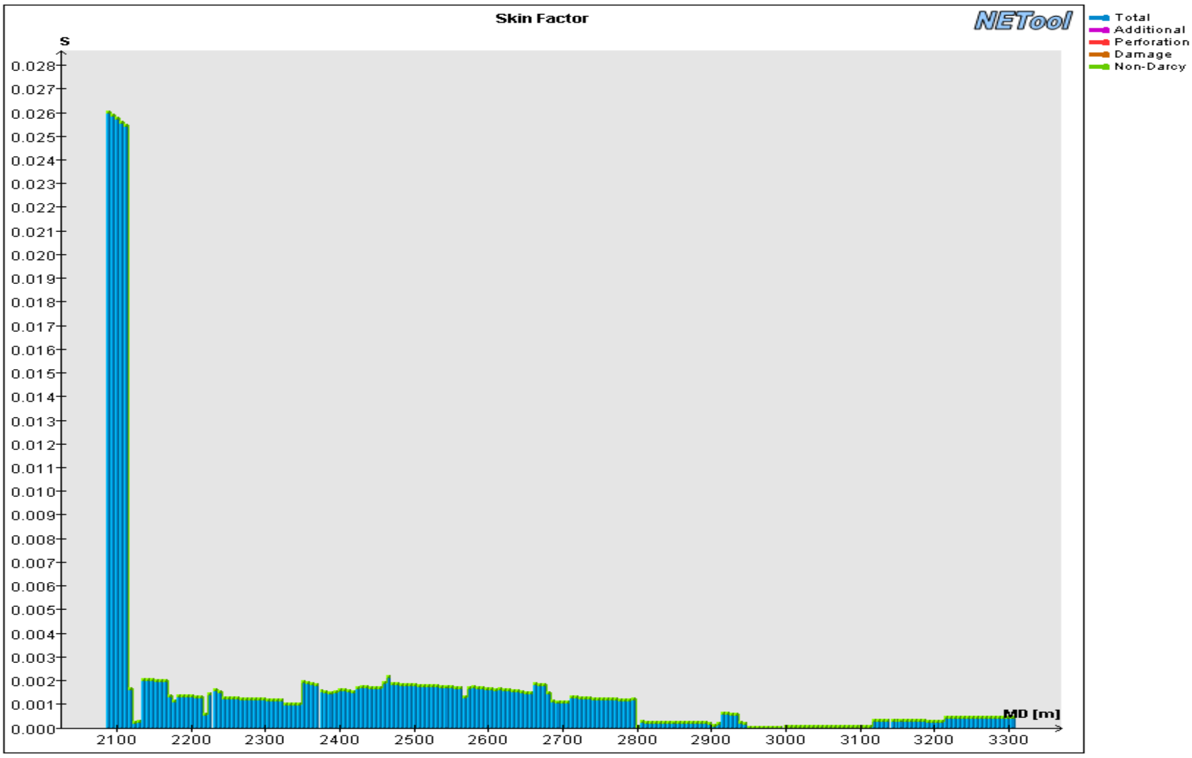
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

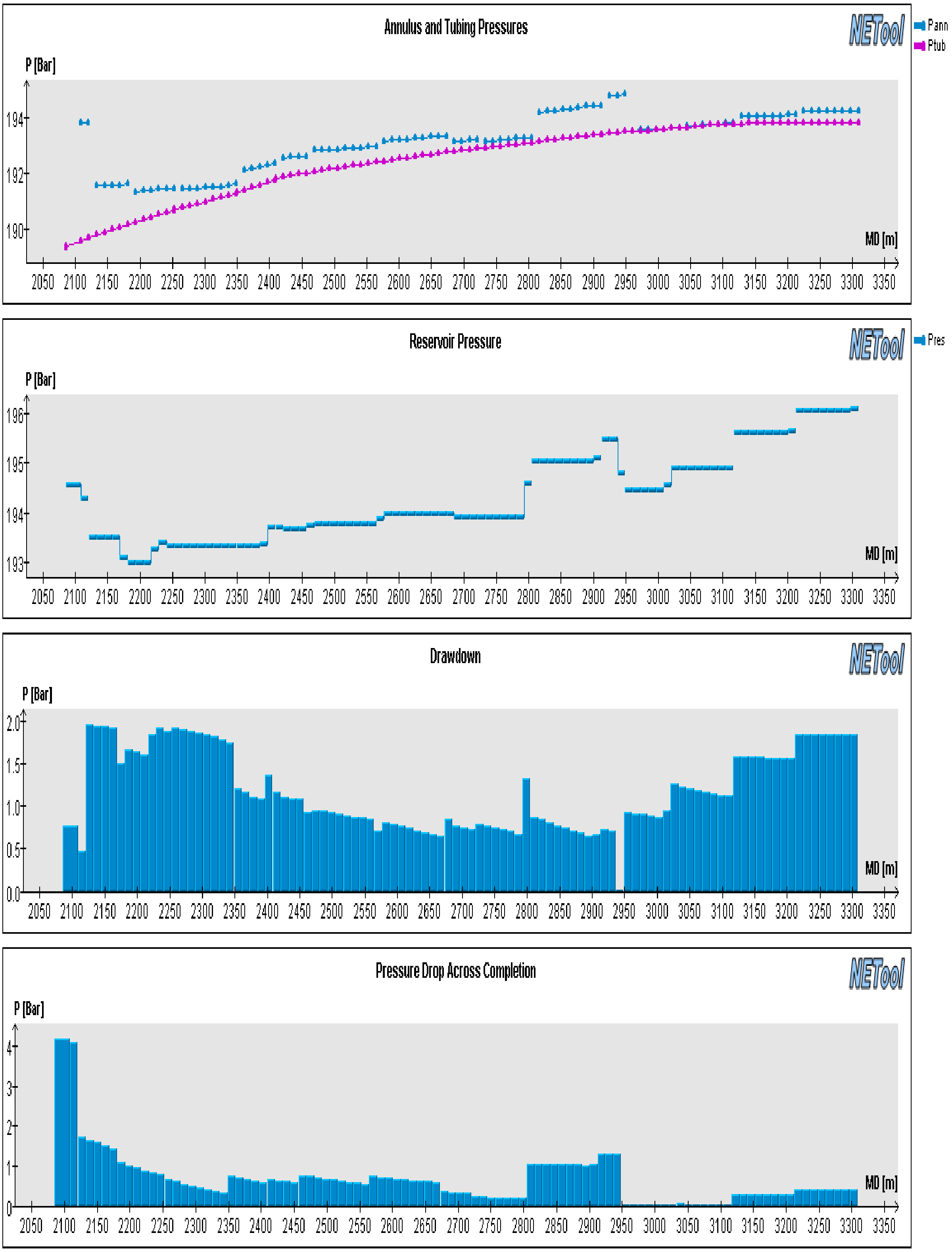
A.13 Plots for well KP7, 1826 days, 5,5” case, 4x4mm ICD

Completion overview for the case:

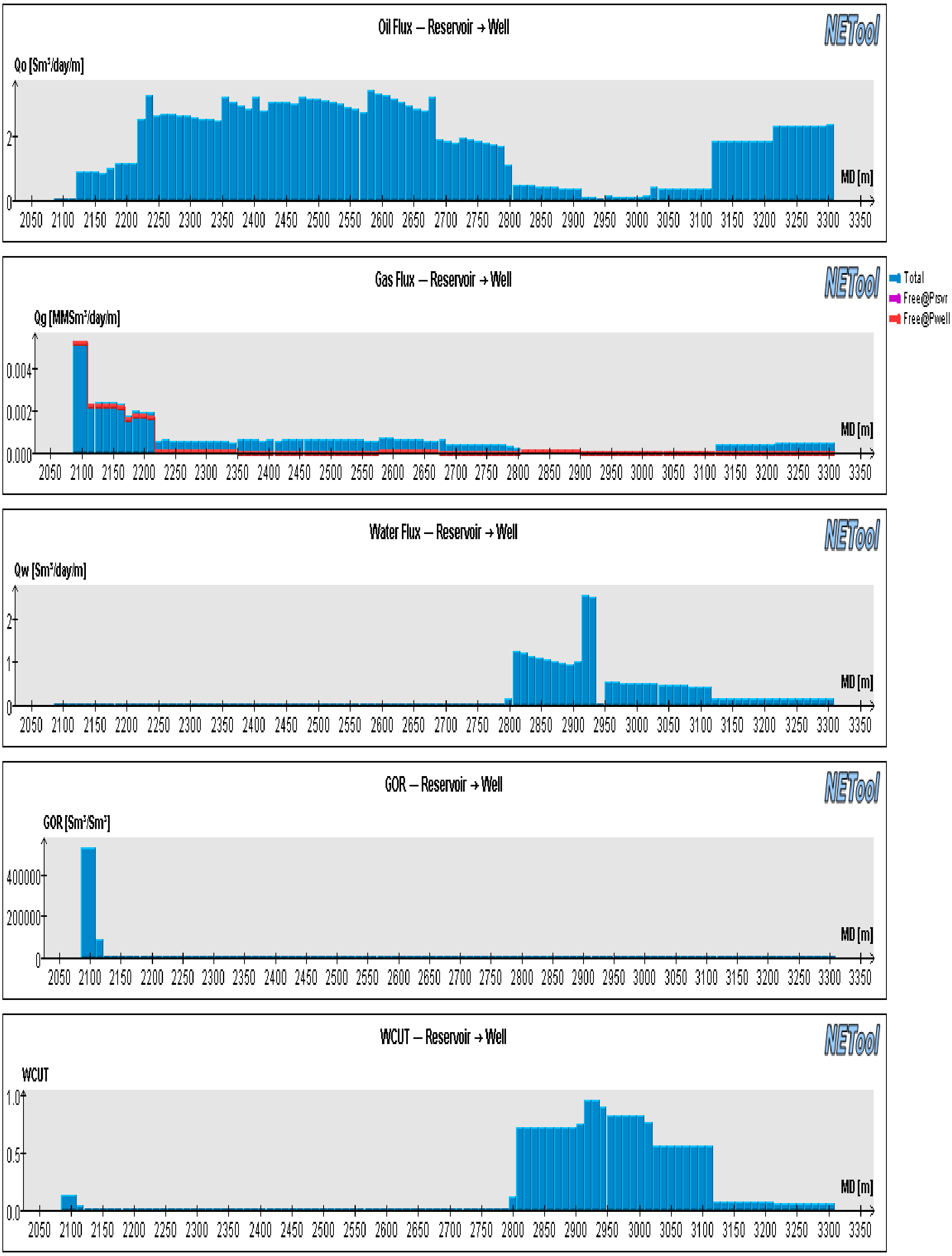
Reservoir section OD	8 ½”
Completion OD	5 ½””
Completion ID	4,77”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2445	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
2	2085,3	23,7	**Nozzle ICD**	4	4	Yes	No	No	**37**	2457	0,3	**Packer**	-	-	No	No	N/A
3	2109	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**38**	2457	12,0	**Nozzle ICD**	4	4	Yes	No	No
4	2120,7	0,3	**Packer**	-	-	No	No	N/A	**39**	2469	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
5	2121	12,0	**Nozzle ICD**	4	4	Yes	No	No	**40**	2481	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
6	2133	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**41**	2493	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
7	2145	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**42**	2505	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
8	2157	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**43**	2517	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
9	2169	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**44**	2529	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
10	2180,7	0,3	**Packer**	-	-	No	No	N/A	**45**	2541	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
11	2181	12,0	**Nozzle ICD**	4	4	Yes	No	No	**46**	2553	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
12	2193	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**47**	2565	0,3	**Packer**	-	-	No	No	N/A
13	2205	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**48**	2565	12,0	**Nozzle ICD**	4	4	Yes	No	No
14	2217	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**49**	2577	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
15	2229	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**50**	2589	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
16	2241	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**51**	2601	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
17	2252,7	0,3	**Packer**	-	-	No	No	N/A	**52**	2613	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
18	2253	12,0	**Nozzle ICD**	4	4	Yes	No	No	**53**	2625	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
19	2265	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**54**	2637	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
20	2277	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**55**	2649	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
21	2289	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**56**	2661	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
22	2301	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**57**	2673	0,3	**Packer**	-	-	No	No	N/A
23	2313	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**58**	2673	11,7	**Nozzle ICD**	4	4	Yes	No	No
24	2325	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**59**	2685	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
25	2337	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**60**	2697	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
26	2349	0,3	**Packer**	-	-	No	No	N/A	**61**	2709	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
27	2349,3	11,7	**Nozzle ICD**	4	4	Yes	No	No	**62**	2721	0,3	**Packer**	-	-	No	No	N/A
28	2361	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**63**	2721	12,0	**Nozzle ICD**	4	4	Yes	No	No
29	2373	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**64**	2733	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
30	2385	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**65**	2745	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
31	2397	11,7	**Nozzle ICD**	4	4	Yes	Yes	No	**66**	2757	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
32	2408,7	0,3	**Packer**	-	-	No	No	N/A	**67**	2769	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
33	2409	12,0	**Nozzle ICD**	4	4	Yes	No	No	**68**	2781	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
34	2421	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**69**	2793	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
35	2433	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**70**	2805	0,3	**Packer**	-	-	No	No	N/A

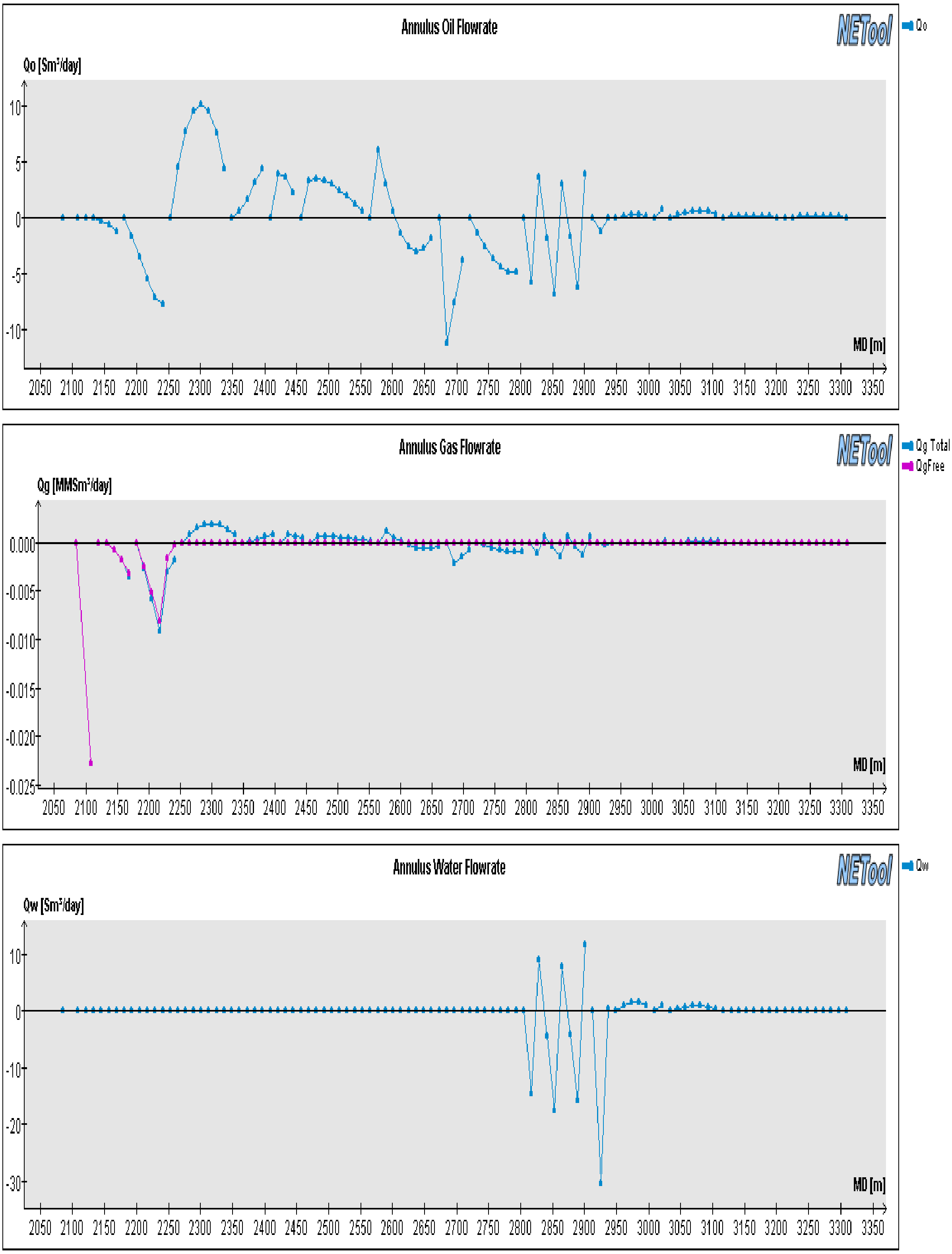
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	2805	12,0	**Blank pipe**	-	-	Yes	No	No	**102**	3117	12,0	**Nozzle ICD**	4	4	Yes	No	No
72	2817	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**103**	3129	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
73	2829	12,0	**Blank pipe**	-	-	Yes	Yes	No	**104**	3141	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
74	2841	12,0	**Blank pipe**	-	-	Yes	Yes	No	**105**	3153	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
75	2853	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**106**	3165	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
76	2865	12,0	**Blank pipe**	-	-	Yes	Yes	No	**107**	3177	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
77	2877	12,0	**Blank pipe**	-	-	Yes	Yes	No	**108**	3189	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
78	2889	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**109**	3201	11,7	**Nozzle ICD**	4	4	Yes	Yes	No
79	2901	11,7	**Blank pipe**	-	-	Yes	Yes	No	**110**	3213	0,3	**Packer**	-	-	No	No	N/A
80	2912,7	0,3	**Packer**	-	-	No	No	N/A	**111**	3213	12,0	**Nozzle ICD**	4	4	Yes	No	No
81	2913	12,0	**Blank pipe**	-	-	Yes	No	No	**112**	3225	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
82	2925	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**113**	3237	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
83	2937	11,7	**Blank pipe**	-	-	Yes	Yes	No	**114**	3249	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
84	2948,7	0,3	**Packer**	-	-	No	No	N/A	**115**	3261	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
85	2949	12,0	**Nozzle ICD**	4	4	Yes	No	No	**116**	3273	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
86	2961	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**117**	3285	12,0	**Nozzle ICD**	4	4	Yes	Yes	No
87	2973	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**118**	3297	12,4	**Nozzle ICD**	4	4	Yes	Yes	No
88	2985	12,0	**Nozzle ICD**	4	4	Yes	Yes	No	**TOE**	3309							
89	2997	11,7	**Nozzle ICD**	4	4	Yes	Yes	No									
90	3008,7	0,3	**Packer**	-	-	No	No	N/A									
91	3009	12,0	**Nozzle ICD**	4	4	Yes	No	No									
92	3021	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
93	3033	0,3	**Packer**	-	-	No	No	N/A									
94	3033,3	11,7	**Nozzle ICD**	4	4	Yes	No	No									
95	3045	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
96	3057	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
97	3069	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
98	3081	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
99	3093	12,0	**Nozzle ICD**	4	4	Yes	Yes	No									
100	3105	11,7	**Nozzle ICD**	4	4	Yes	Yes	No									
101	3116,7	0,3	**Packer**	-	-	No	No	N/A									



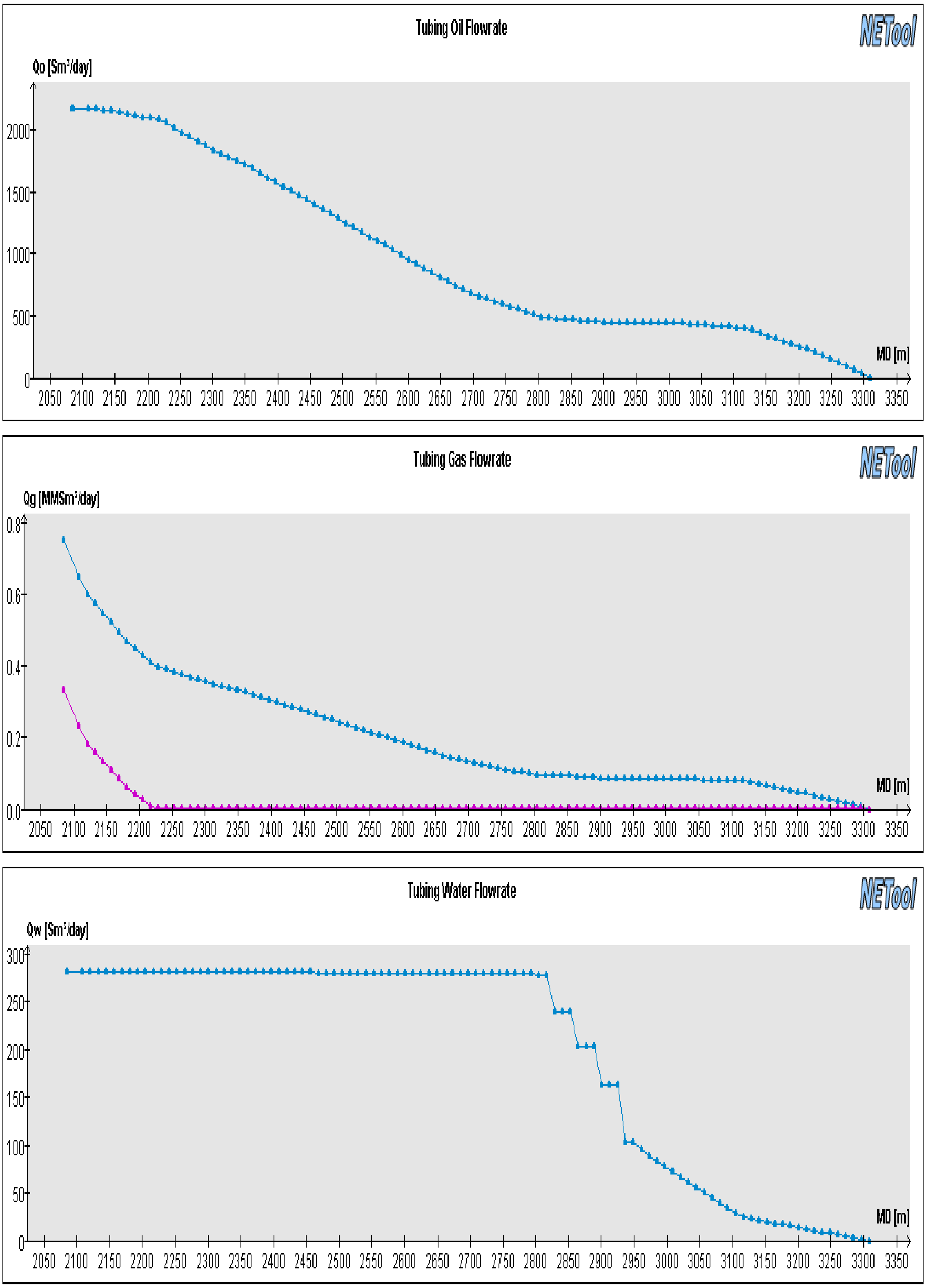
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



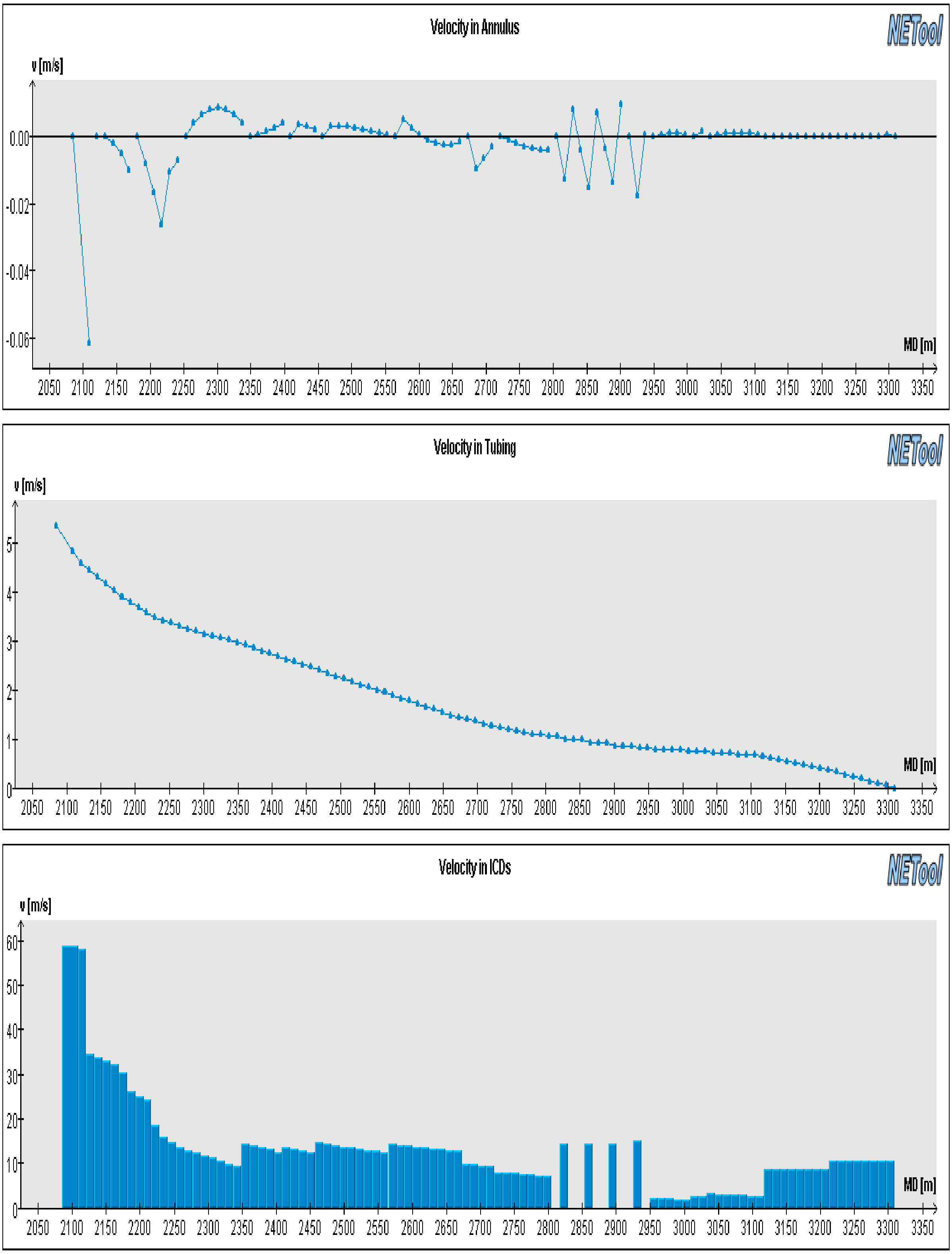
Influx of oil, gas and water from the reservoir and into the well along the wellbore



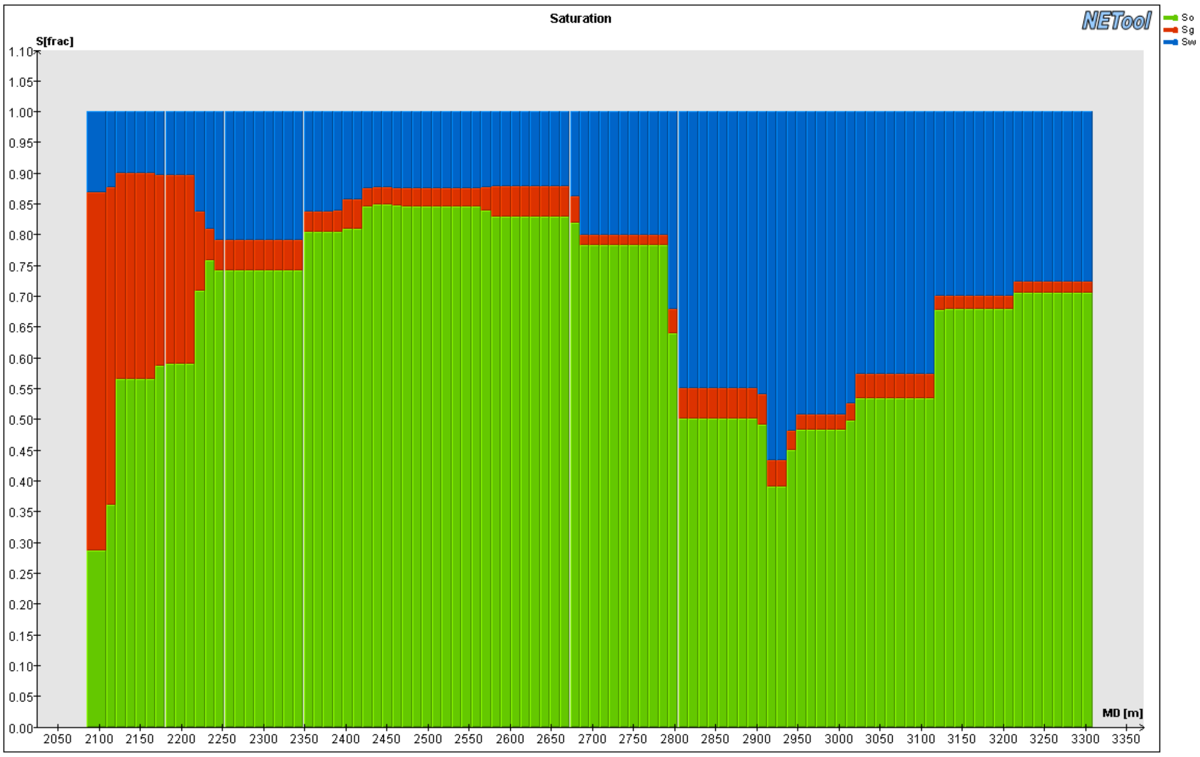
Annulus oil, gas and water flow rate along the wellbore



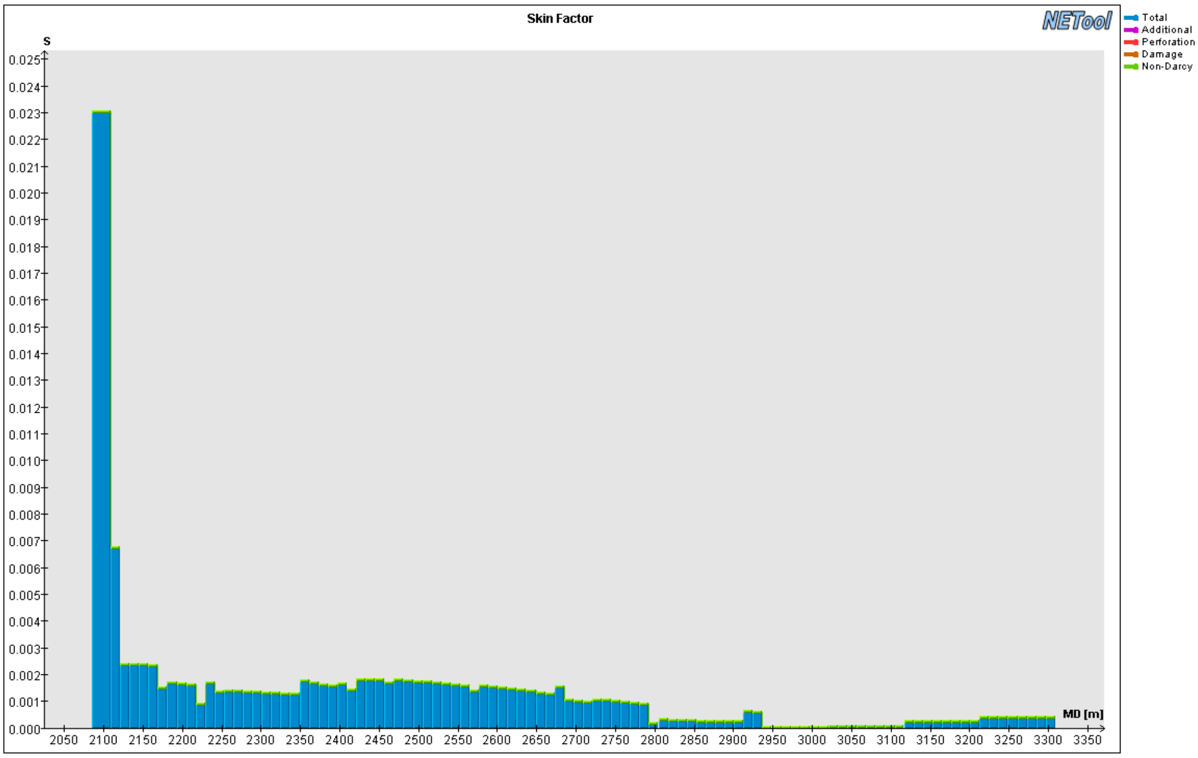
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus and tubing



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

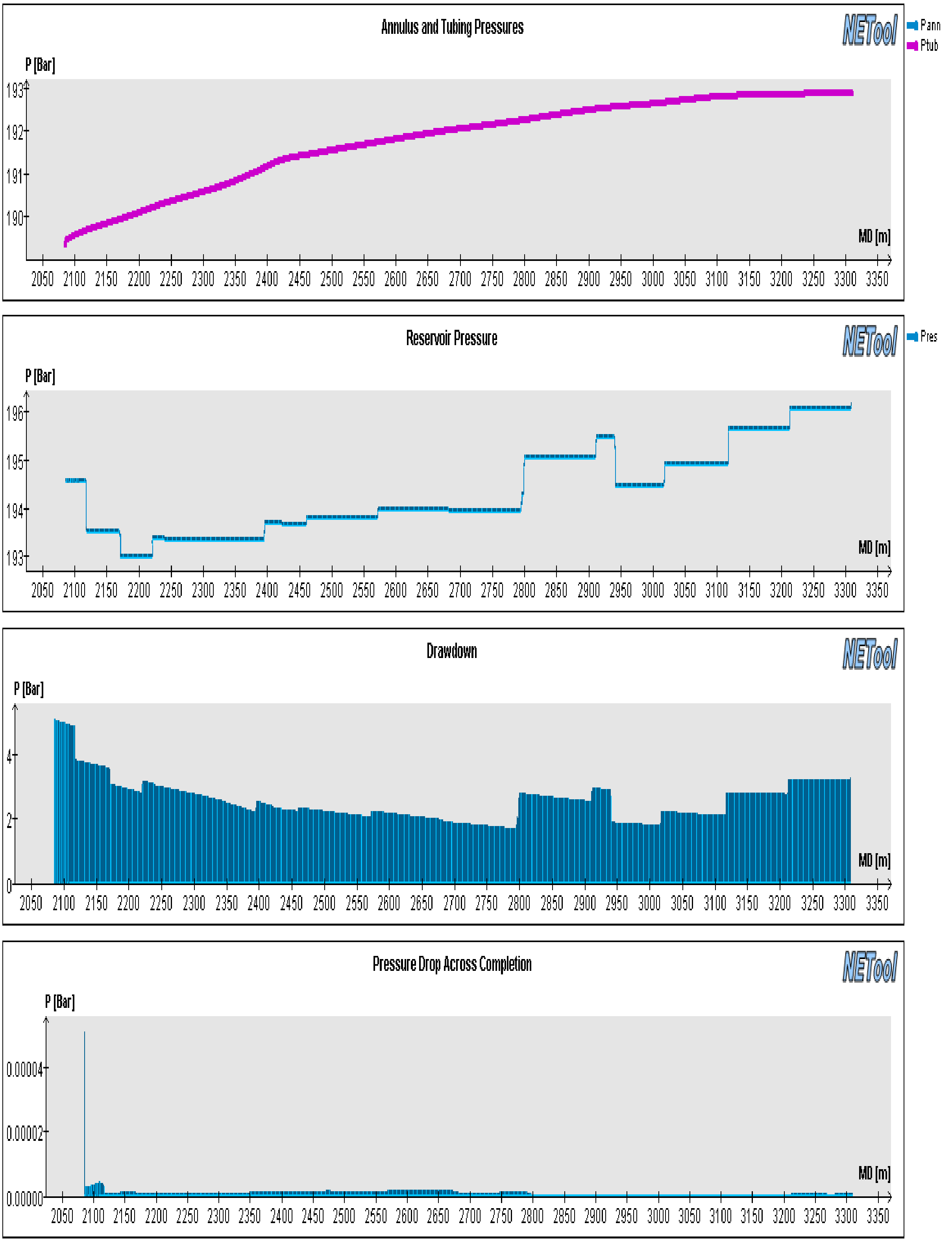
A.14 Plots for well KP7, 1826 days, WWS case, NoICD

Completion overview for the case:

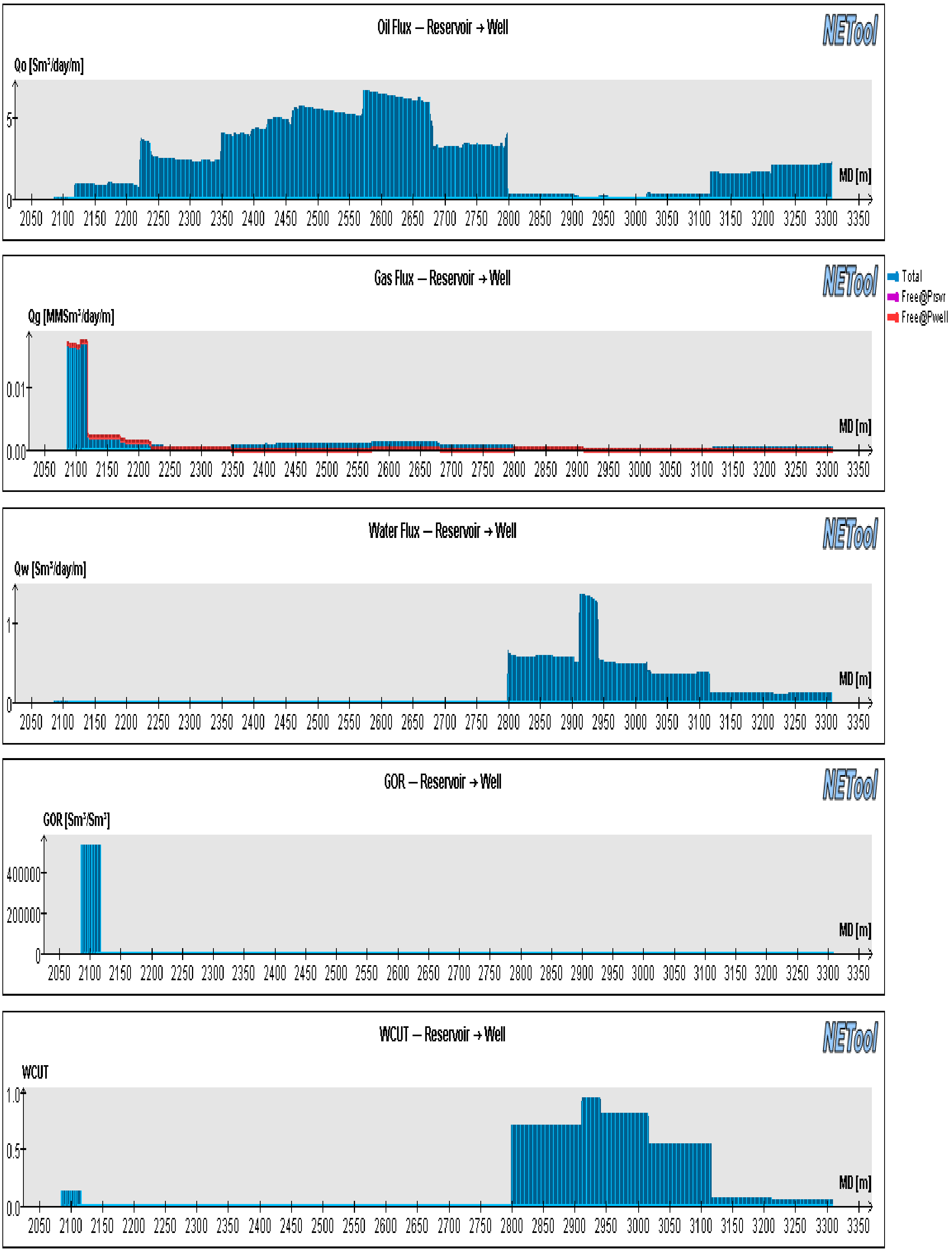
Reservoir section OD	8 ½”
Completion OD	7,05”
Completion ID	5,29

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2505	12,0	WWS	-	-	Yes	Yes	No
2	2085,3	23,7	WWS	-	-	Yes	No	No	37	2517	12,0	WWS	-	-	Yes	Yes	No
3	2109	12,0	WWS	-	-	Yes	Yes	No	38	2529,0	12,0	WWS	-	-	Yes	Yes	No
4	2121	12,0	WWS	-	-	Yes	Yes	No	39	2541	12,0	WWS	-	-	Yes	Yes	No
5	2133	12,0	WWS	-	-	Yes	Yes	No	40	2553	12,0	WWS	-	-	Yes	Yes	No
6	2145	12,0	WWS	-	-	Yes	Yes	No	41	2565	12,0	WWS	-	-	Yes	Yes	No
7	2157	12,0	WWS	-	-	Yes	Yes	No	42	2577	12,0	WWS	-	-	Yes	Yes	No
8	2169	12,0	WWS	-	-	Yes	Yes	No	43	2589	12,0	WWS	-	-	Yes	Yes	No
9	2181	12,0	WWS	-	-	Yes	Yes	No	44	2601	12,0	WWS	-	-	Yes	Yes	No
10	2193	12,0	WWS	-	-	Yes	Yes	No	45	2613	12,0	WWS	-	-	Yes	Yes	No
11	2205	12,0	WWS	-	-	Yes	Yes	No	46	2625	12,0	WWS	-	-	Yes	Yes	No
12	2217	12,0	WWS	-	-	Yes	Yes	No	47	2637	12,0	WWS	-	-	Yes	Yes	No
13	2229	12,0	WWS	-	-	Yes	Yes	No	48	2649	12,0	WWS	-	-	Yes	Yes	No
14	2241	12,0	WWS	-	-	Yes	Yes	No	49	2661	12,0	WWS	-	-	Yes	Yes	No
15	2253	12,0	WWS	-	-	Yes	Yes	No	50	2673	12,0	WWS	-	-	Yes	Yes	No
16	2265	12,0	WWS	-	-	Yes	Yes	No	51	2685	12,0	WWS	-	-	Yes	Yes	No
17	2277	12,0	WWS	-	-	Yes	Yes	No	52	2697	12,0	WWS	-	-	Yes	Yes	No
18	2289	12,0	WWS	-	-	Yes	Yes	No	53	2709	12,0	WWS	-	-	Yes	Yes	No
19	2301	12,0	WWS	-	-	Yes	Yes	No	54	2721	12,0	WWS	-	-	Yes	Yes	No
20	2313	12,0	WWS	-	-	Yes	Yes	No	55	2733	12,0	WWS	-	-	Yes	Yes	No
21	2325	12,0	WWS	-	-	Yes	Yes	No	56	2745	12,0	WWS	-	-	Yes	Yes	No
22	2337	12,0	WWS	-	-	Yes	Yes	No	57	2757	12,0	WWS	-	-	Yes	Yes	No
23	2349	12,0	WWS	-	-	Yes	Yes	No	58	2769	12,0	WWS	-	-	Yes	Yes	No
24	2361	12,0	WWS	-	-	Yes	Yes	No	59	2781	12,0	WWS	-	-	Yes	Yes	No
25	2373	12,0	WWS	-	-	Yes	Yes	No	60	2793	12,0	WWS	-	-	Yes	Yes	No
26	2385	12,0	WWS	-	-	Yes	Yes	No	61	2805	12,0	WWS	-	-	Yes	Yes	No
27	2397	12,0	WWS	-	-	Yes	Yes	No	62	2817	12,0	WWS	-	-	Yes	Yes	No
28	2409	12,0	WWS	-	-	Yes	Yes	No	63	2829	12,0	WWS	-	-	Yes	Yes	No
29	2421	12,0	WWS	-	-	Yes	Yes	No	64	2841	12,0	WWS	-	-	Yes	Yes	No
30	2433	12,0	WWS	-	-	Yes	Yes	No	65	2853	12,0	WWS	-	-	Yes	Yes	No
31	2445	12,0	WWS	-	-	Yes	Yes	No	66	2865	12,0	WWS	-	-	Yes	Yes	No
32	2457	12,0	WWS	-	-	Yes	Yes	No	67	2877	12,0	WWS	-	-	Yes	Yes	No
33	2469	12,0	WWS	-	-	Yes	Yes	No	68	2889	12,0	WWS	-	-	Yes	Yes	No
34	2481	12,0	WWS	-	-	Yes	Yes	No	69	2901	12,0	WWS	-	-	Yes	Yes	No
35	2493	12,0	WWS	-	-	Yes	Yes	No	70	2913	12,0	WWS	-	-	Yes	Yes	No

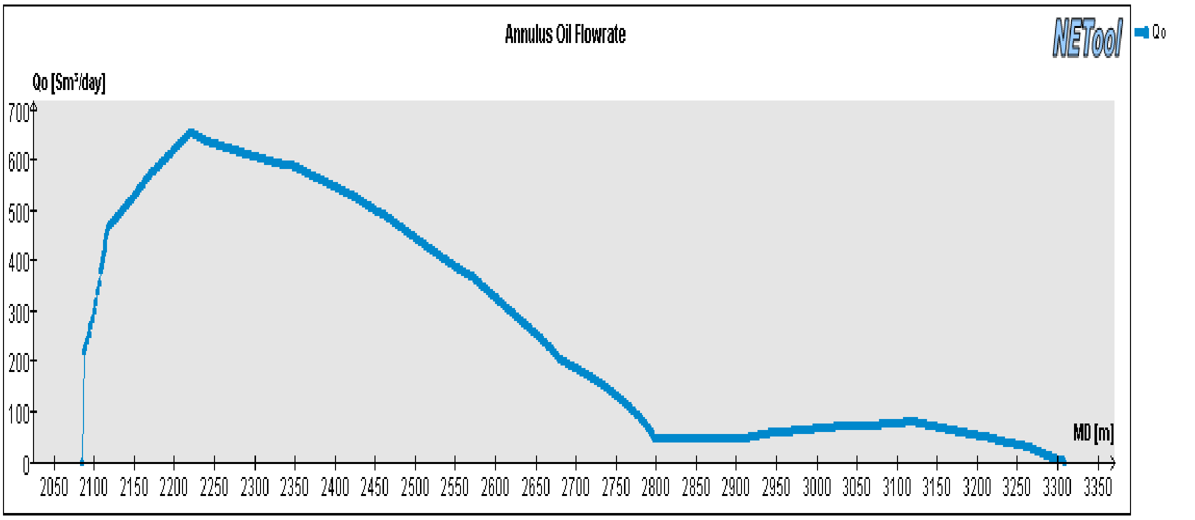
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2925,0	12,0	WWS	-	-	Yes	Yes	No
72	2937	12,0	WWS	-	-	Yes	Yes	No
73	2949	12,0	WWS	-	-	Yes	Yes	No
74	2961	12,0	WWS	-	-	Yes	Yes	No
75	2973	12,0	WWS	-	-	Yes	Yes	No
76	2985	12,0	WWS	-	-	Yes	Yes	No
77	2997	12,0	WWS	-	-	Yes	Yes	No
78	3009	12,0	WWS	-	-	Yes	Yes	No
79	3021	12,0	WWS	-	-	Yes	Yes	No
80	3033	12,0	WWS	-	-	Yes	Yes	No
81	3045	12,0	WWS	-	-	Yes	Yes	No
82	3057	12,0	WWS	-	-	Yes	Yes	No
83	3069	12,0	WWS	-	-	Yes	Yes	No
84	3081	12,0	WWS	-	-	Yes	Yes	No
85	3093	12,0	WWS	-	-	Yes	Yes	No
86	3105	12,0	WWS	-	-	Yes	Yes	No
87	3117	12,0	WWS	-	-	Yes	Yes	No
88	3129	12,0	WWS	-	-	Yes	Yes	No
89	3141	12,0	WWS	-	-	Yes	Yes	No
90	3153	12,0	WWS	-	-	Yes	Yes	No
91	3165	12,0	WWS	-	-	Yes	Yes	No
92	3177	12,0	WWS	-	-	Yes	Yes	No
93	3189	12,0	WWS	-	-	Yes	Yes	No
94	3201	12,0	WWS	-	-	Yes	Yes	No
95	3213	12,0	WWS	-	-	Yes	Yes	No
96	3225	12,0	WWS	-	-	Yes	Yes	No
97	3237	12,0	WWS	-	-	Yes	Yes	No
98	3249	12,0	WWS	-	-	Yes	Yes	No
99	3261	12,0	WWS	-	-	Yes	Yes	No
100	3273	12,0	WWS	-	-	Yes	Yes	No
101	3285	12,0	WWS	-	-	Yes	Yes	No
102	3297	12,4	WWS	-	-	Yes	Yes	No
103	3309,4	12,0	WWS	-	-	Yes	Yes	No

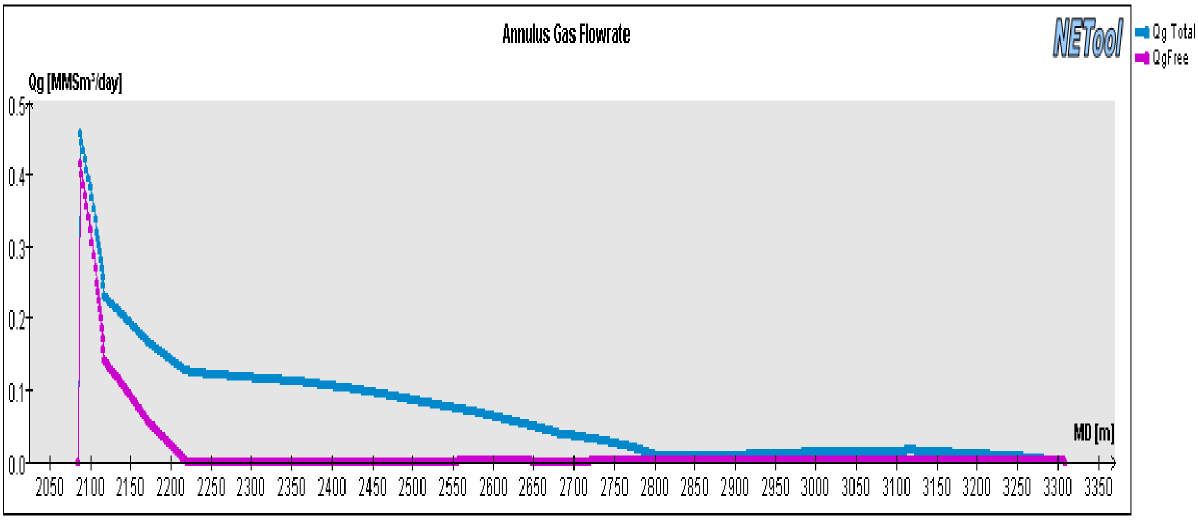


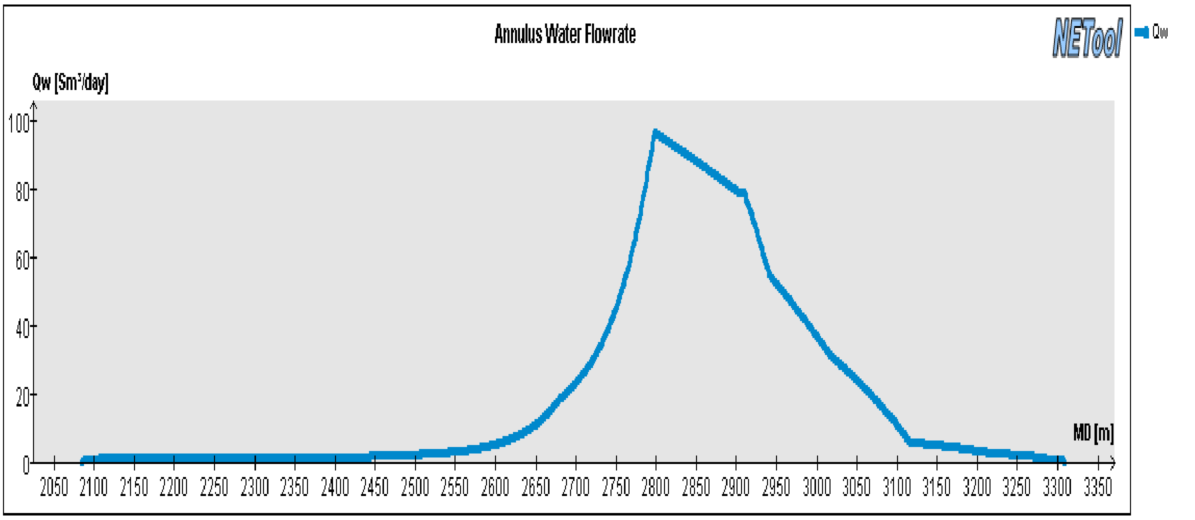
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



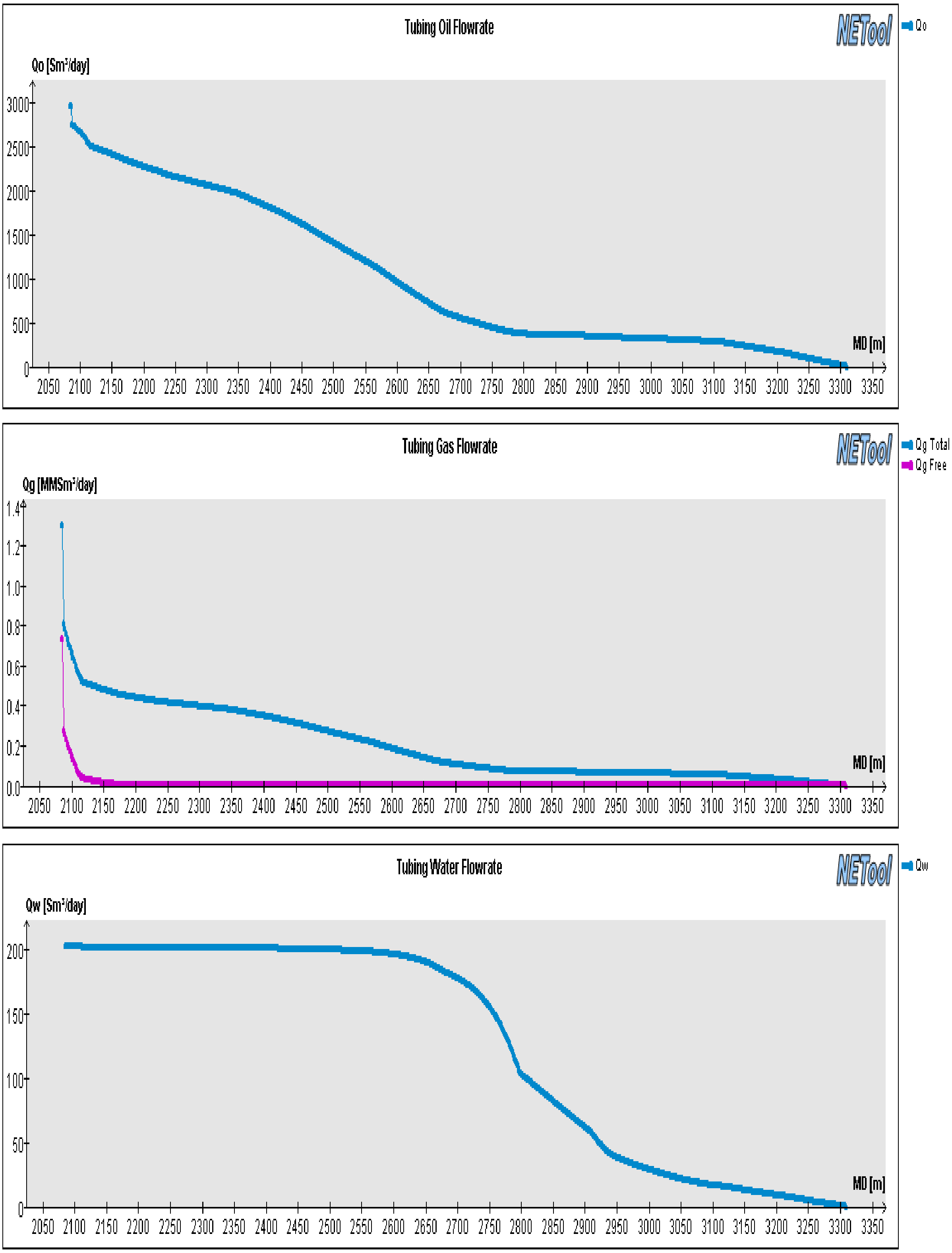
Influx of oil, gas and water from the reservoir and into the well along the wellbore



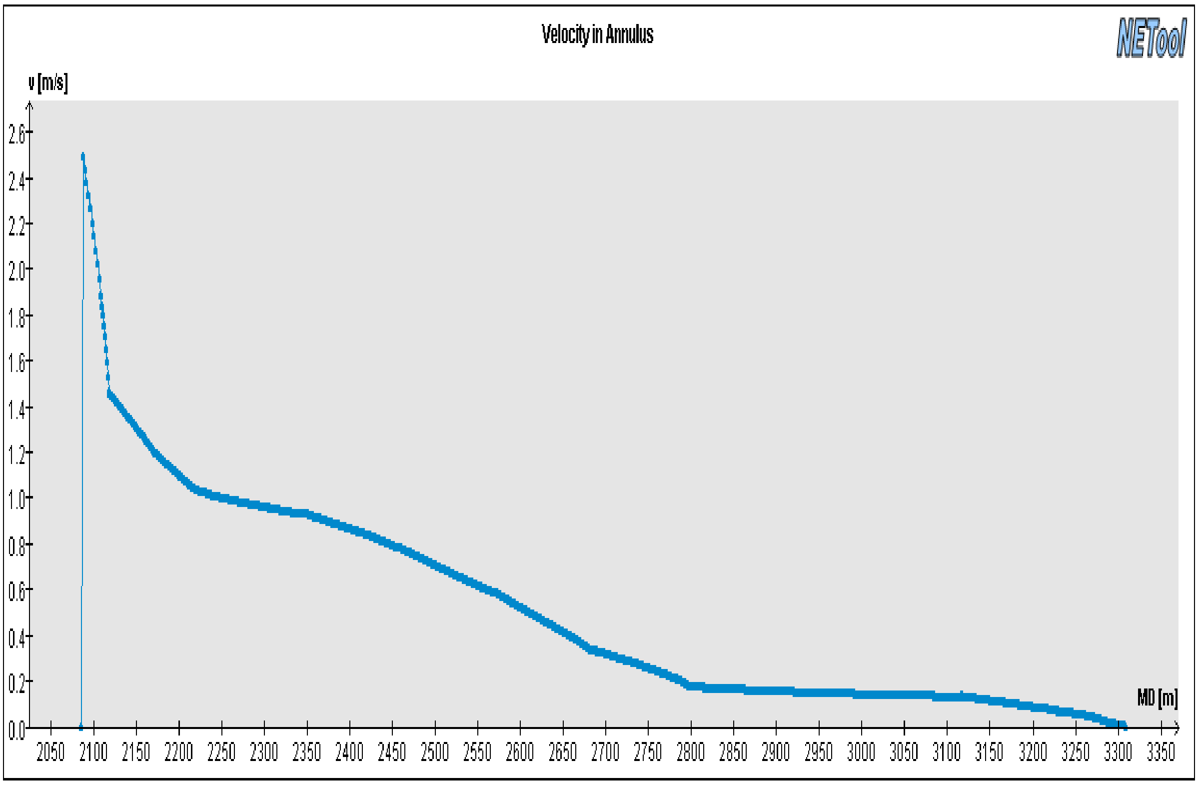


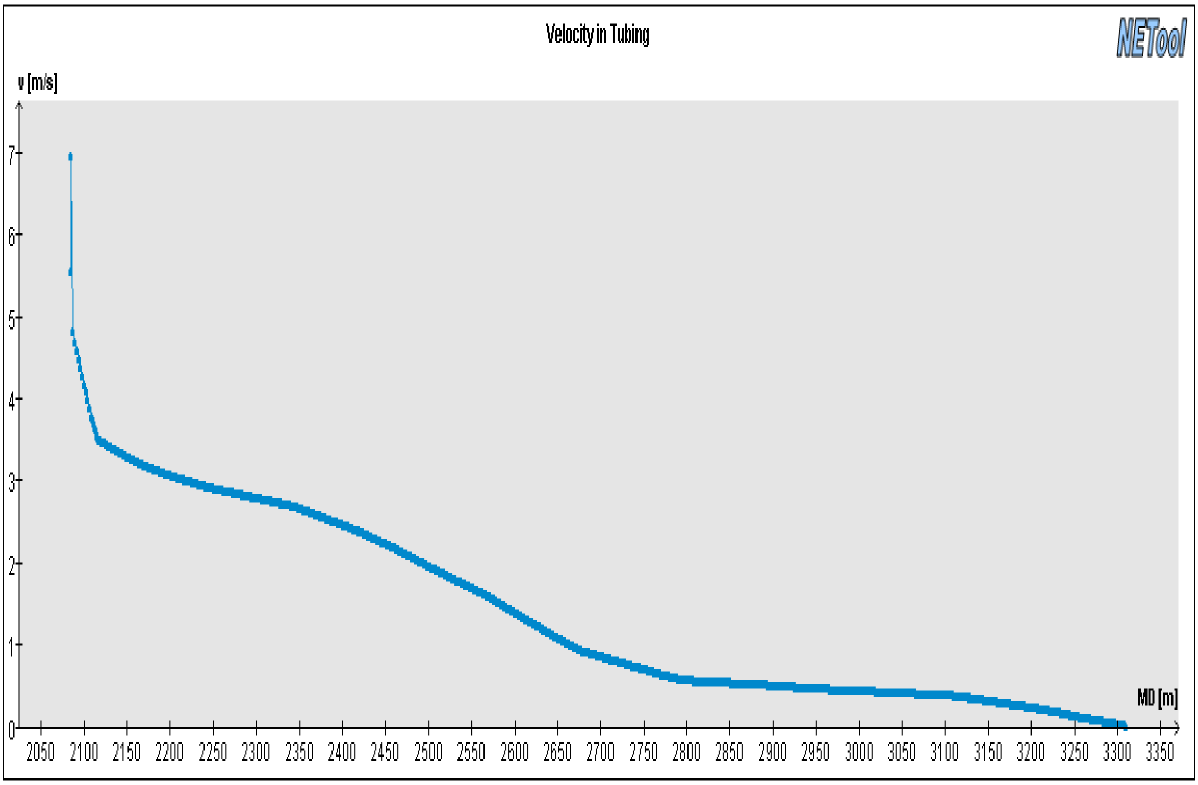


Annulus oil, gas and water flow rate along the wellbore

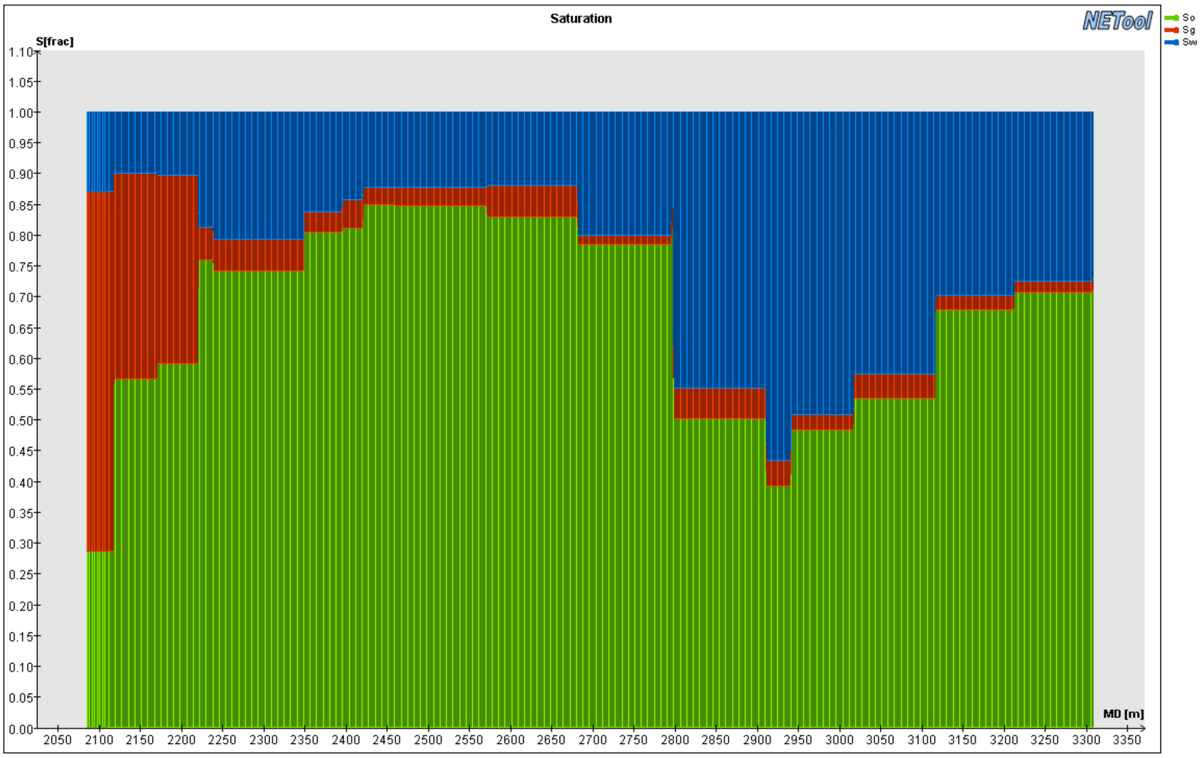


Tubing flow of oil, gas and water along the wellbore

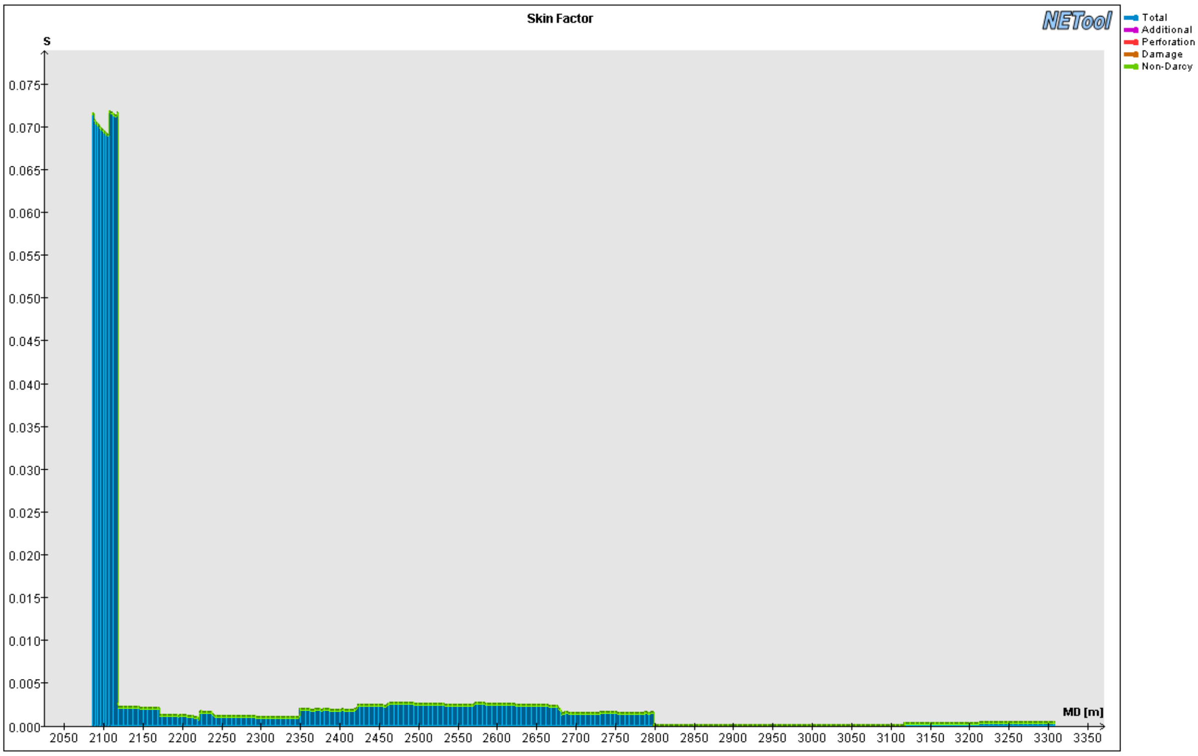




Velocity of the flow in the Annulus and tubing



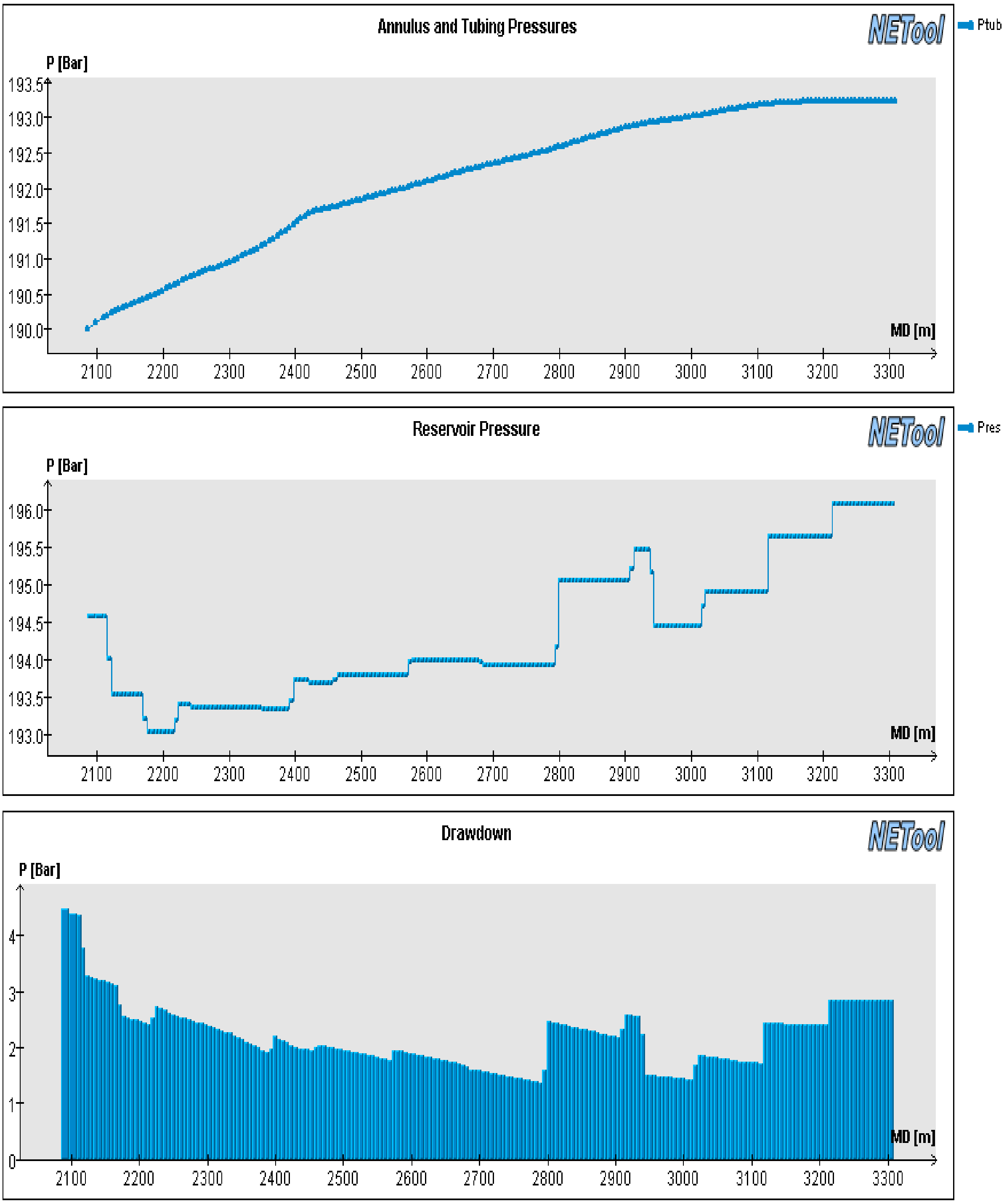
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



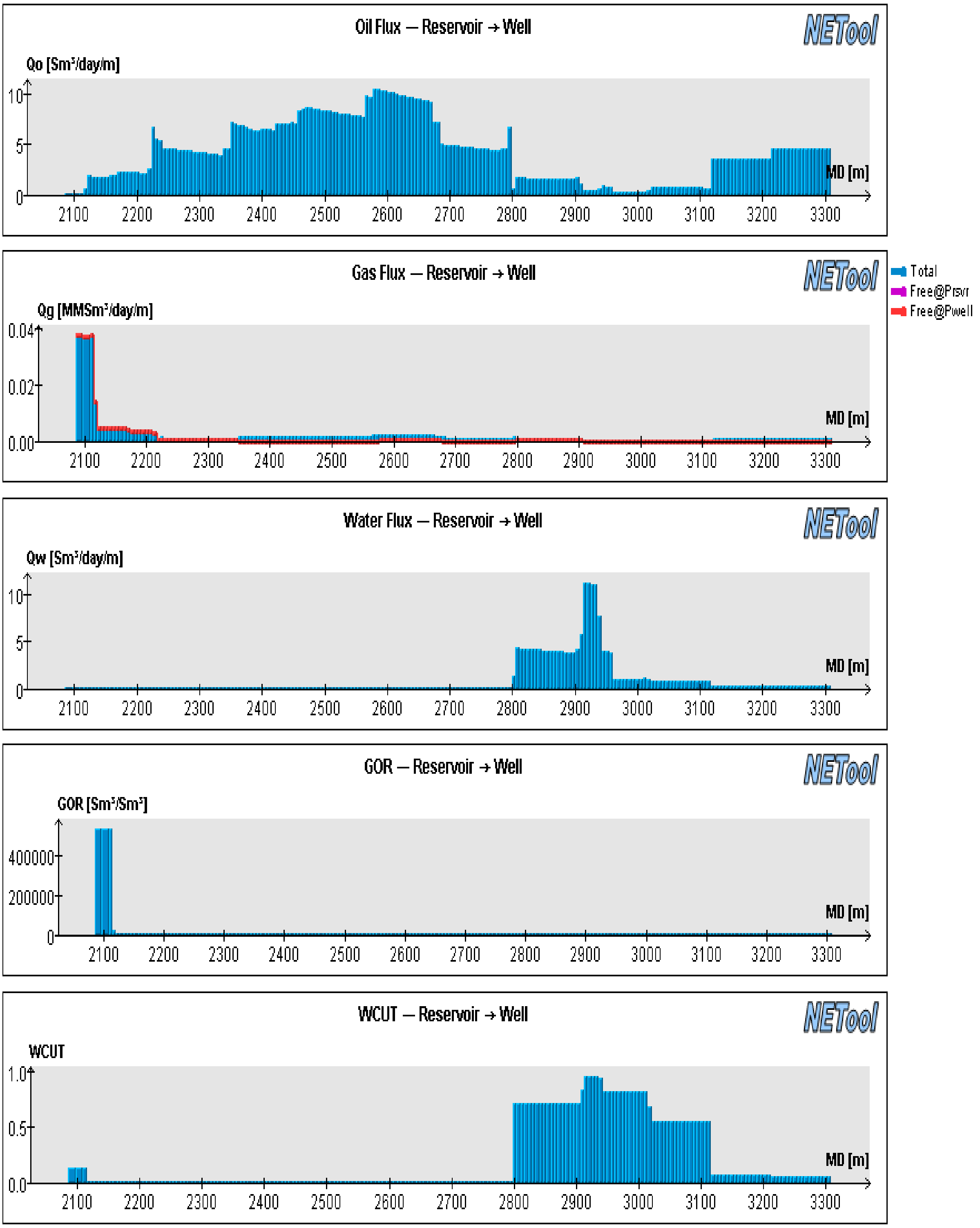
Skin factor plot for the well and given time step

A.15 Plots for well KP7, 1826 days, OH+25% in K_h

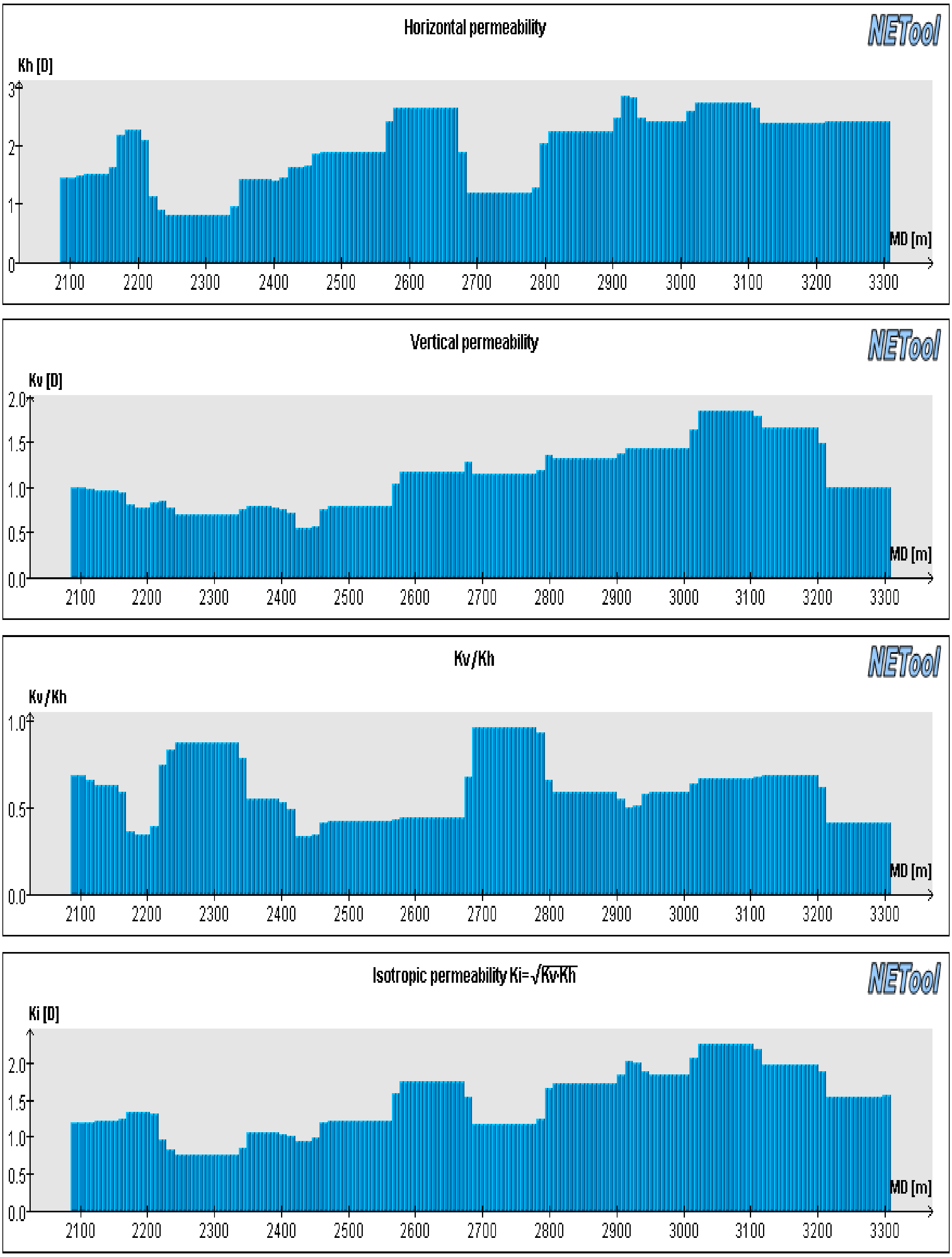
Reference case for 25% change in permeability. Completion set up can be found in Appendix A.3



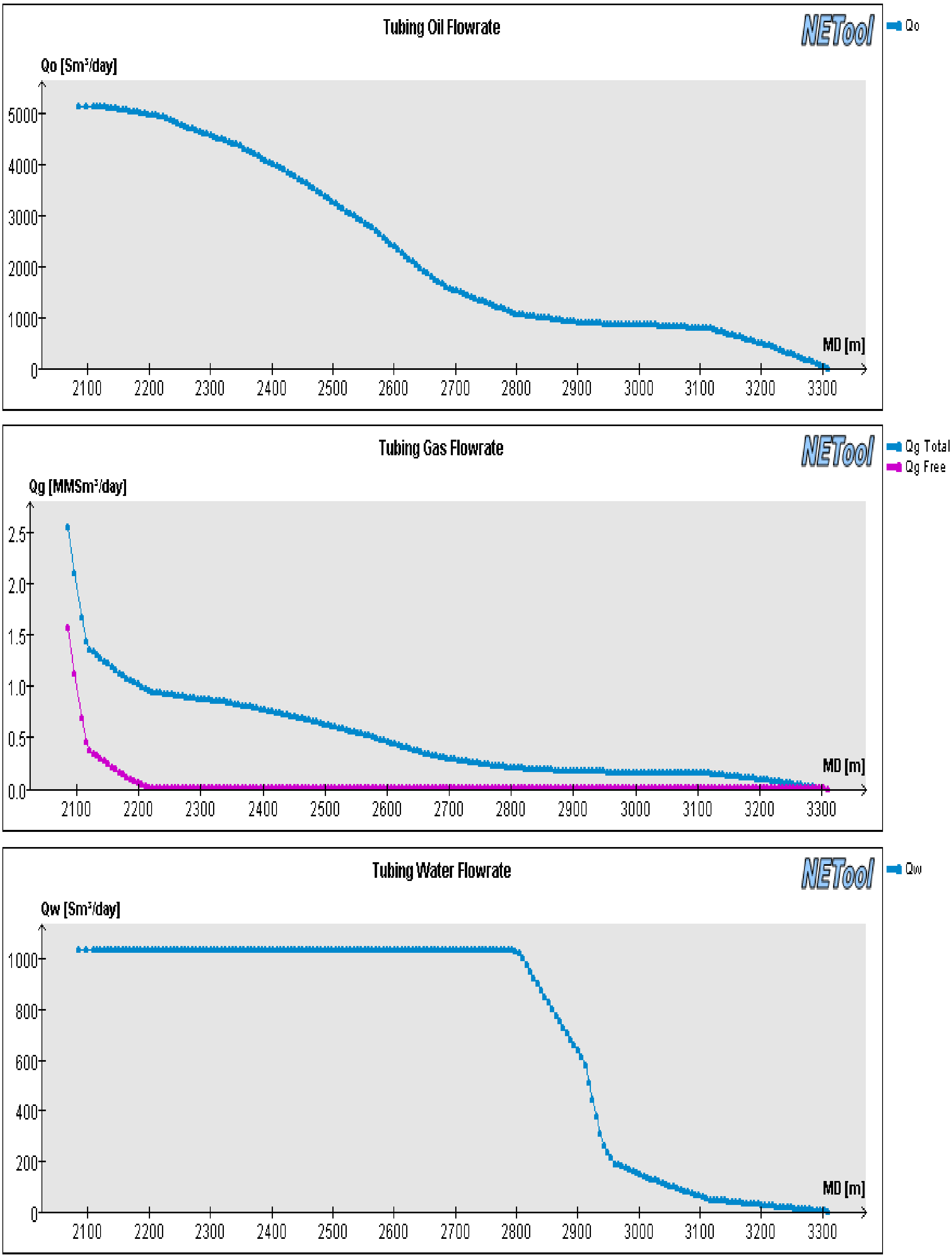
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



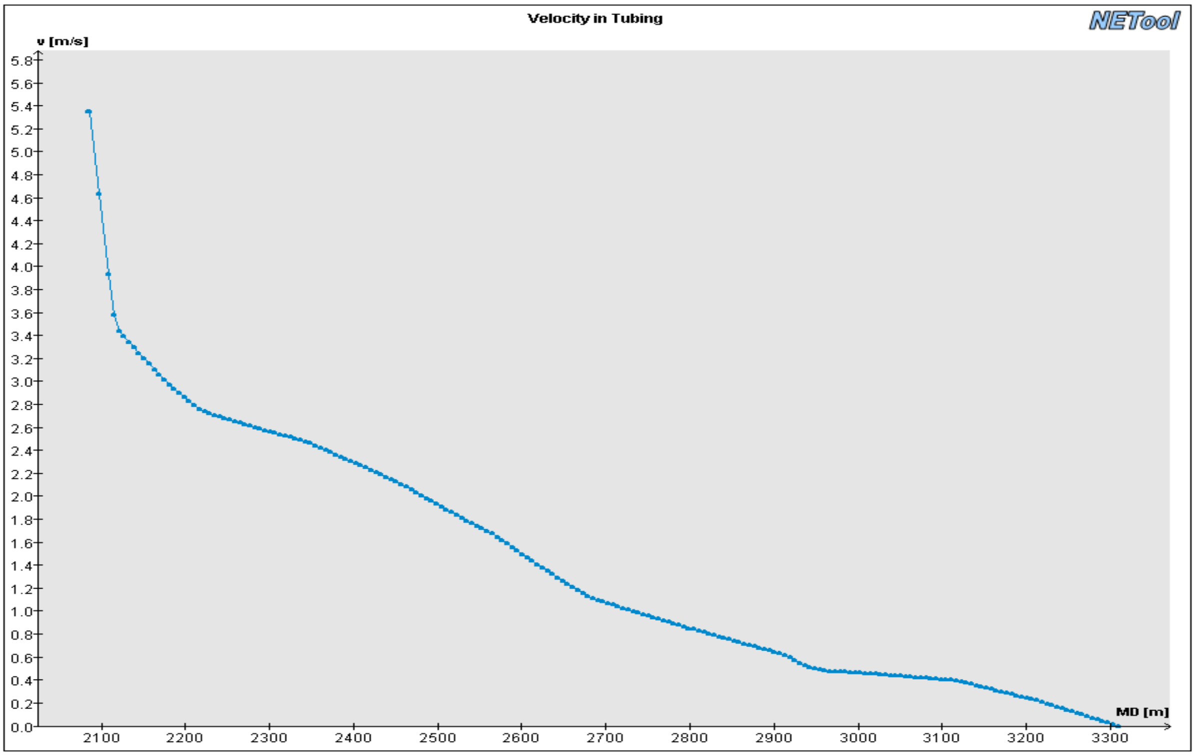
Influx of oil, gas and water from the reservoir and into the well along the wellbore



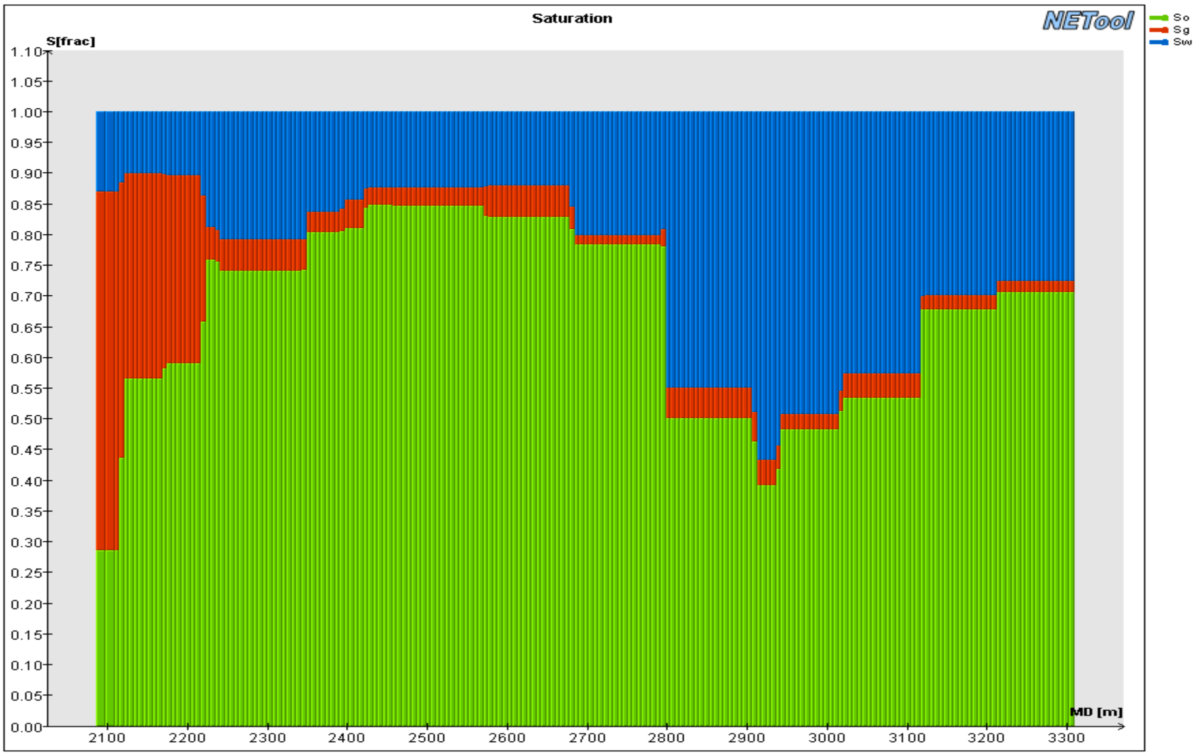
Permeability plot, horizontal, vertical and K_v/K_h



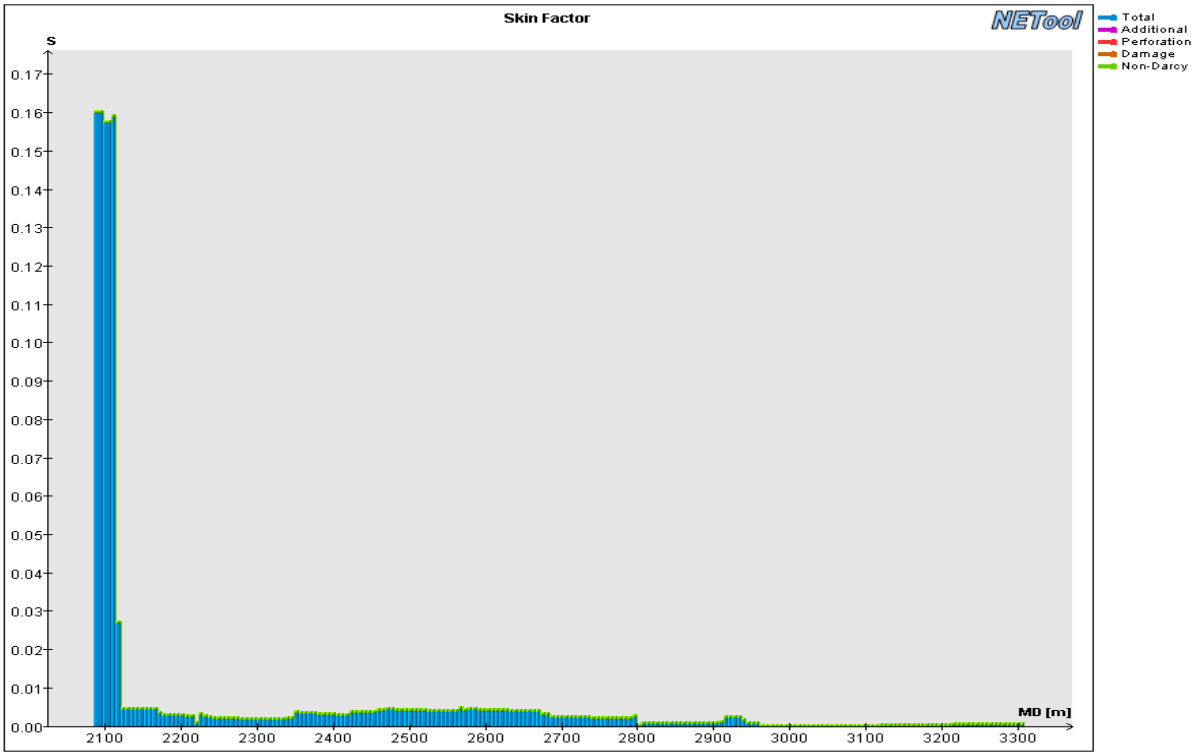
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing



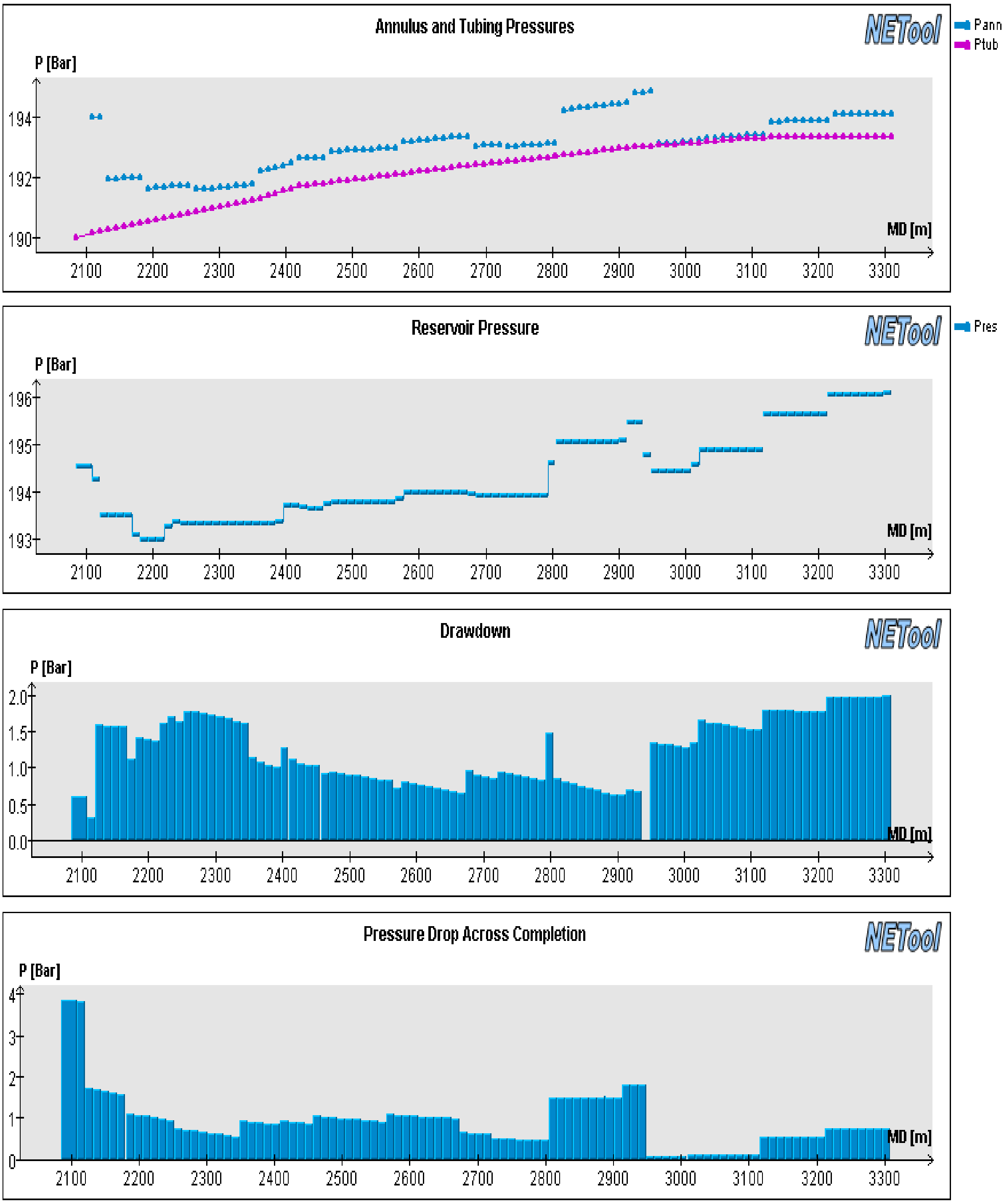
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



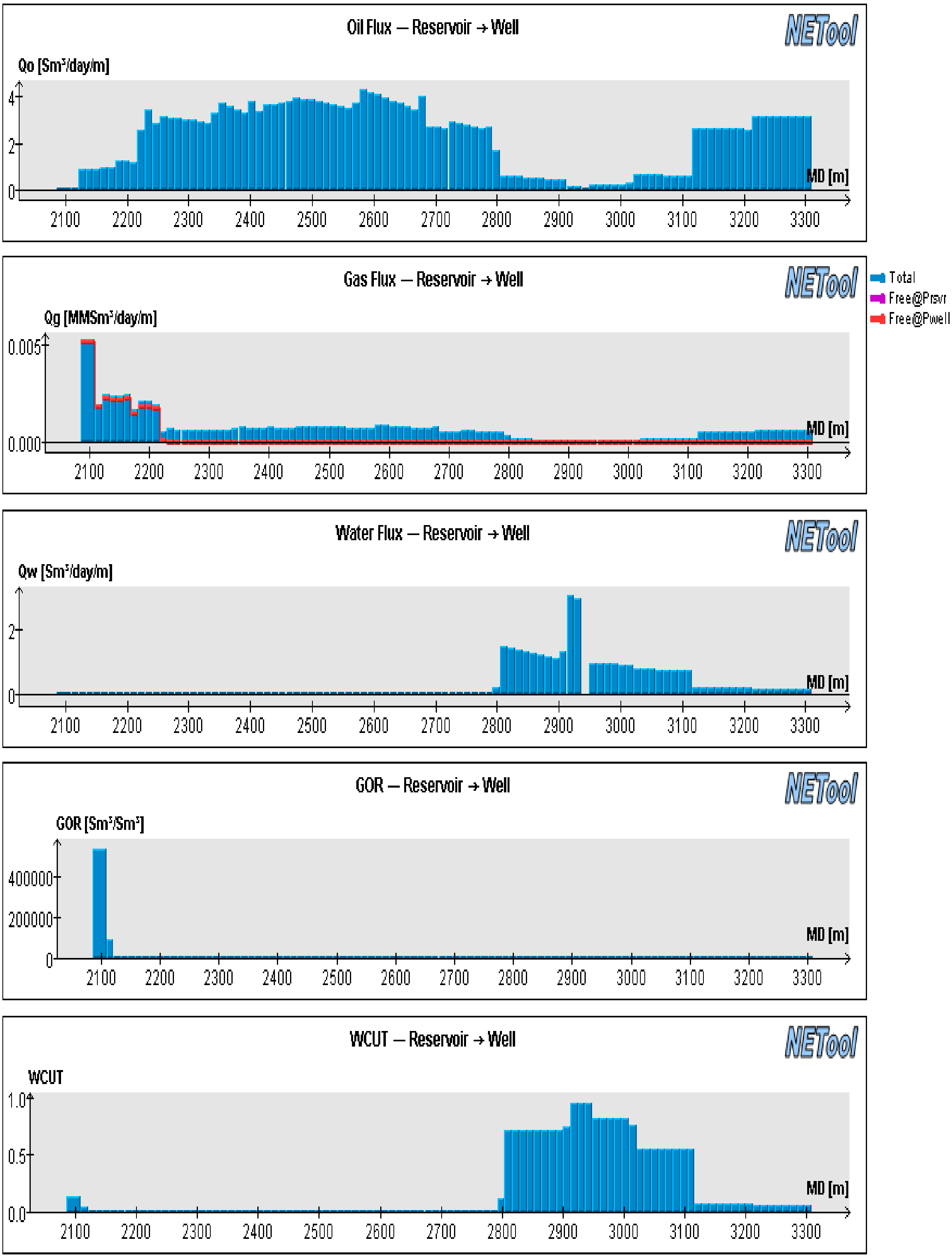
Skin factor plot for the well and given time step

A.16 Plots for well KP7, 1826 days, Recommended ICD+25% in K_h

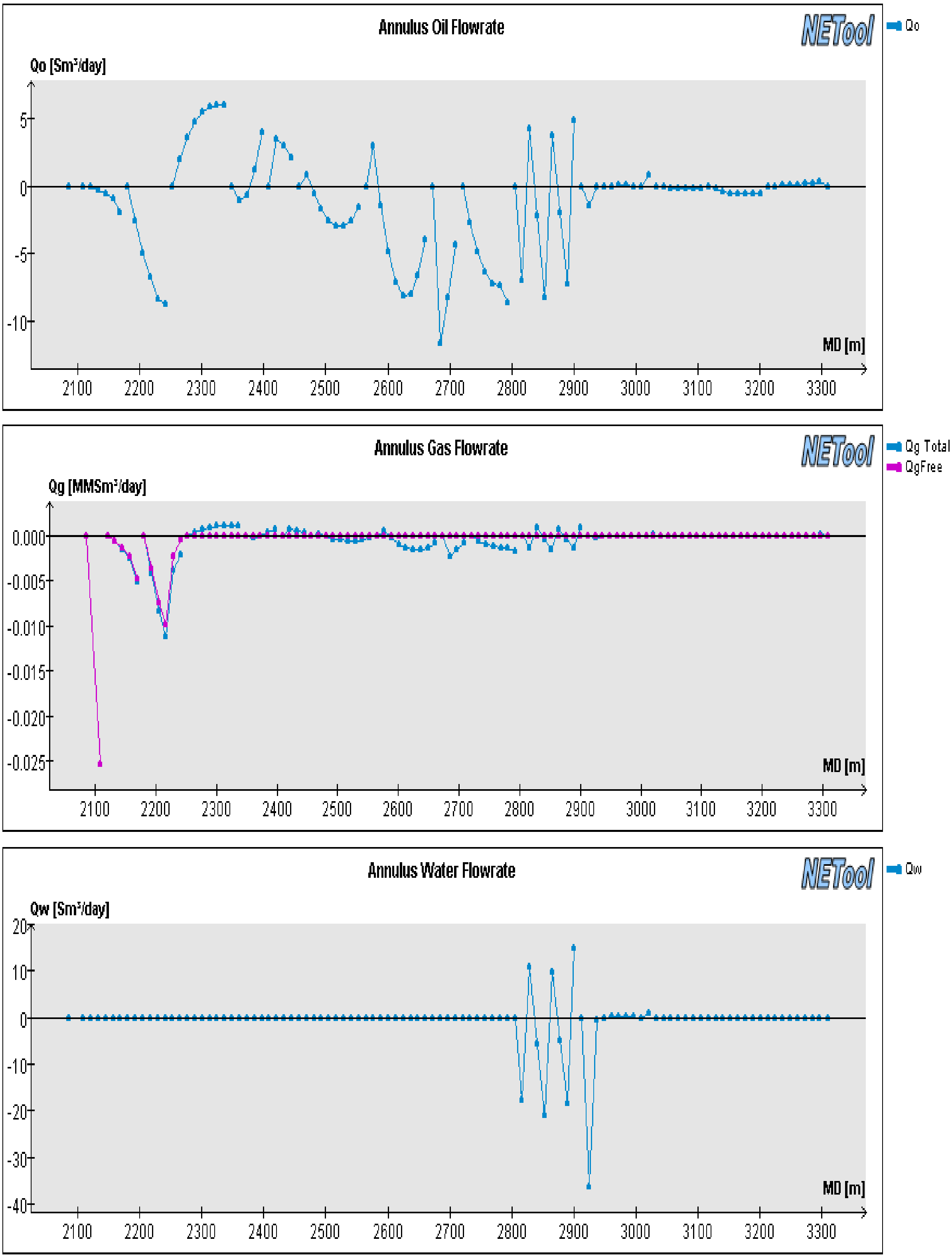
Recommended ICD set up run with 25% increae in K_h. Completion set up can be found in Appendix A.10 Permeability profile the same as in A.14



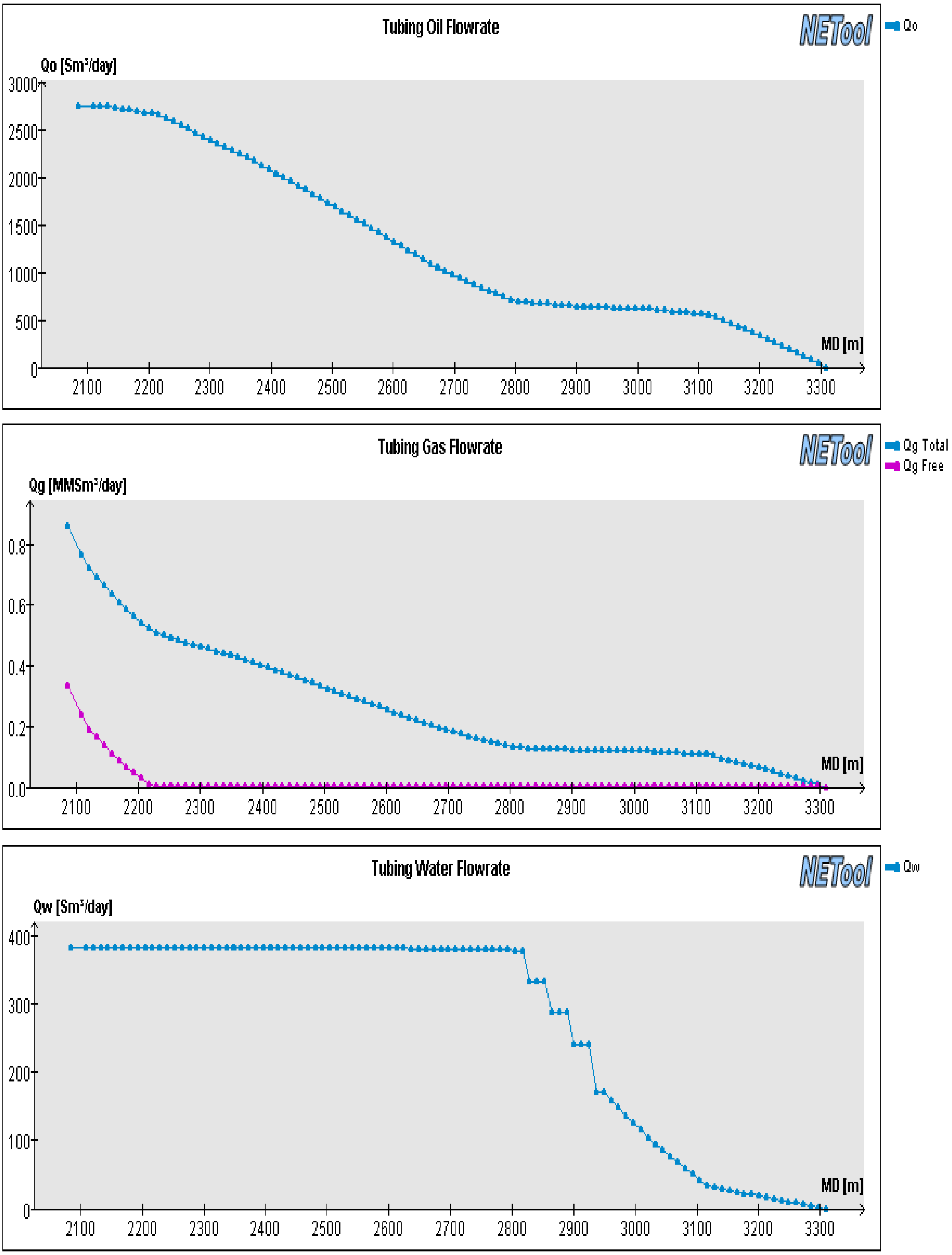
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



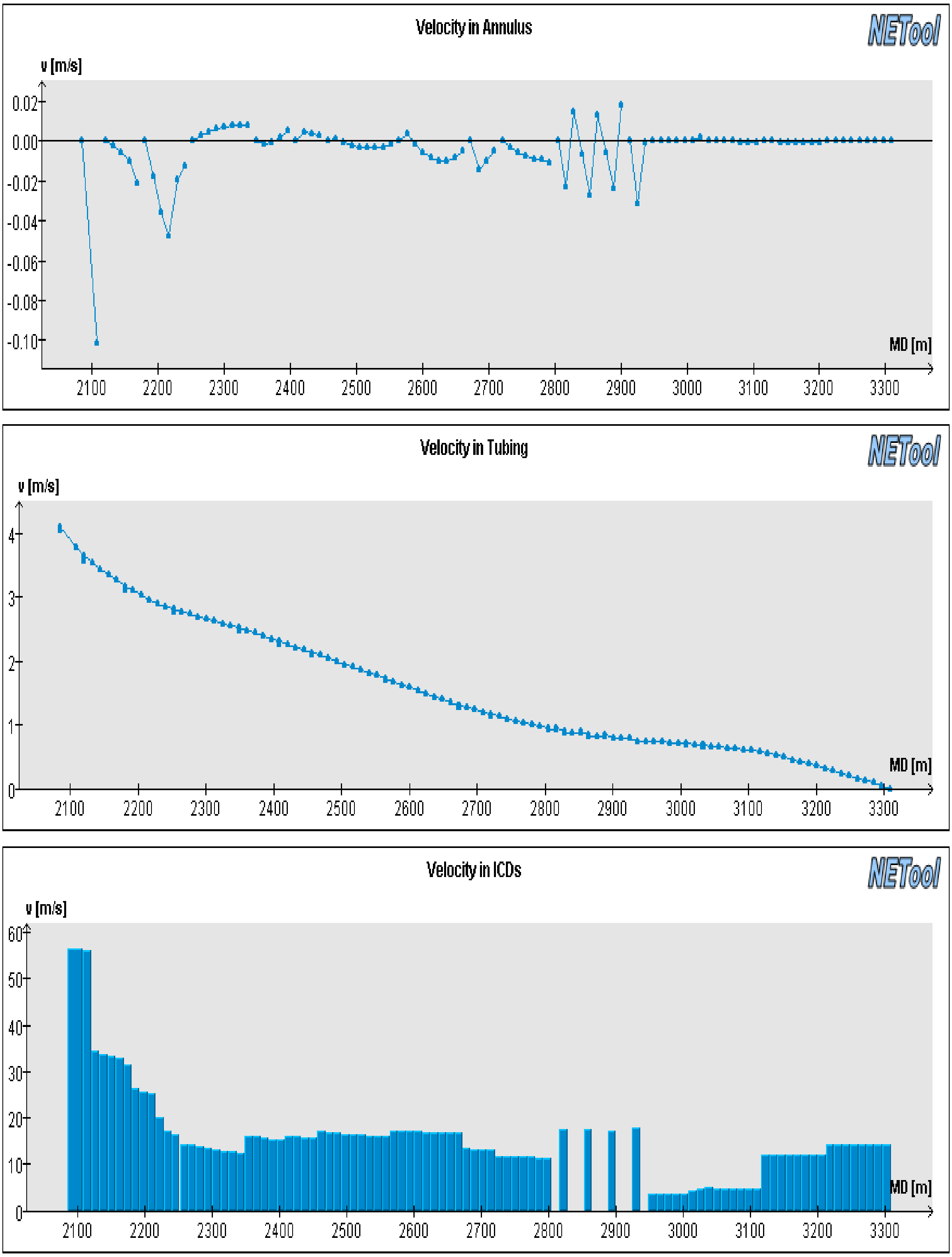
Influx of oil, gas and water from the reservoir and into the well along the wellbore



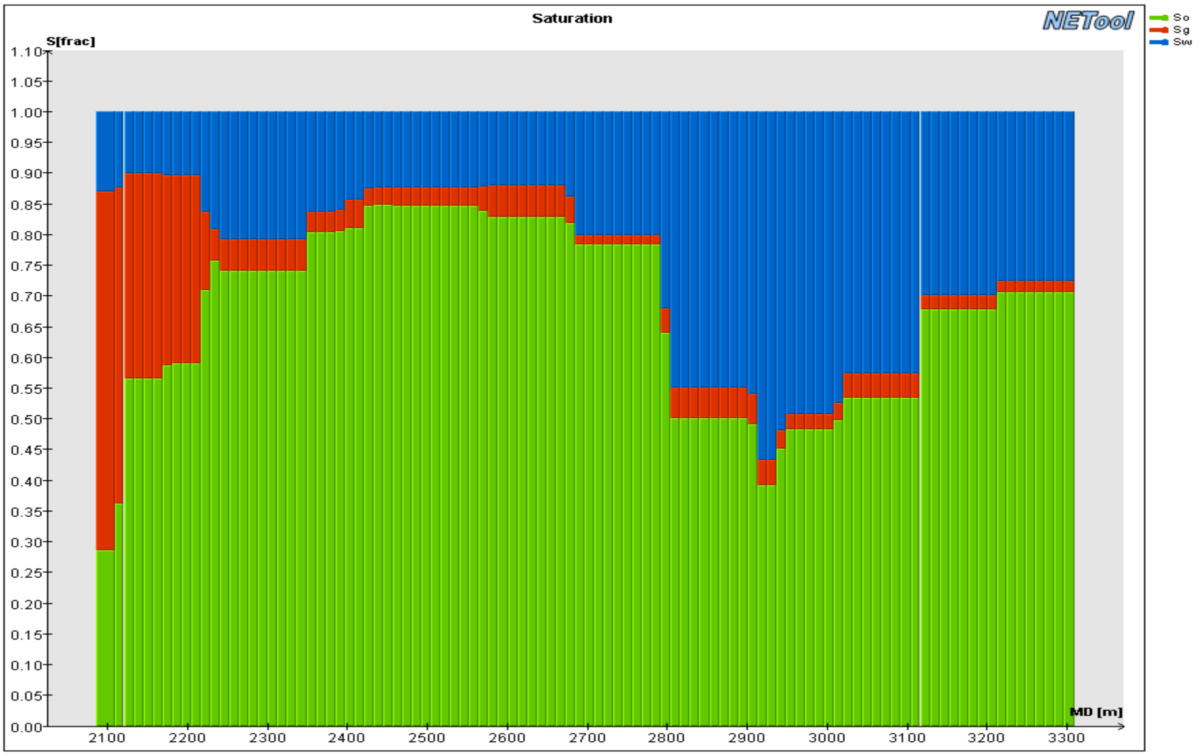
Annulus oil, gas and water flow rate along the wellbore



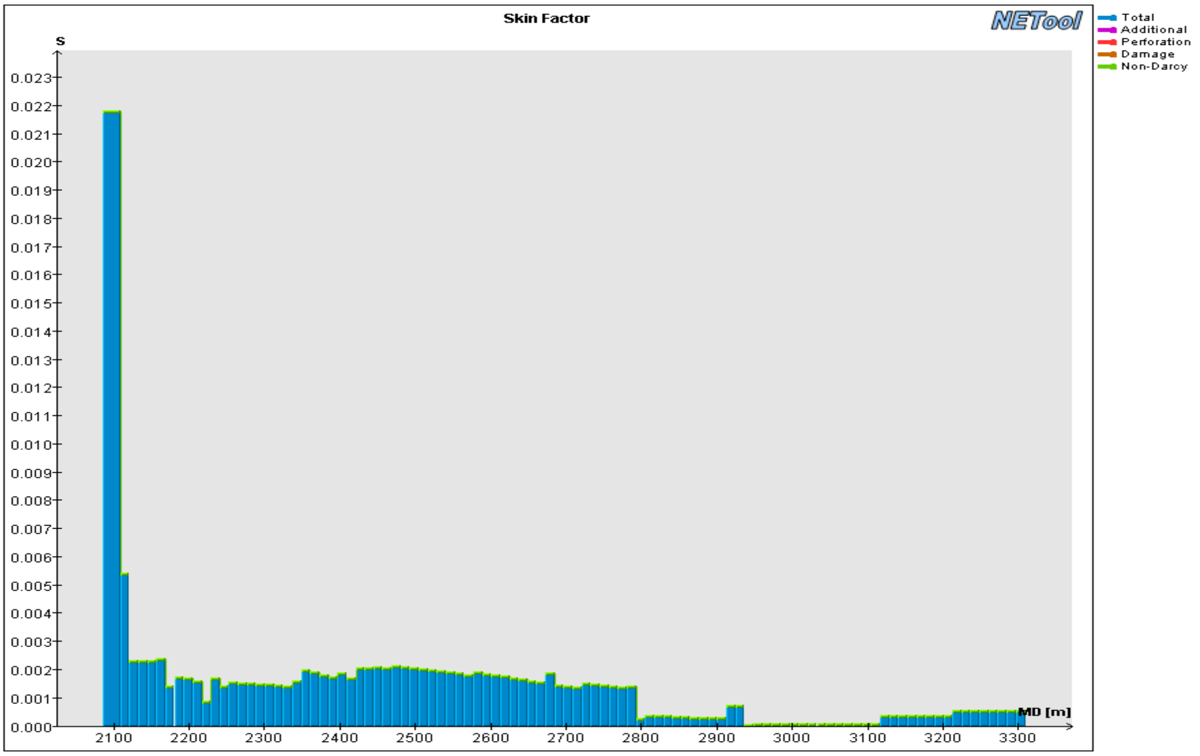
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



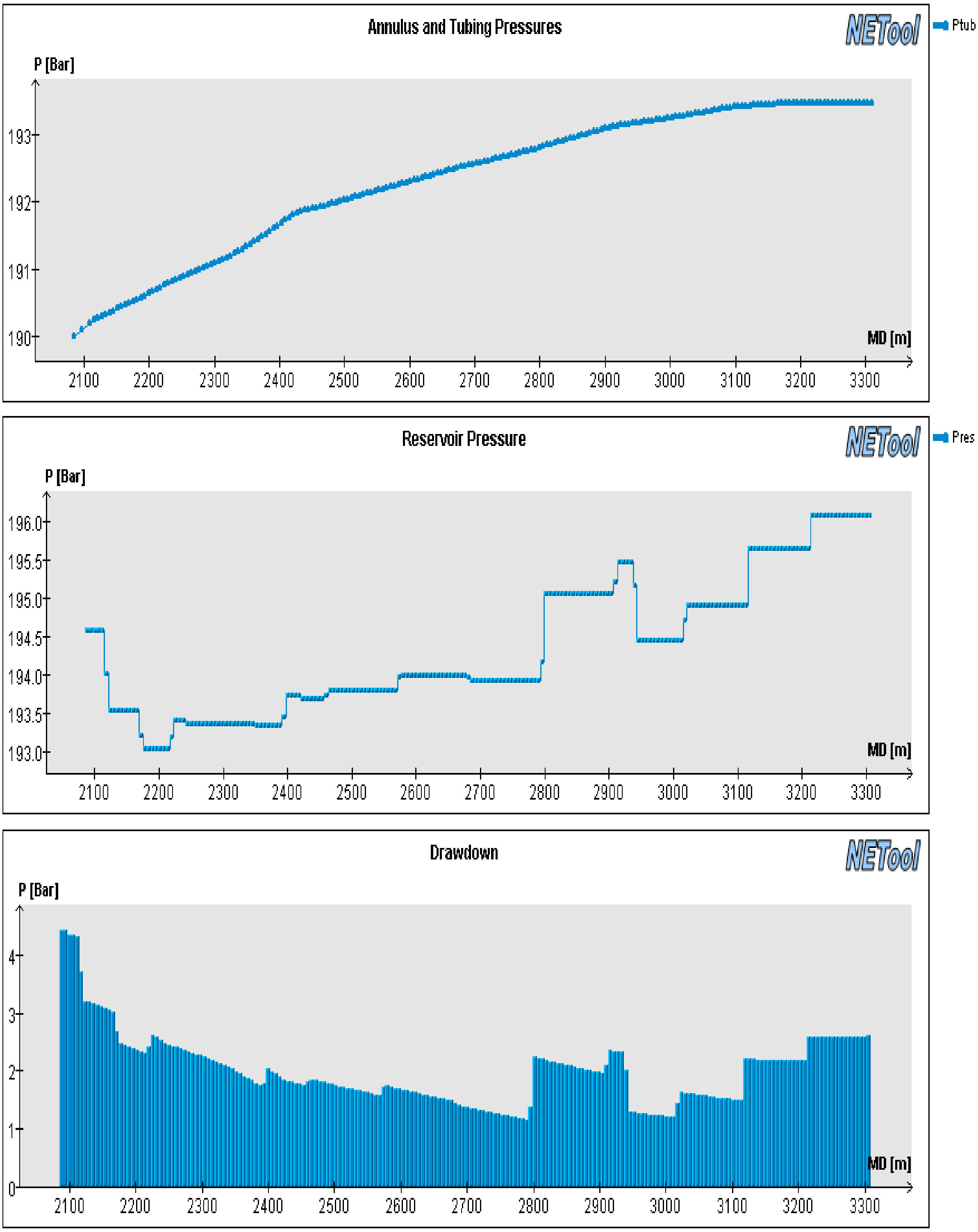
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



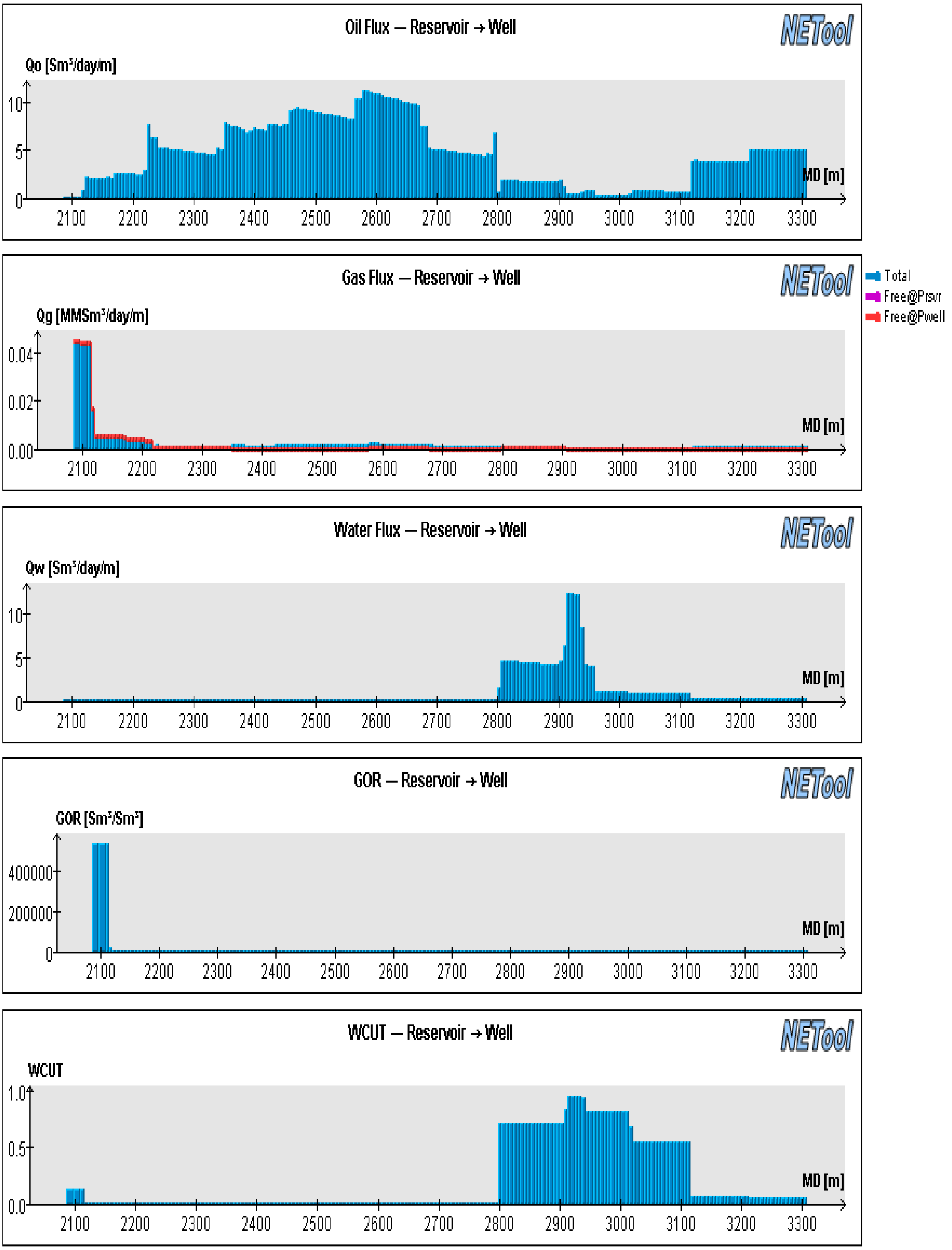
Skin factor plot for the well and given time step

A.17 Plots for well KP7, 1826 days, OH+50% in K_h

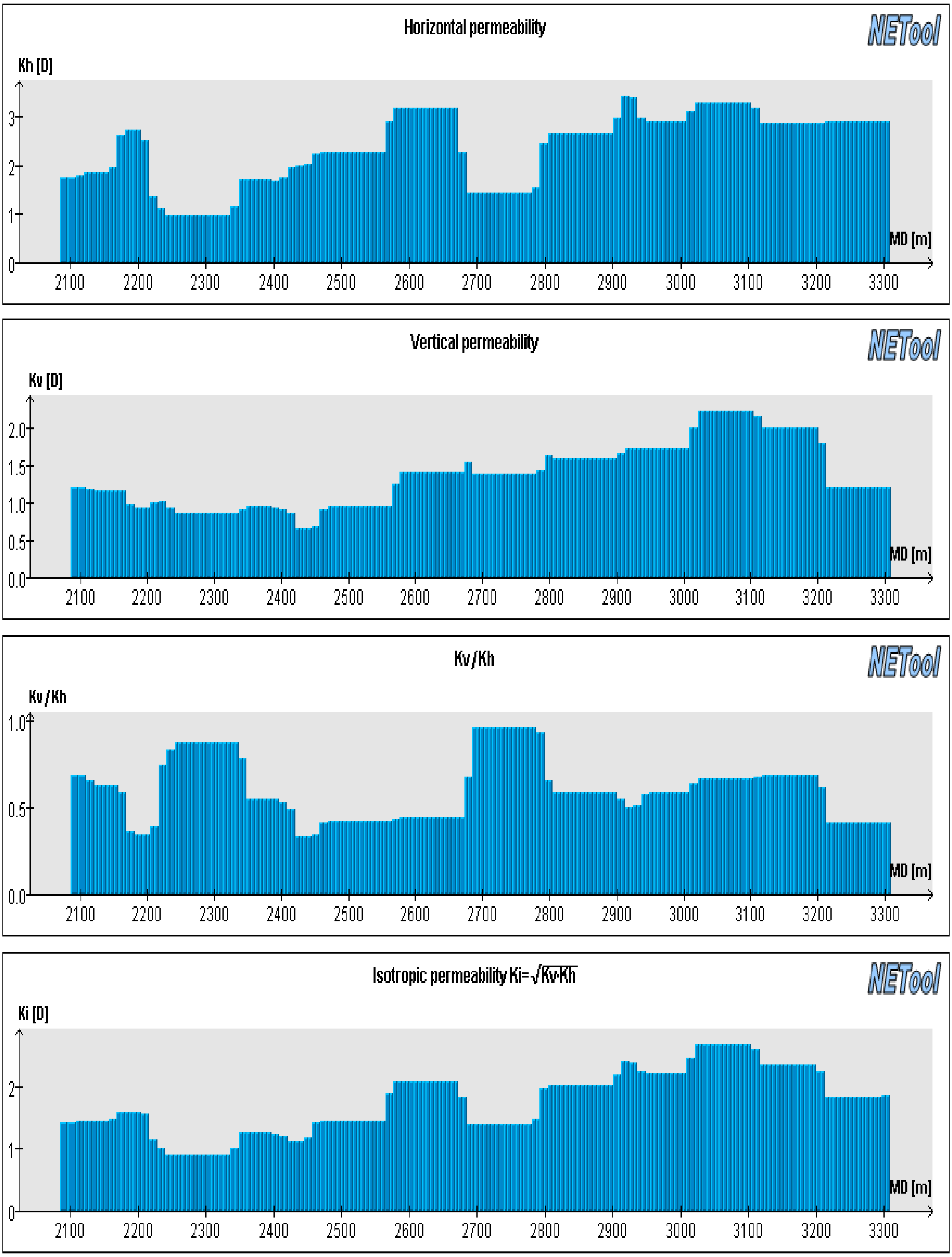
Reference case for 50% change in permeability. Completion set up can be found in Appendix A.3



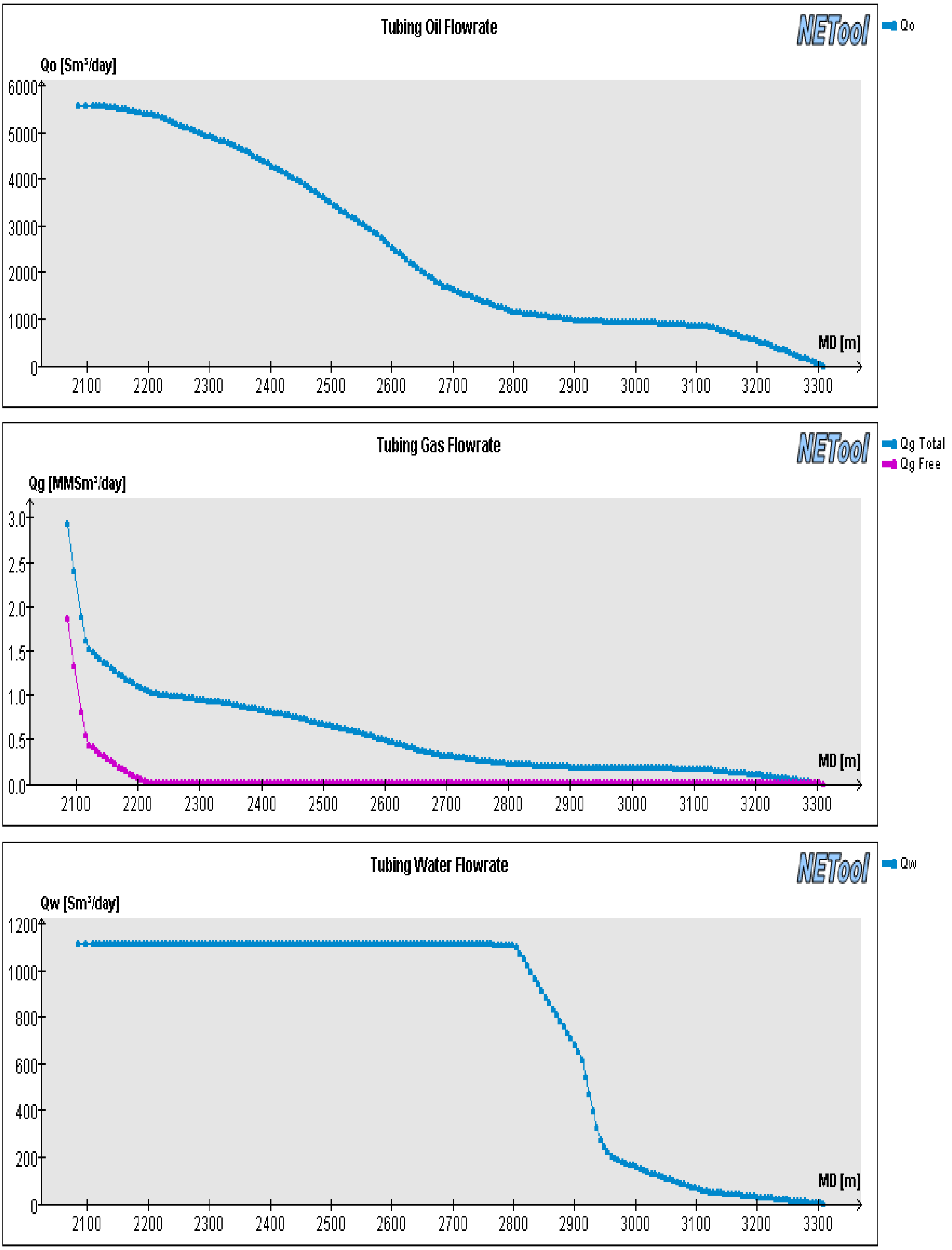
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



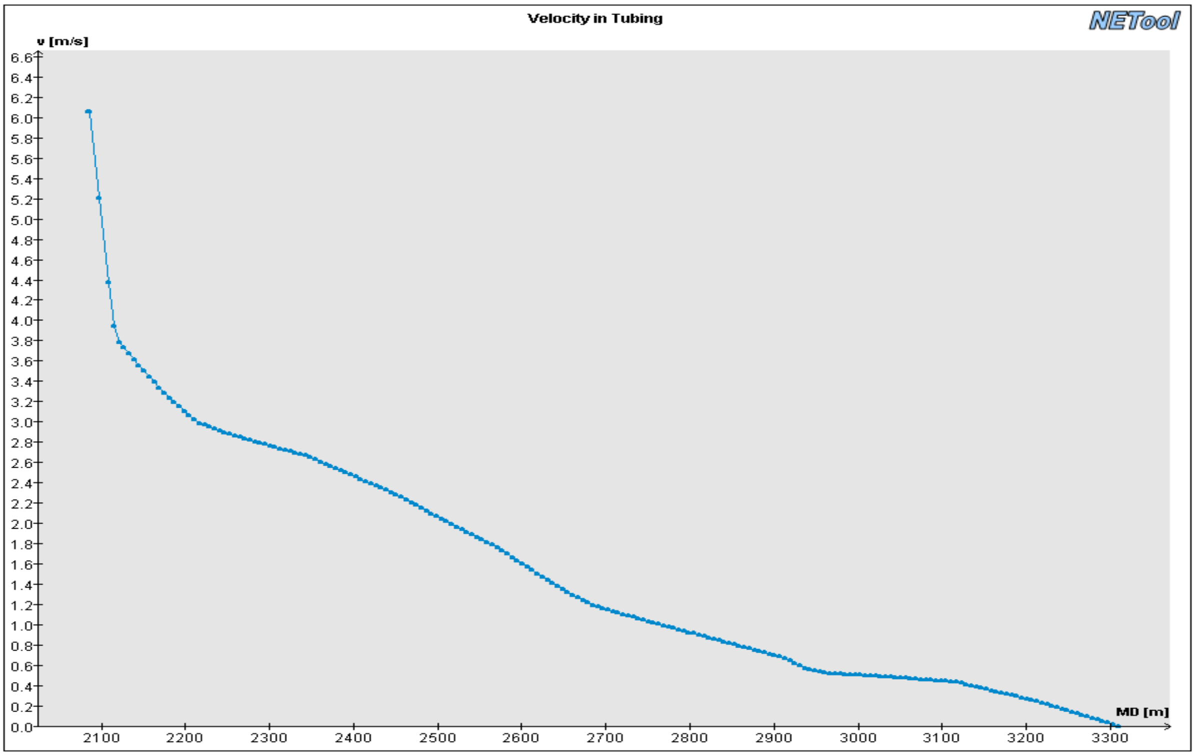
Influx of oil, gas and water from the reservoir and into the well along the wellbore



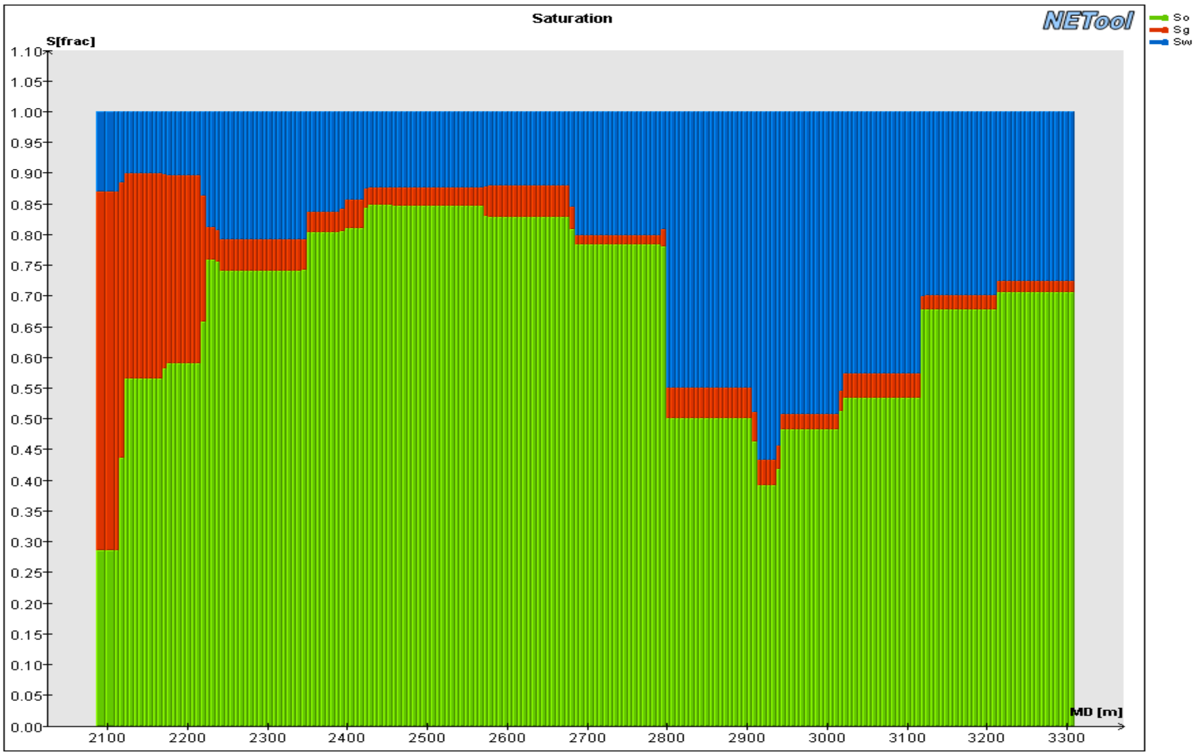
Permeability plot, horizontal, vertical and K_v/K_h



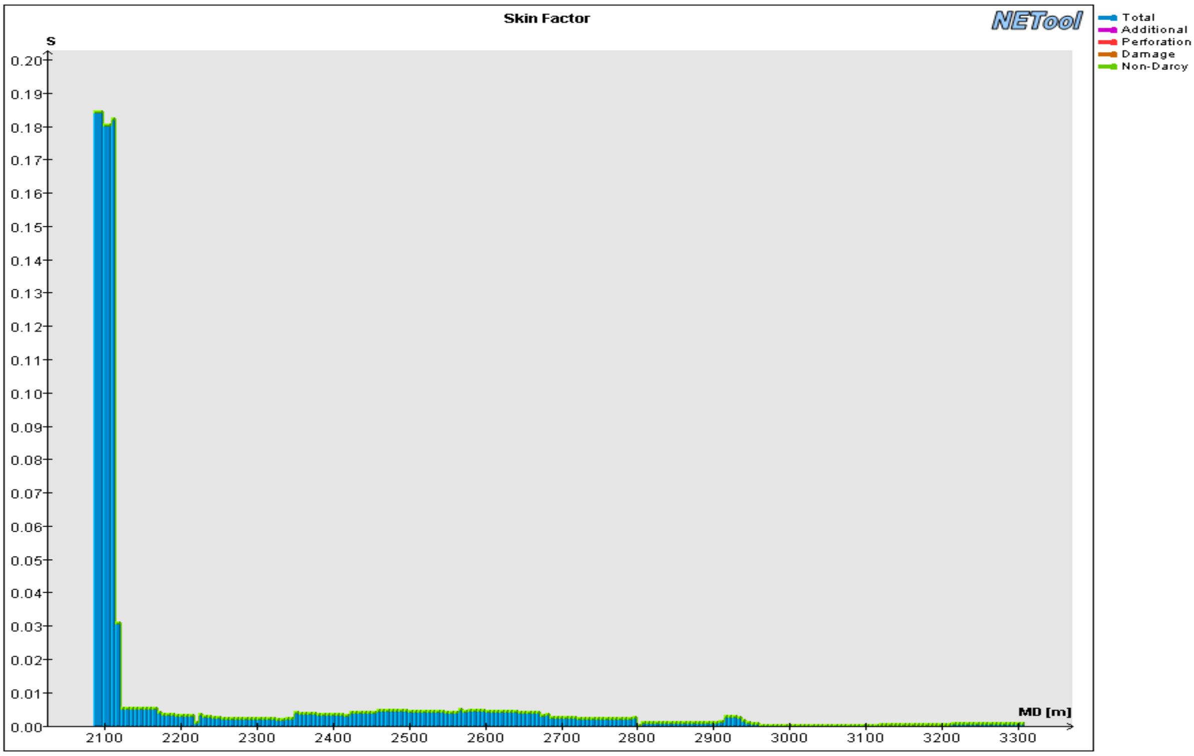
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing



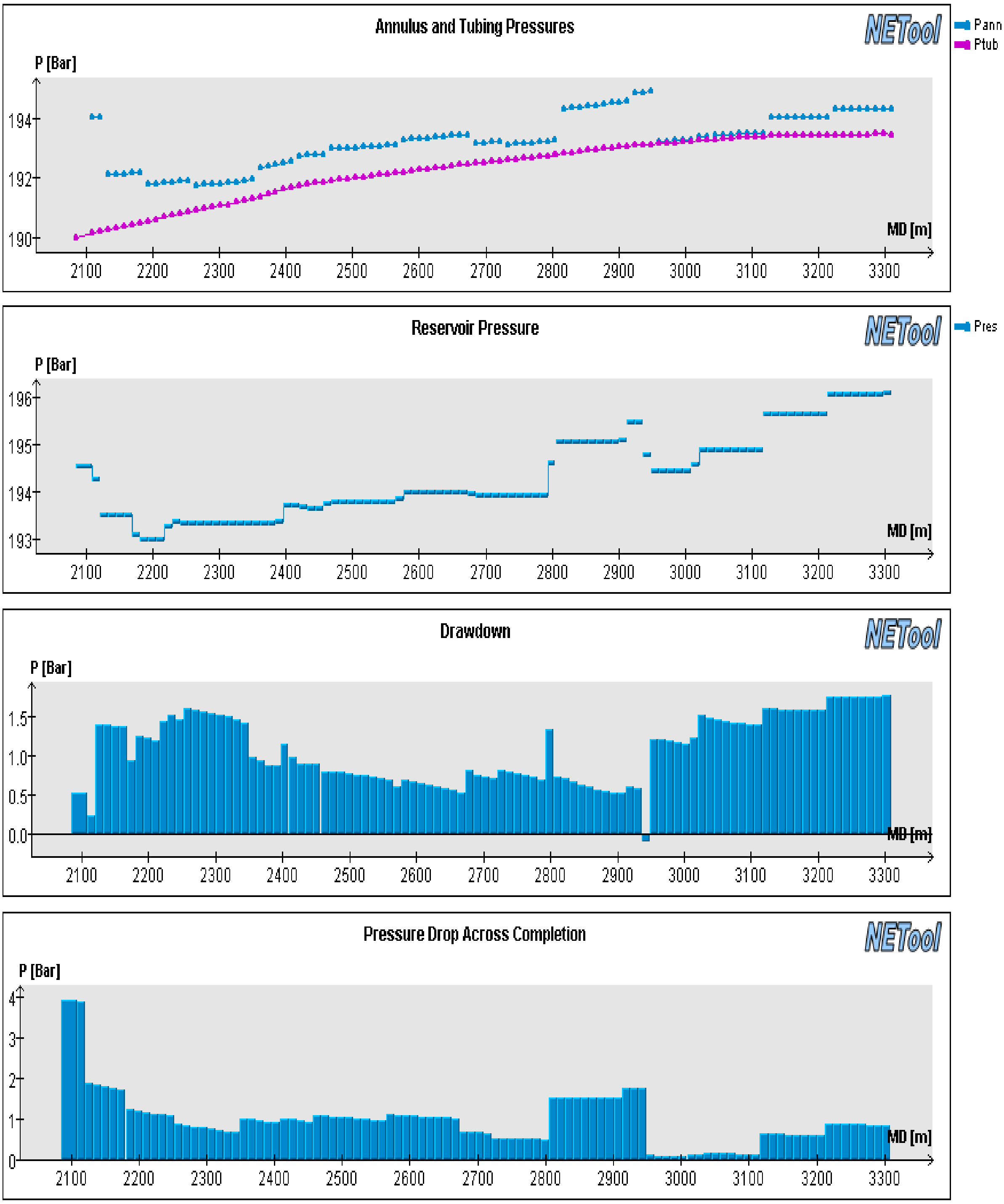
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



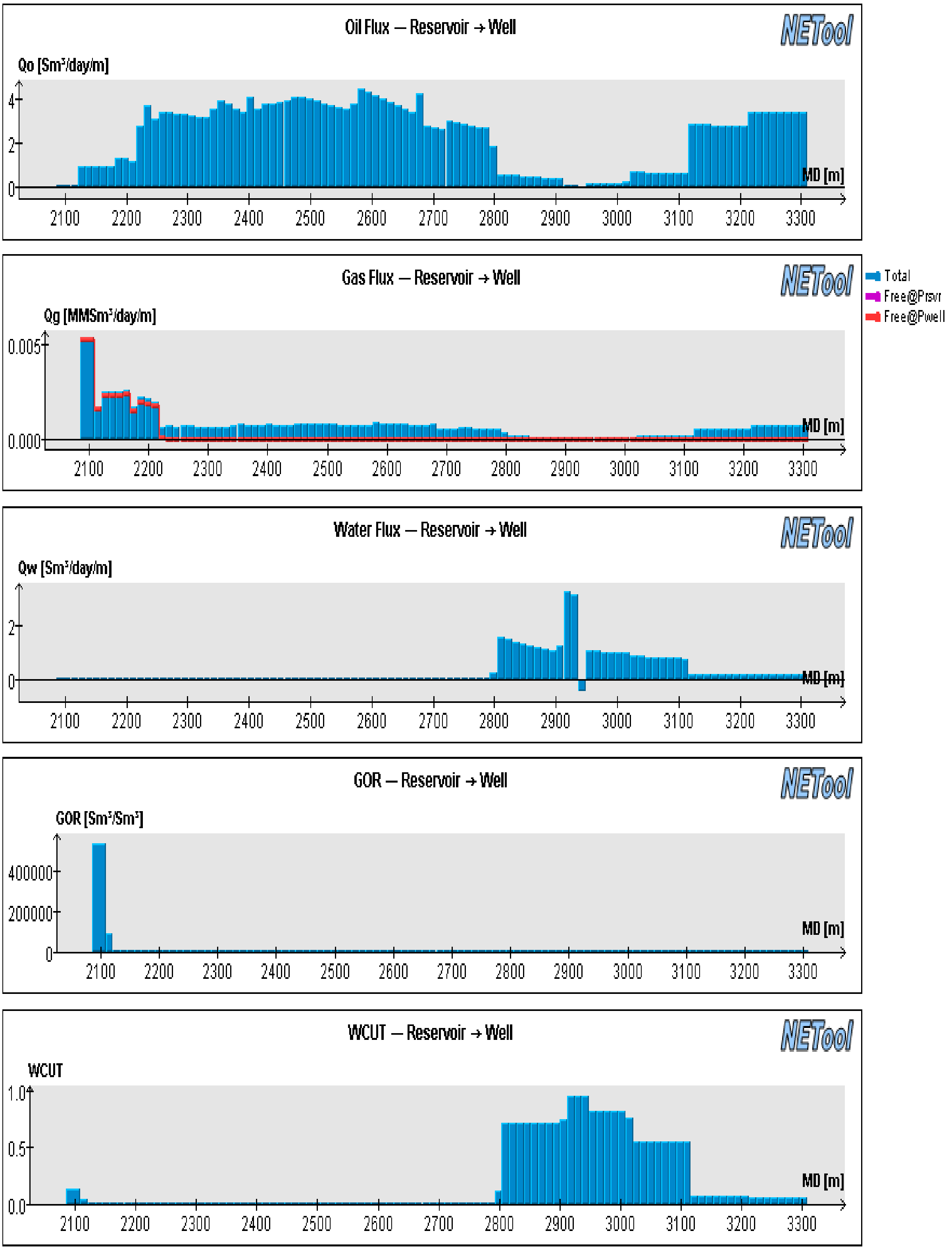
Skin factor plot for the well and given time step

A.18 Plots for well KP7, 1826 days, Recommended ICD+50% in K_h

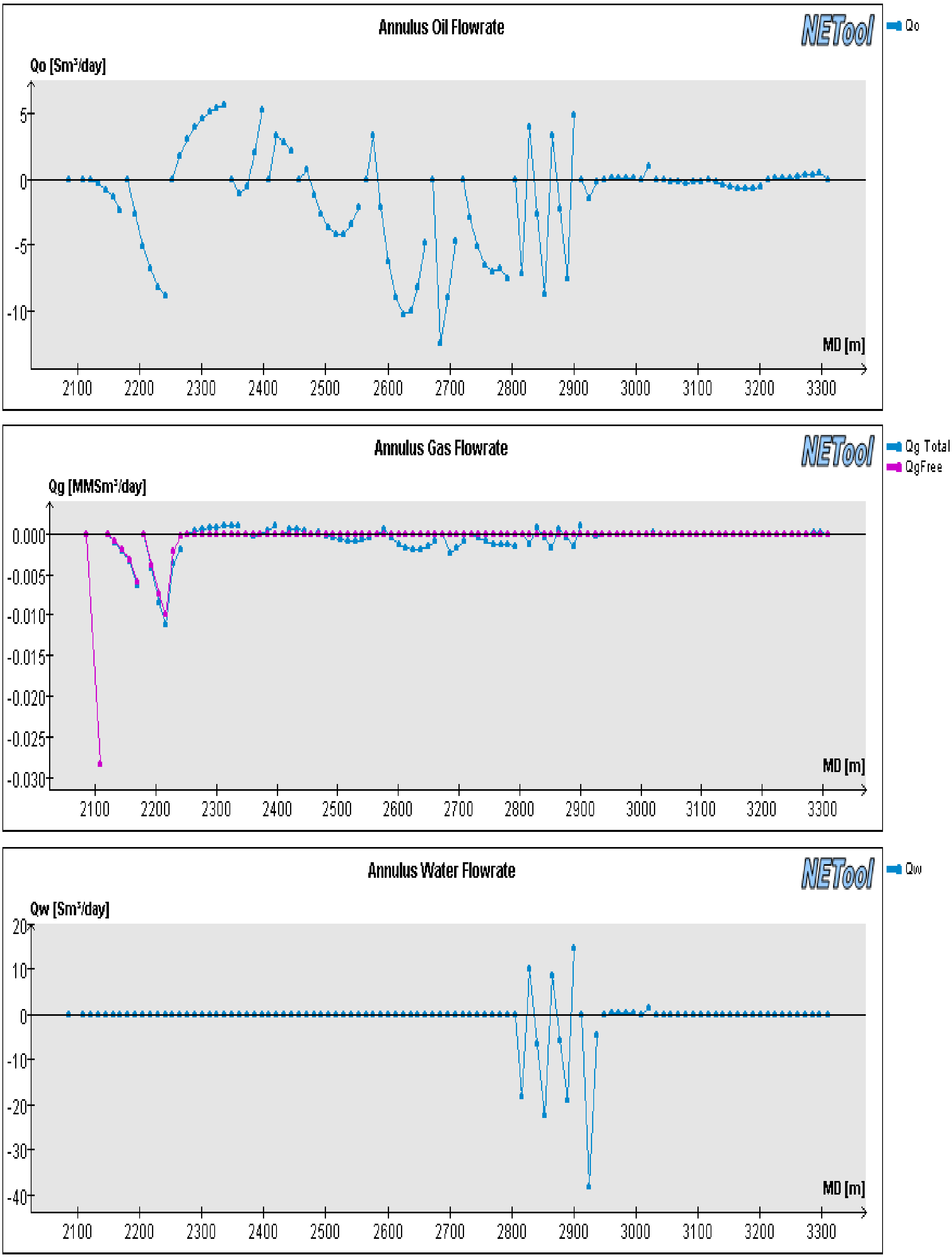
Recommended ICD set up run with 25% increae in K_h. Completion set up can be found in Appendix A.10 Permeability profile the same as in A.16



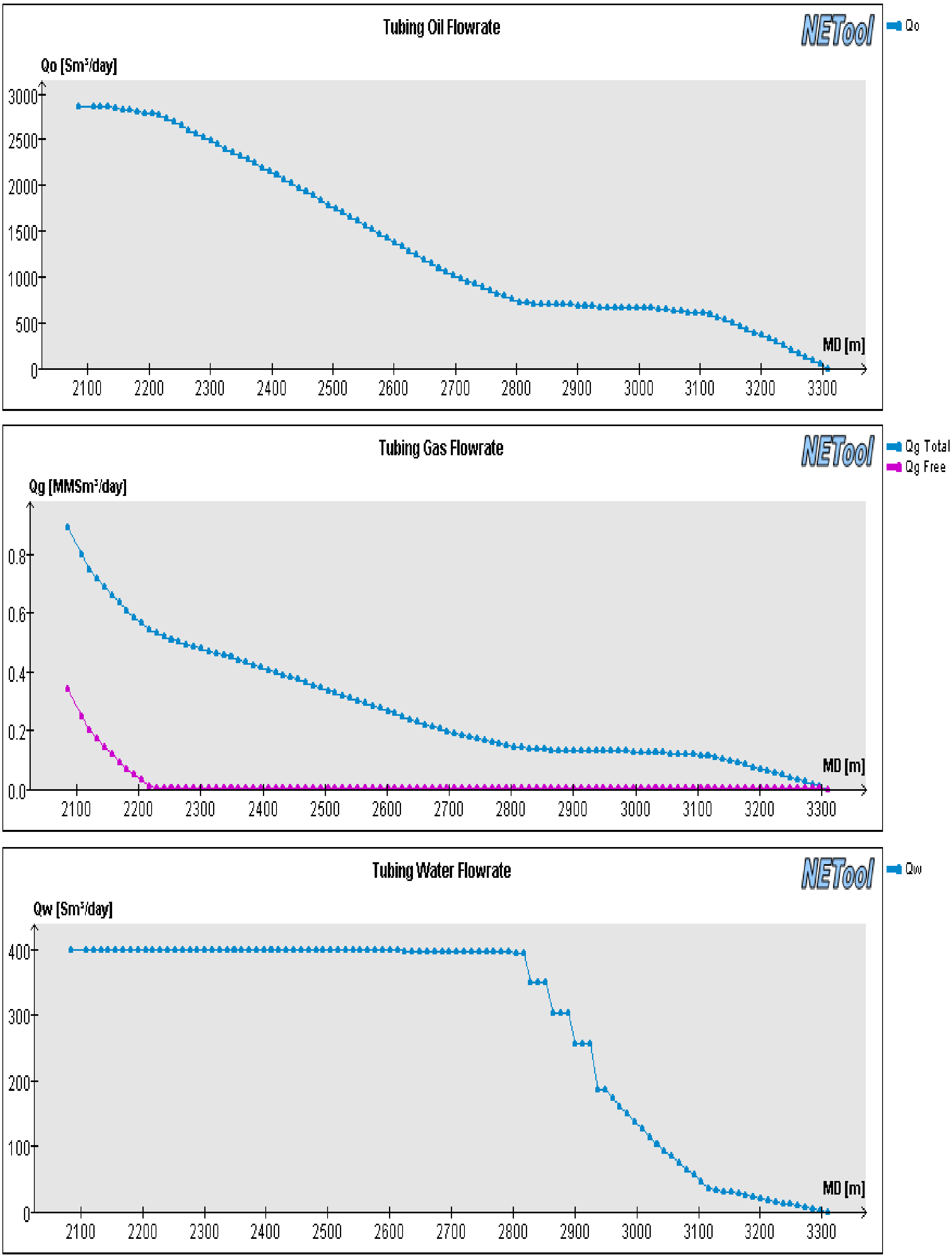
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



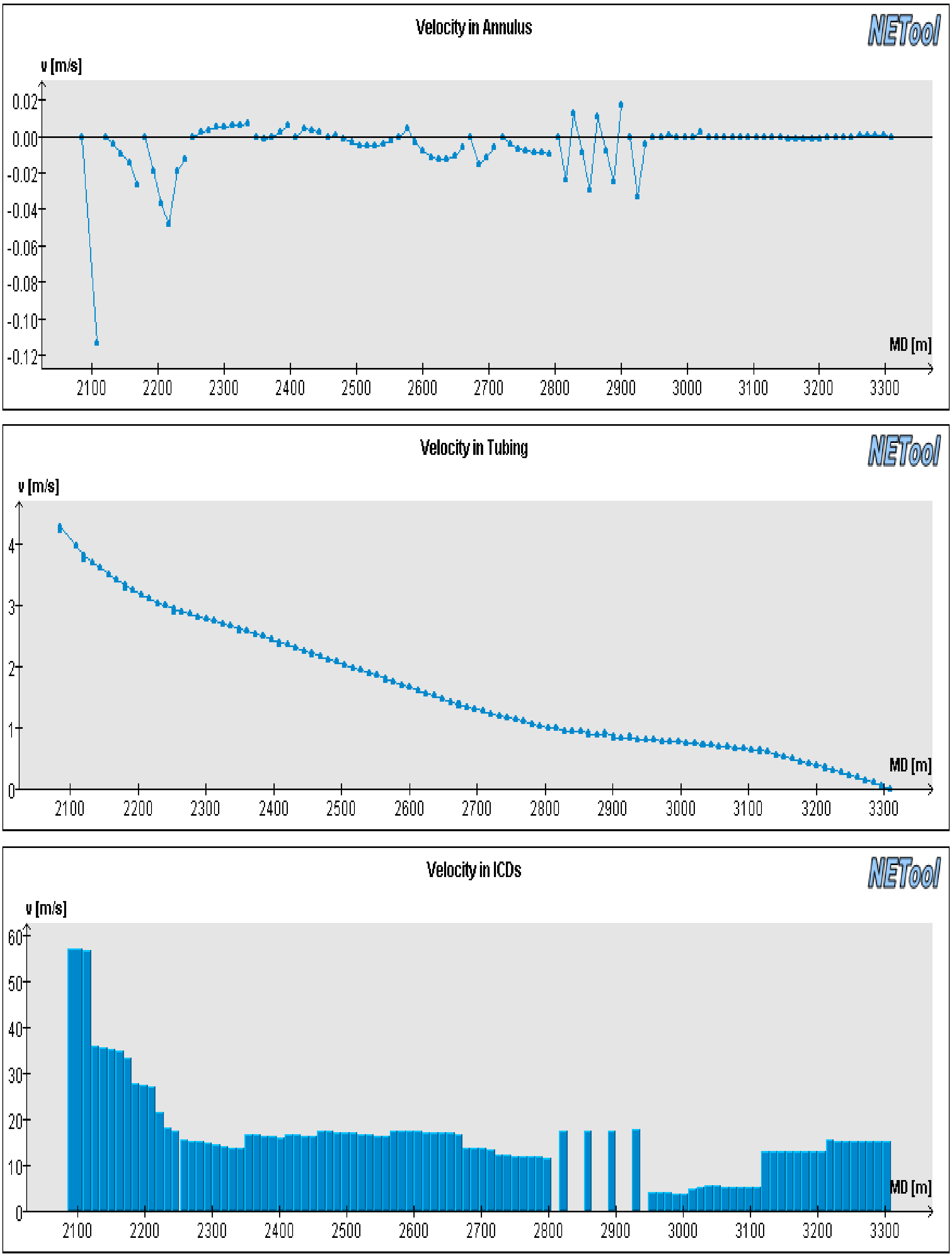
Influx of oil, gas and water from the reservoir and into the well along the wellbore



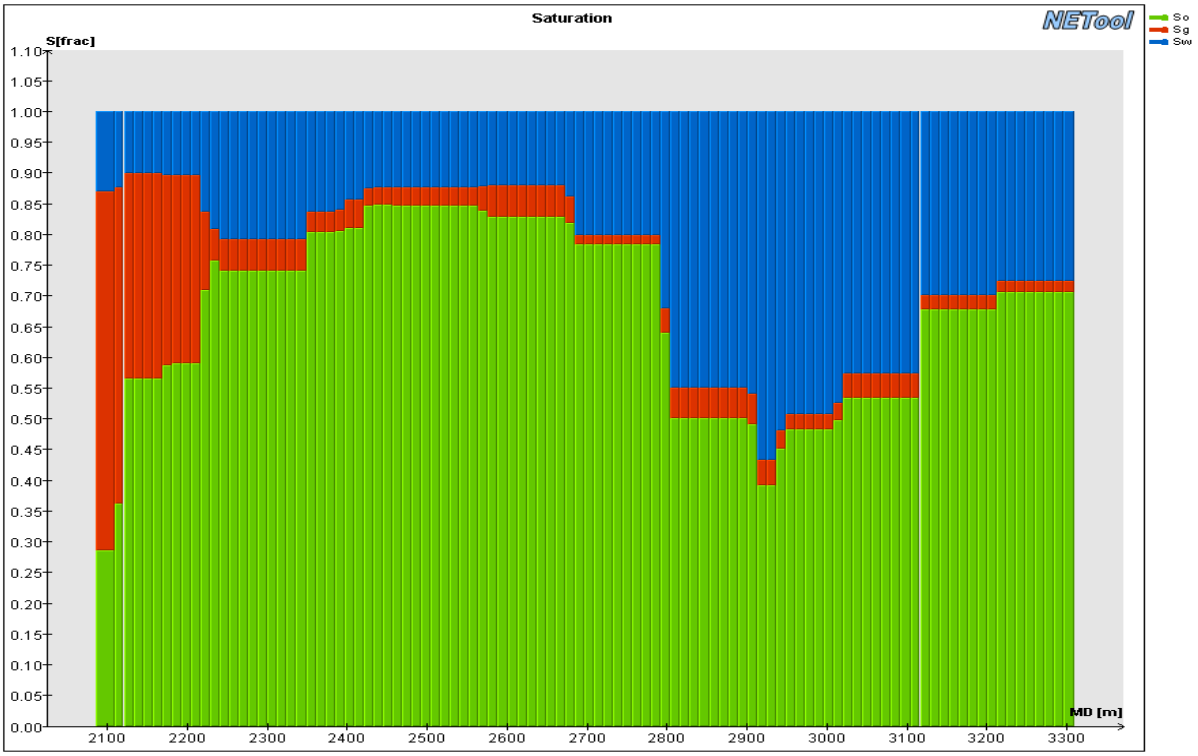
Annulus oil, gas and water flow rate along the wellbore



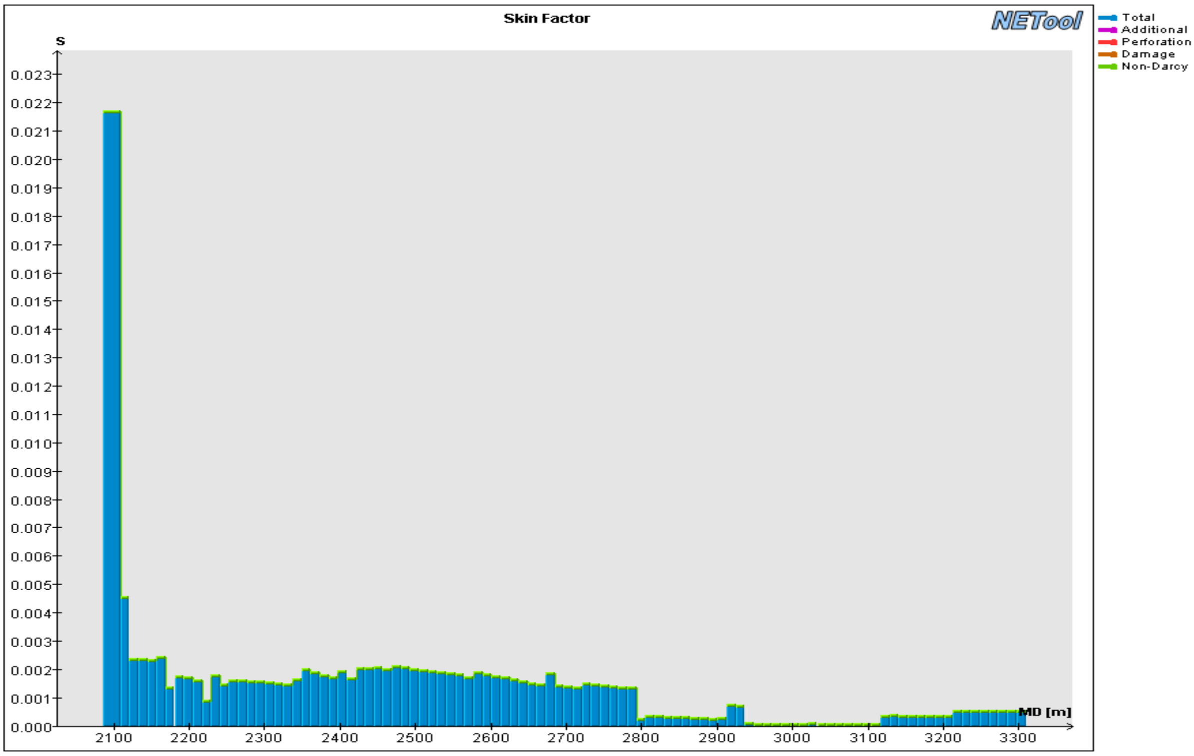
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



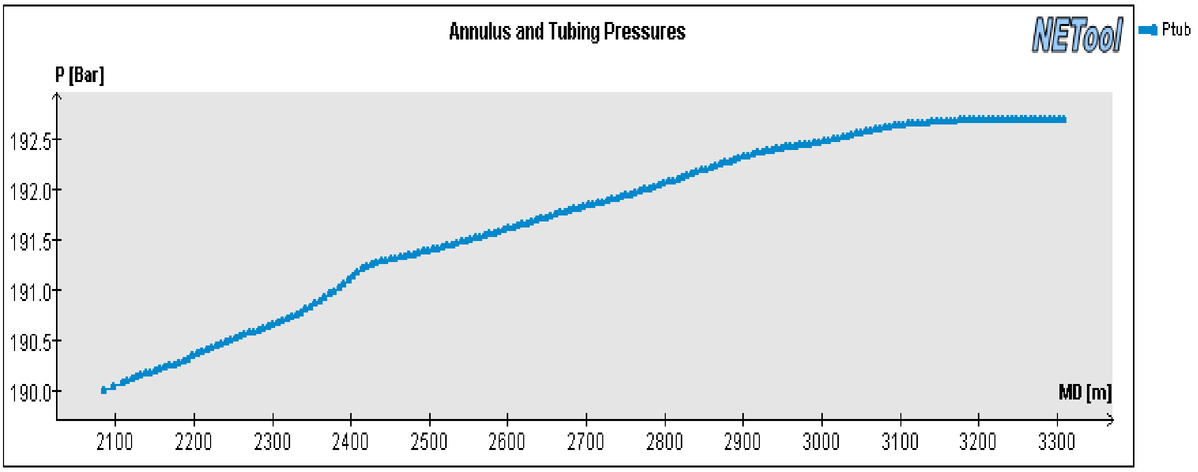
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

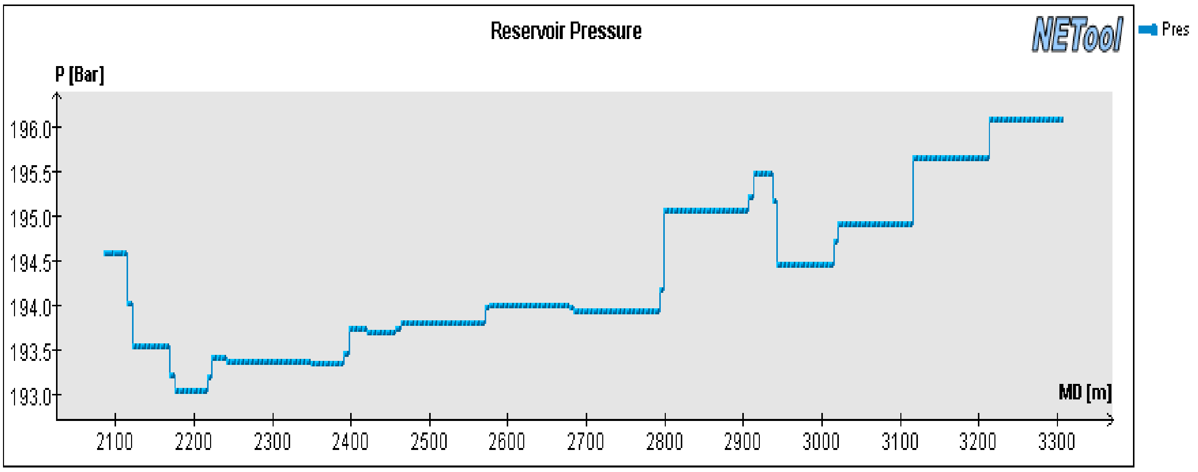


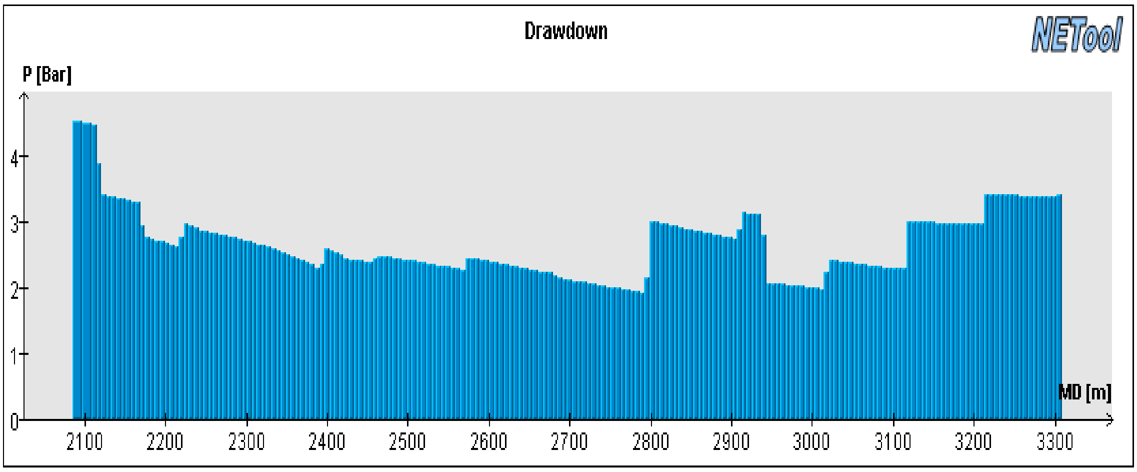
Skin factor plot for the well and given time step

A.19 Plots for well KP7, 1826 days, OH-25% in K_h

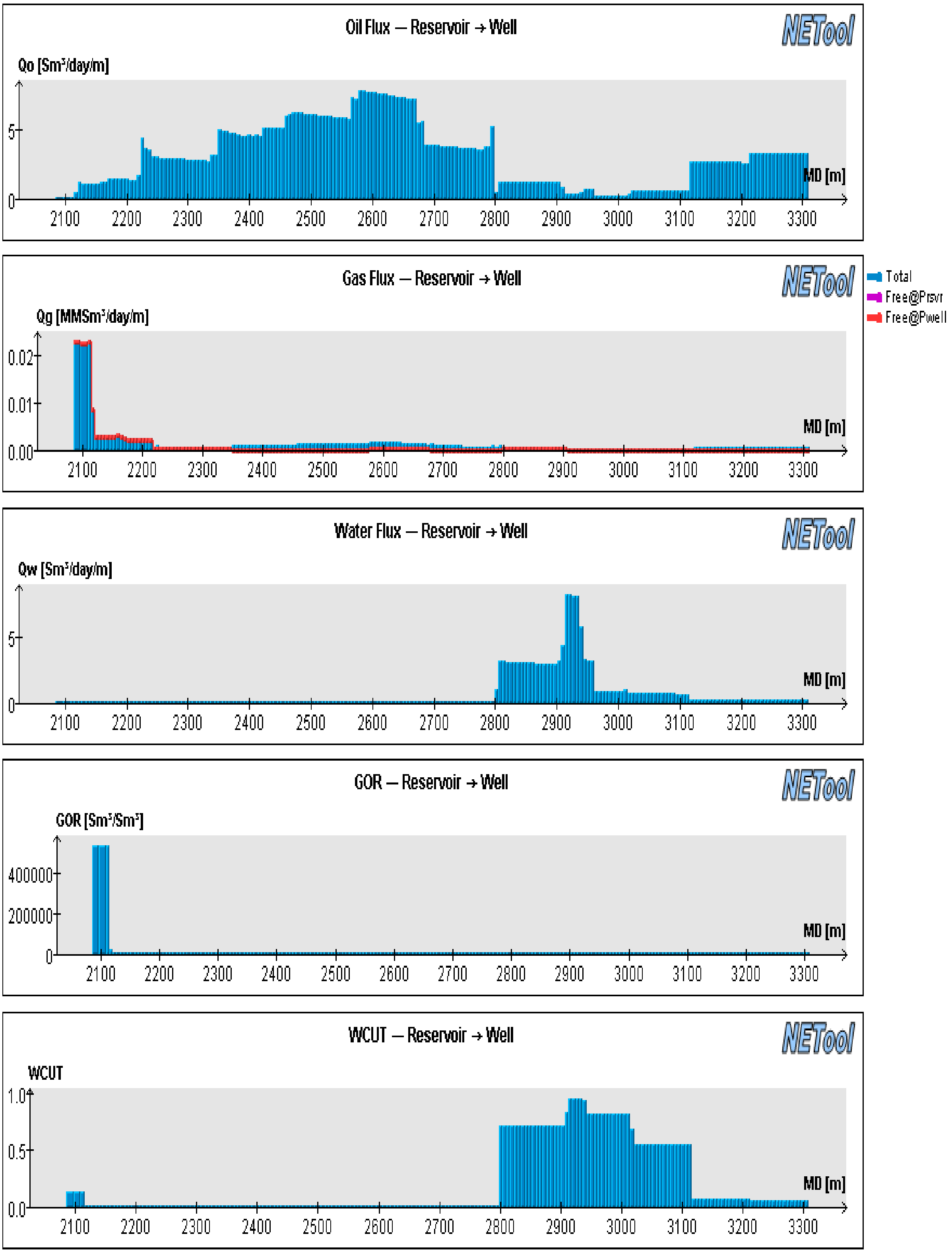
Reference case for -25% change in permeability. Completion set up can be found in Appendix A.3



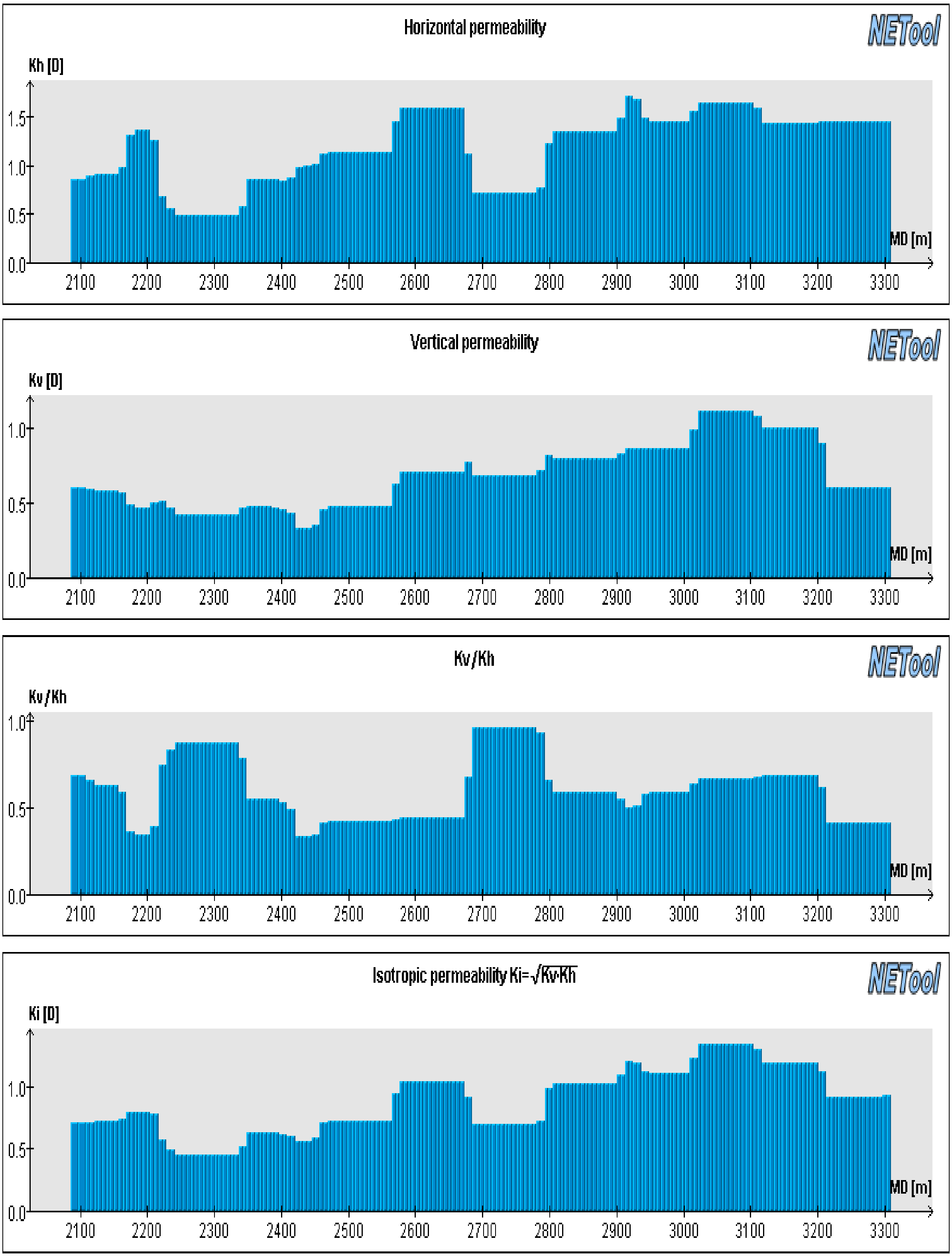




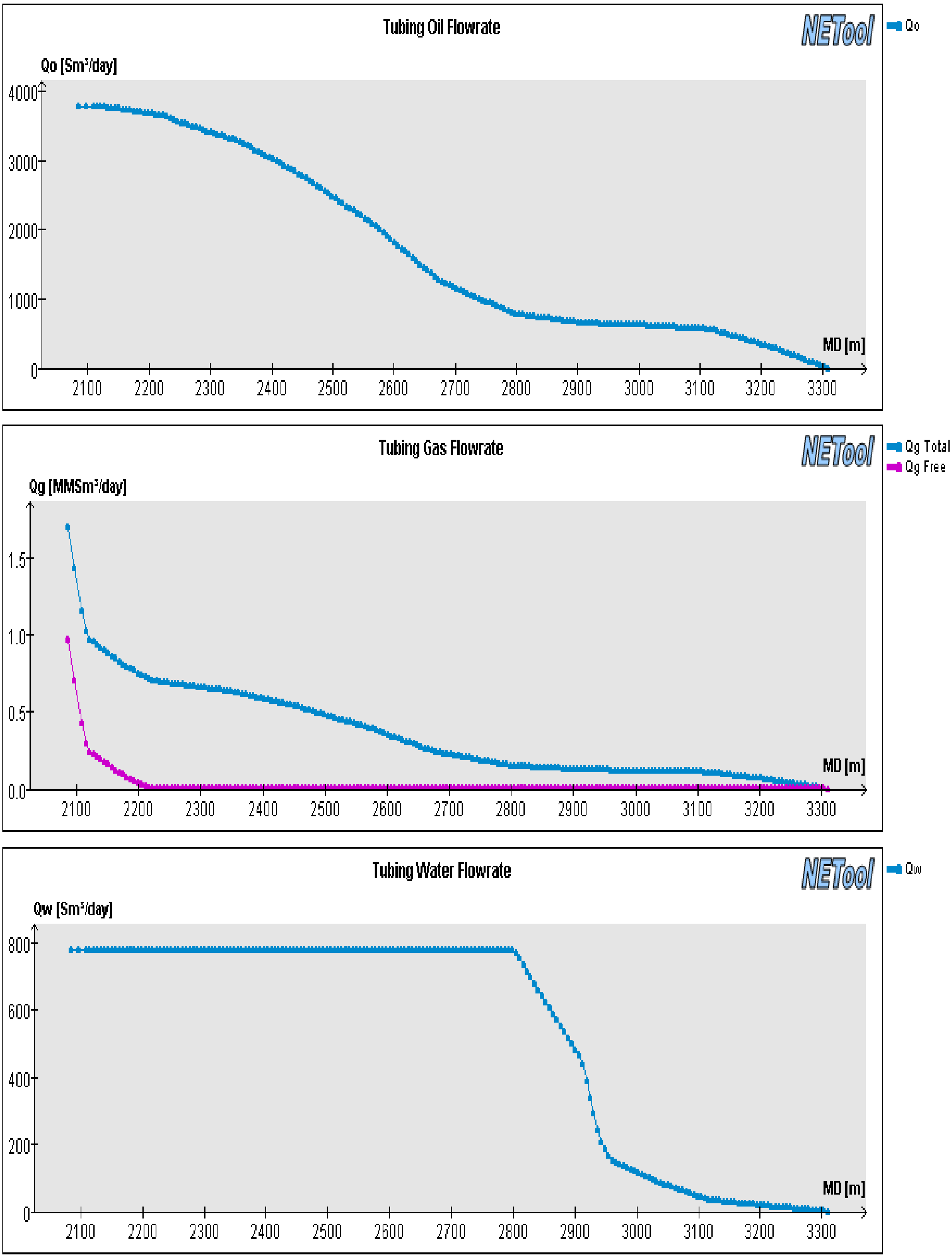
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



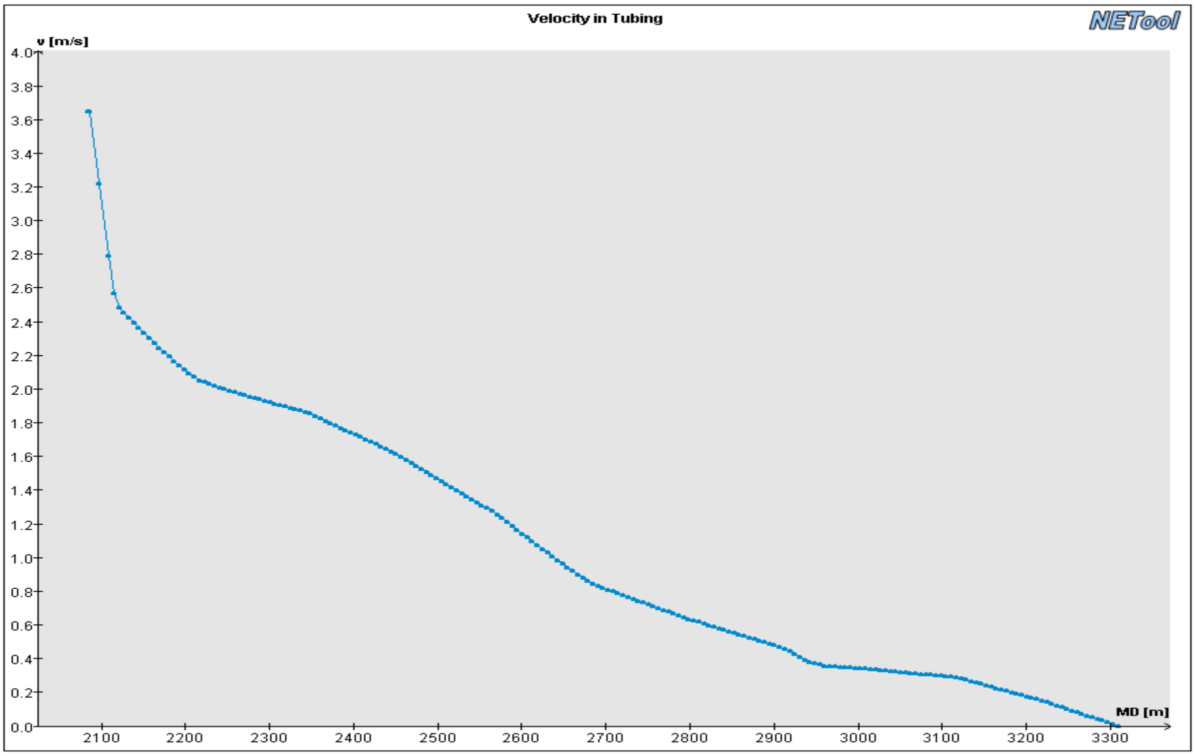
Influx of oil, gas and water from the reservoir and into the well along the wellbore



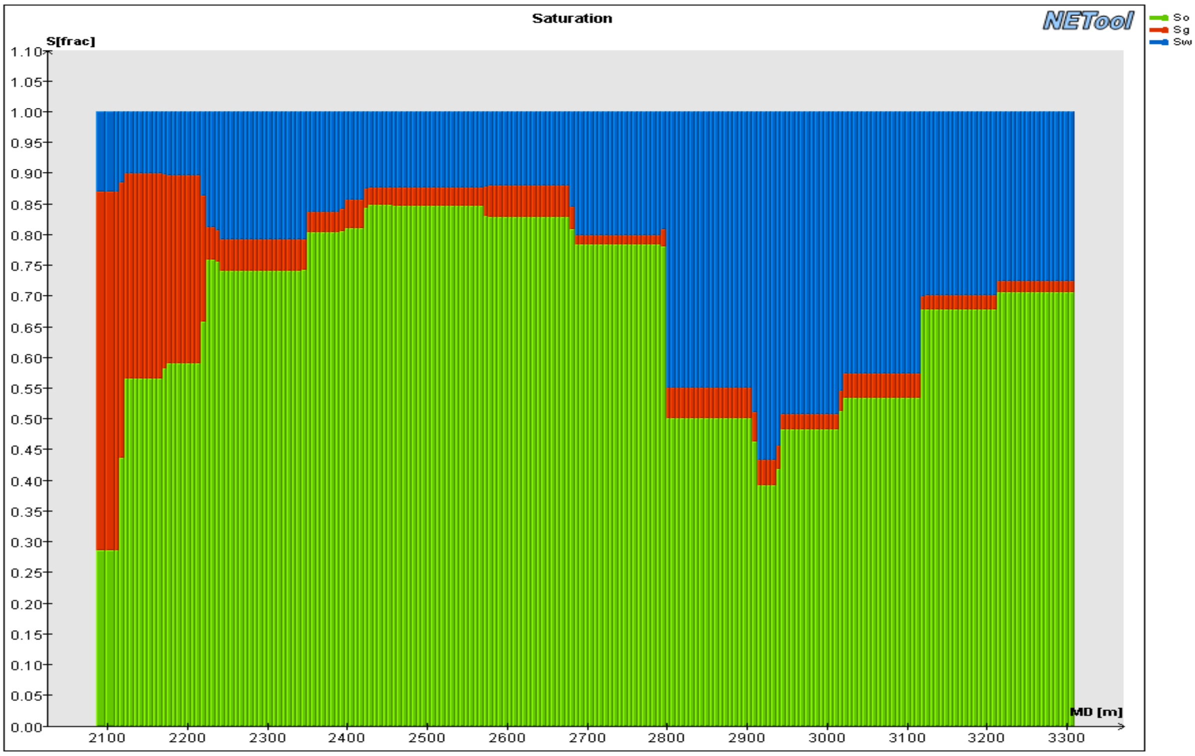
Permeability plot, horizontal, vertical and K_v/K_h



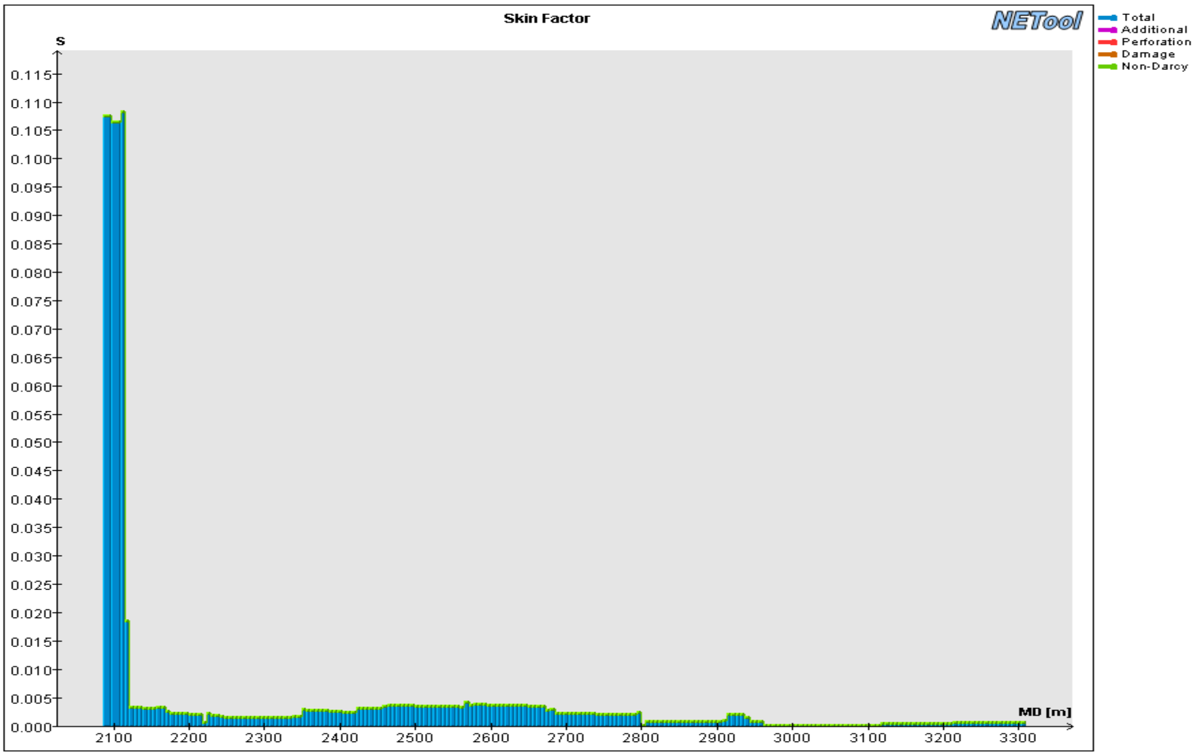
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing



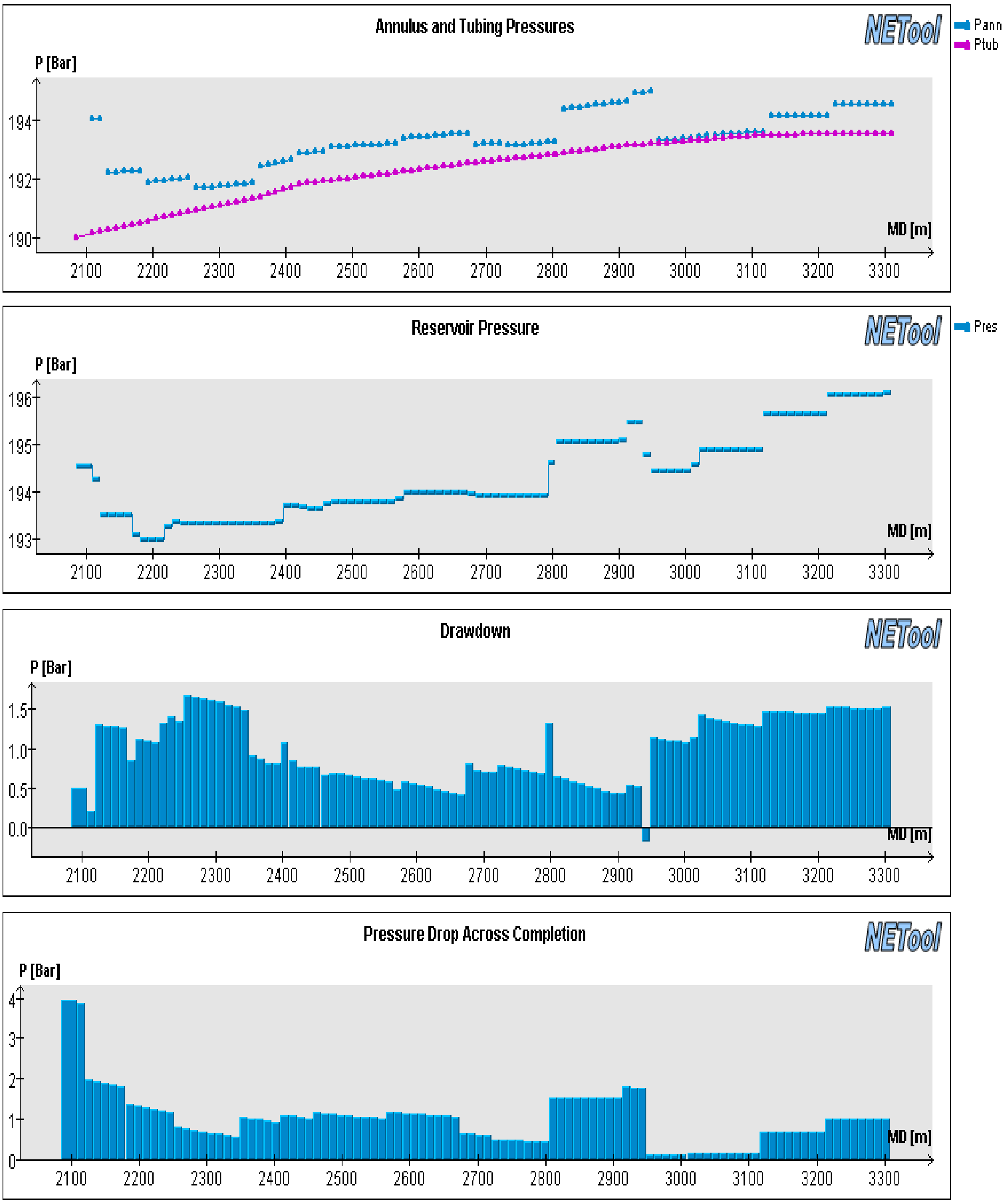
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



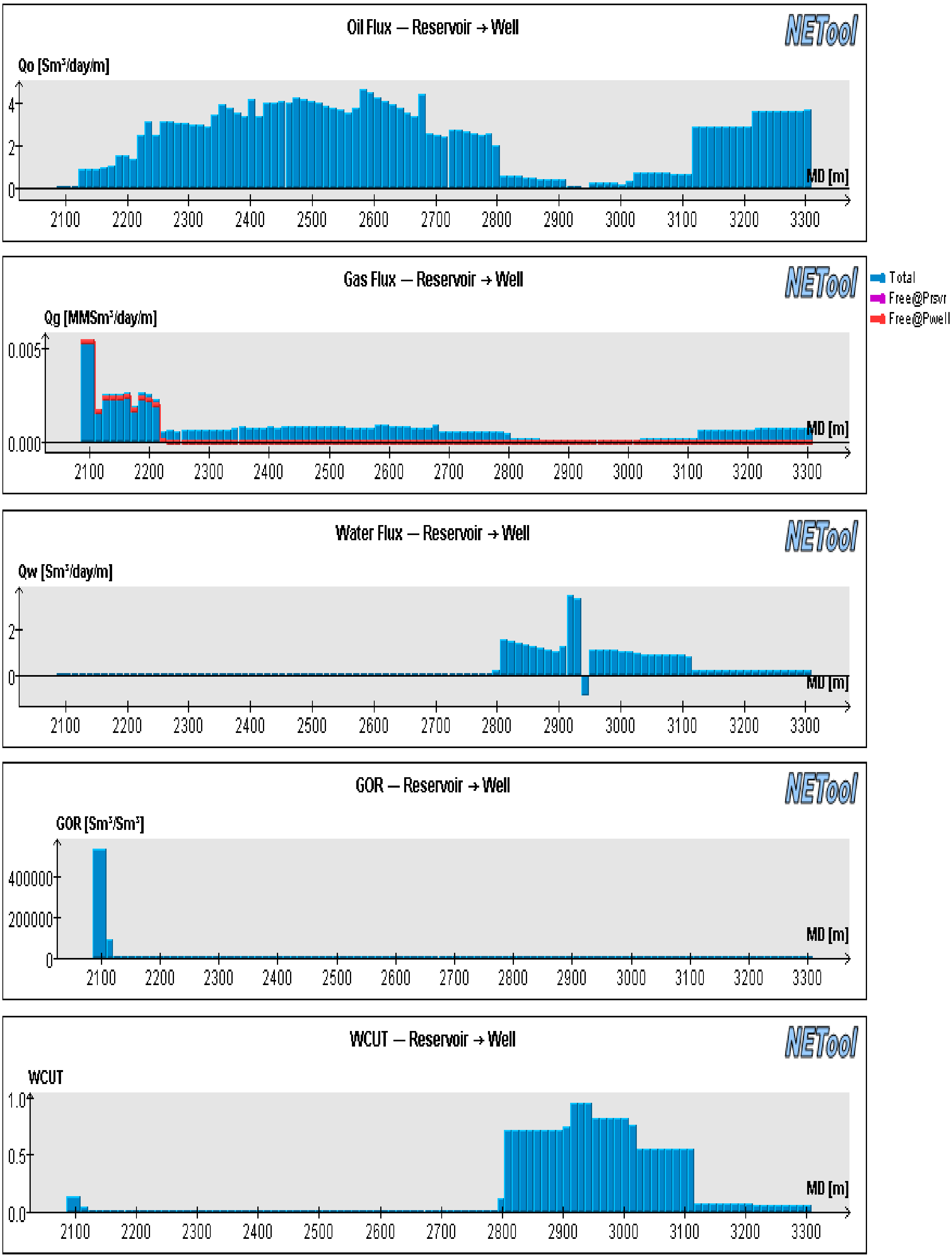
Skin factor plot for the well and given time step

A.20 Plots for well KP7, 1826 days, Recommended ICD-25% in K_h

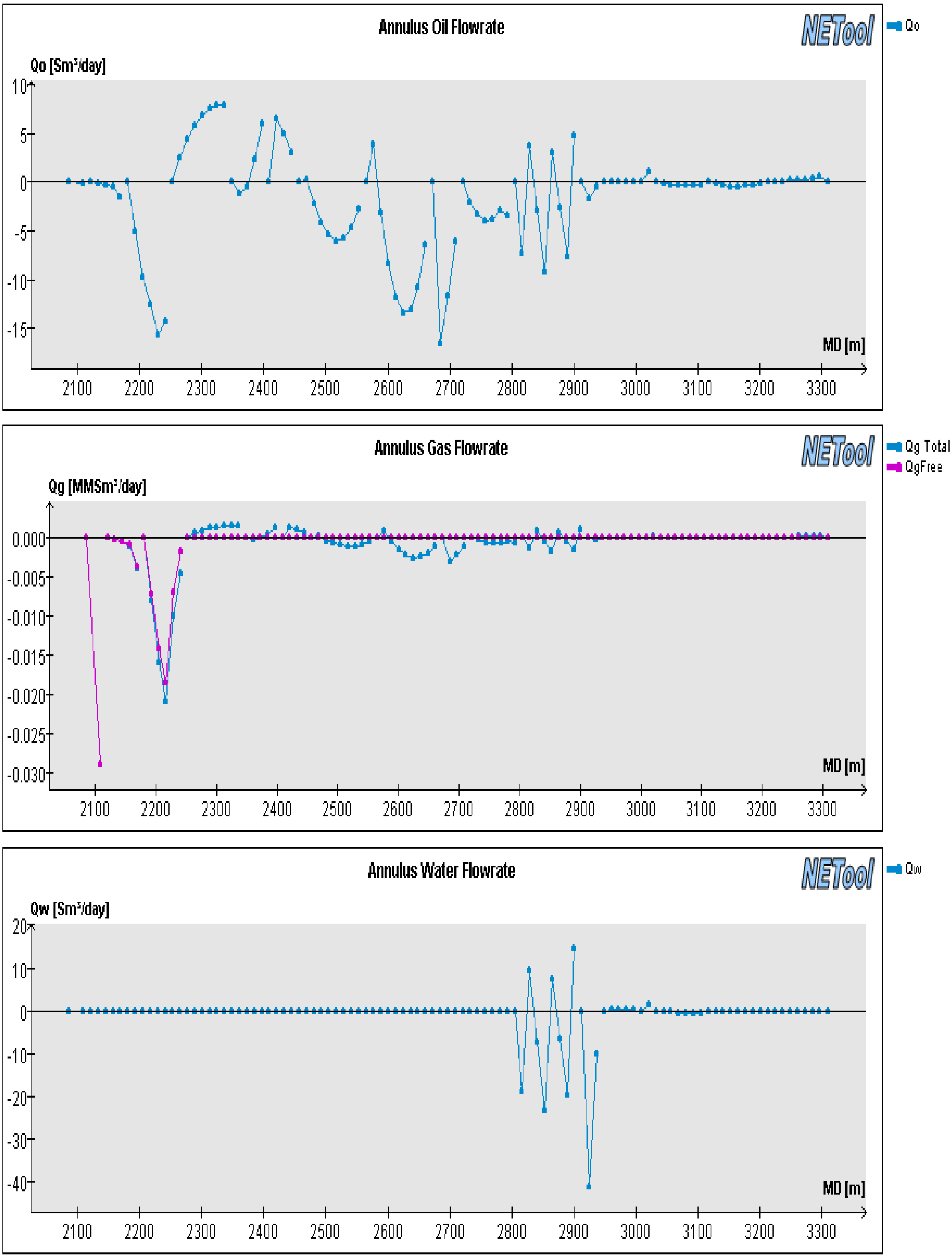
Recommended ICD set up run with 25% decreae in K_h. Completion set up can be found in Appendix A.10 Permeability profile the same as in A.16



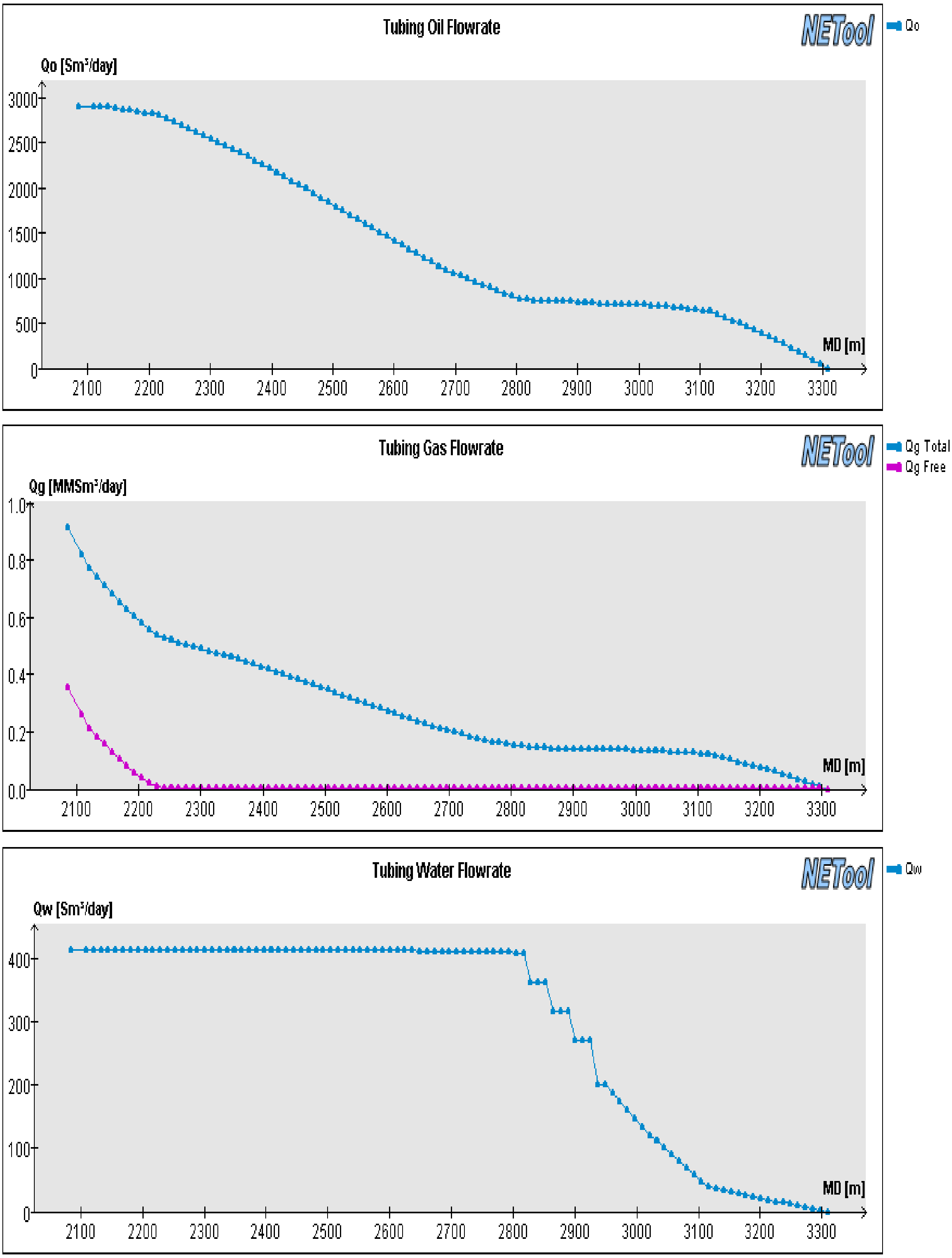
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



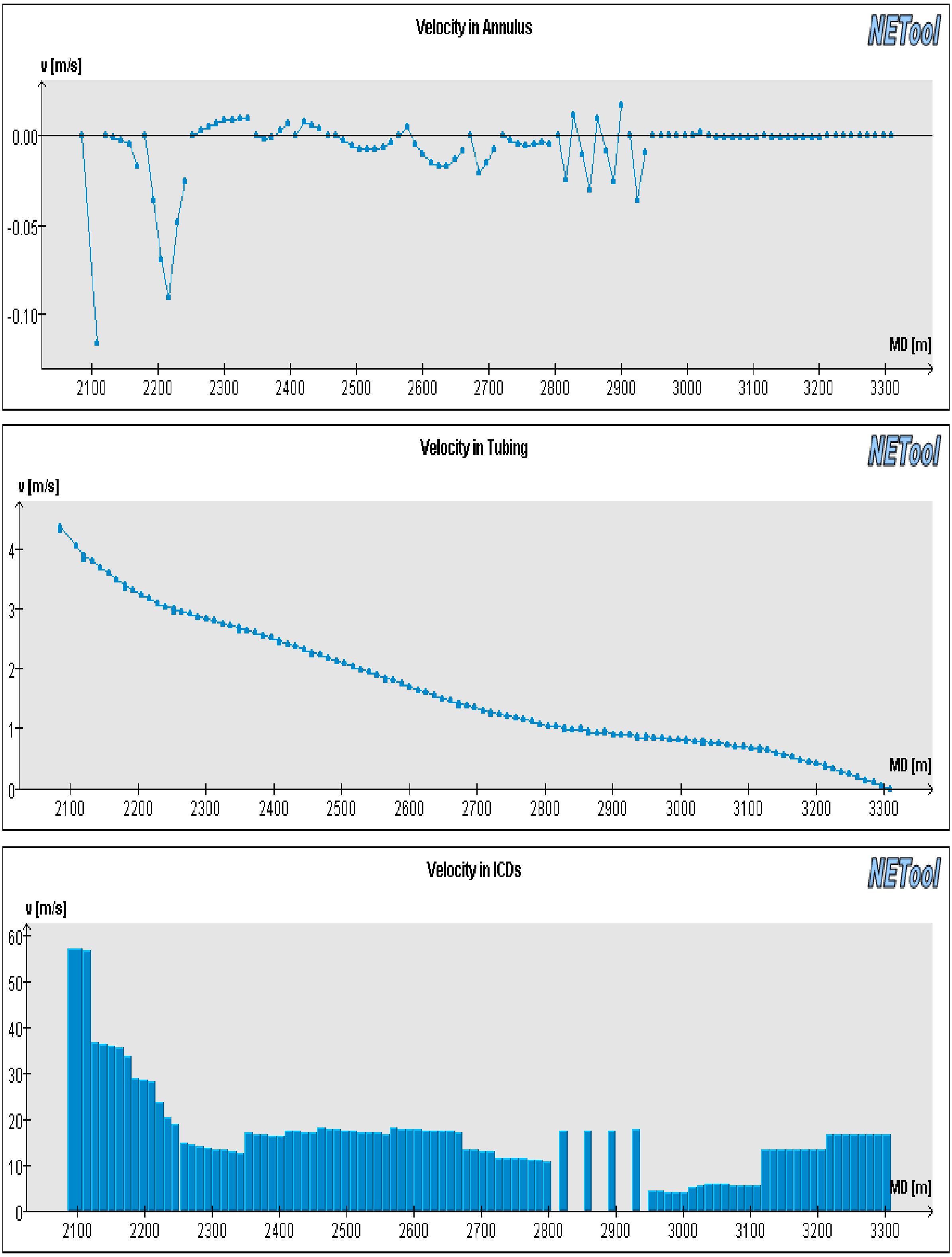
Influx of oil, gas and water from the reservoir and into the well along the wellbore



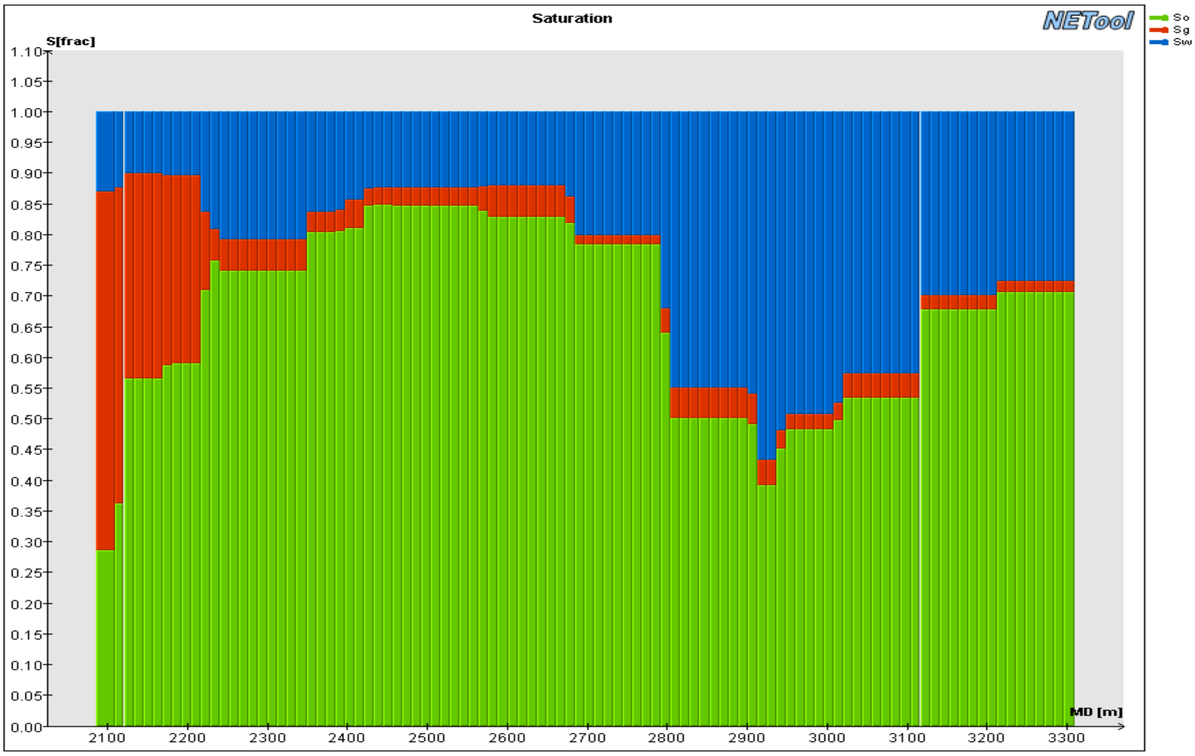
Annulus oil, gas and water flow rate along the wellbore



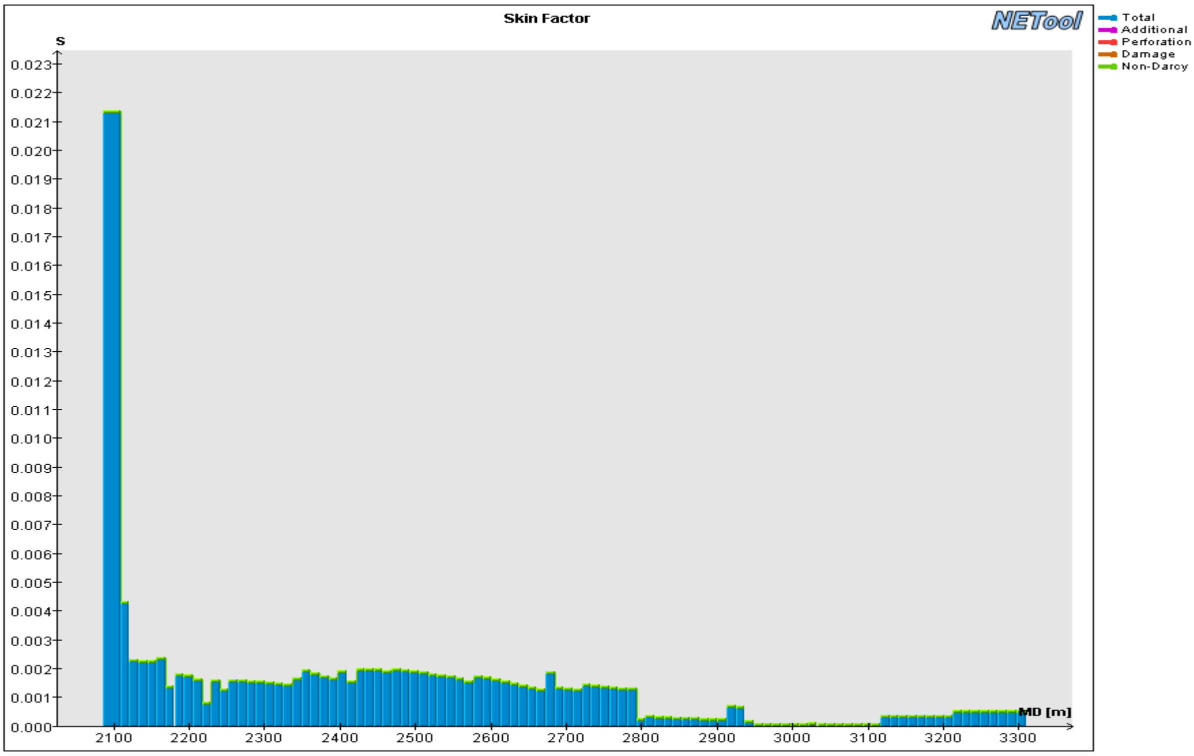
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.21 Plots for well KP7, 1826 days, Recommended ICD 250m shorter wellbore.

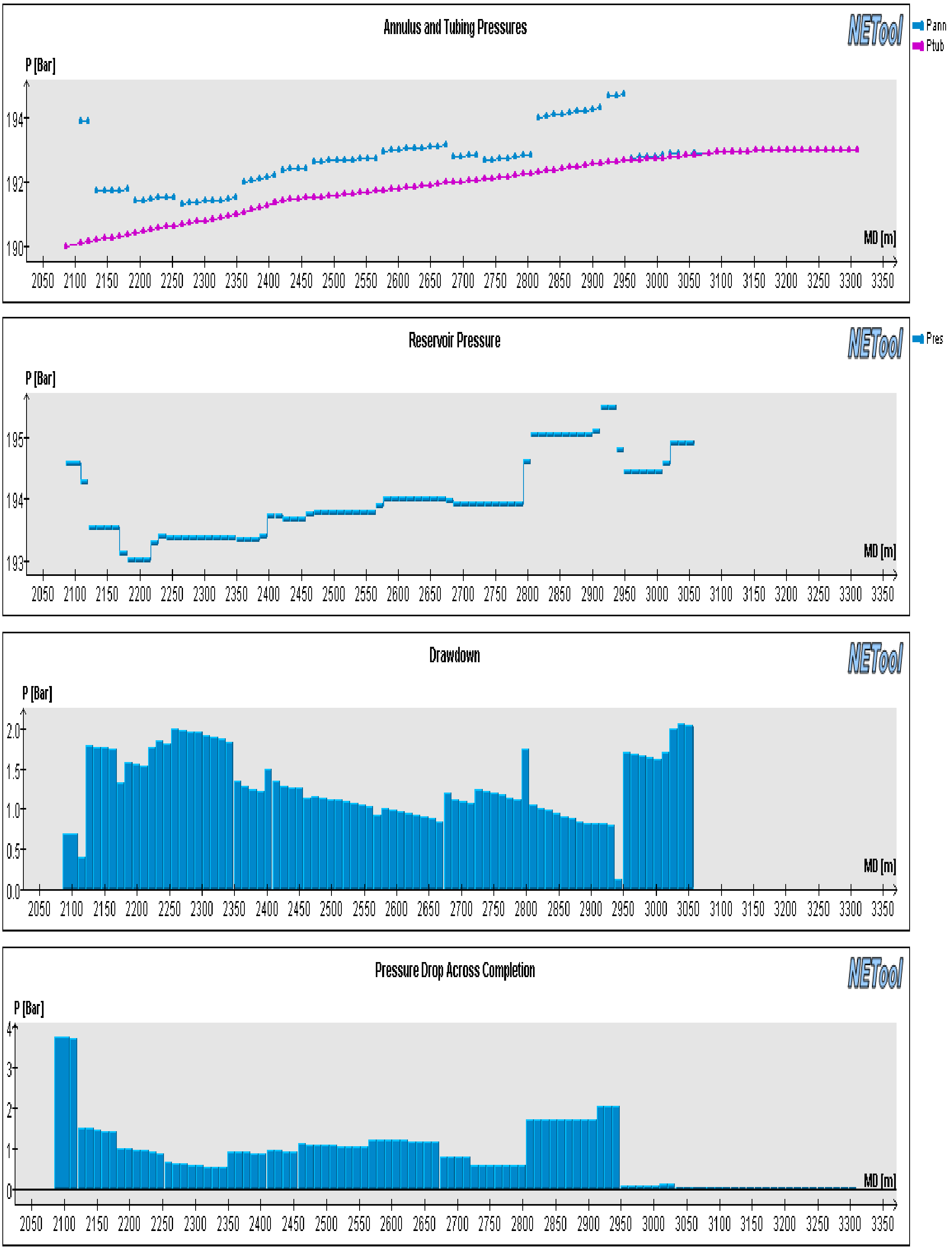
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	5 ½””
Completion ID	4,77”
Nozzle coefficient	0,953

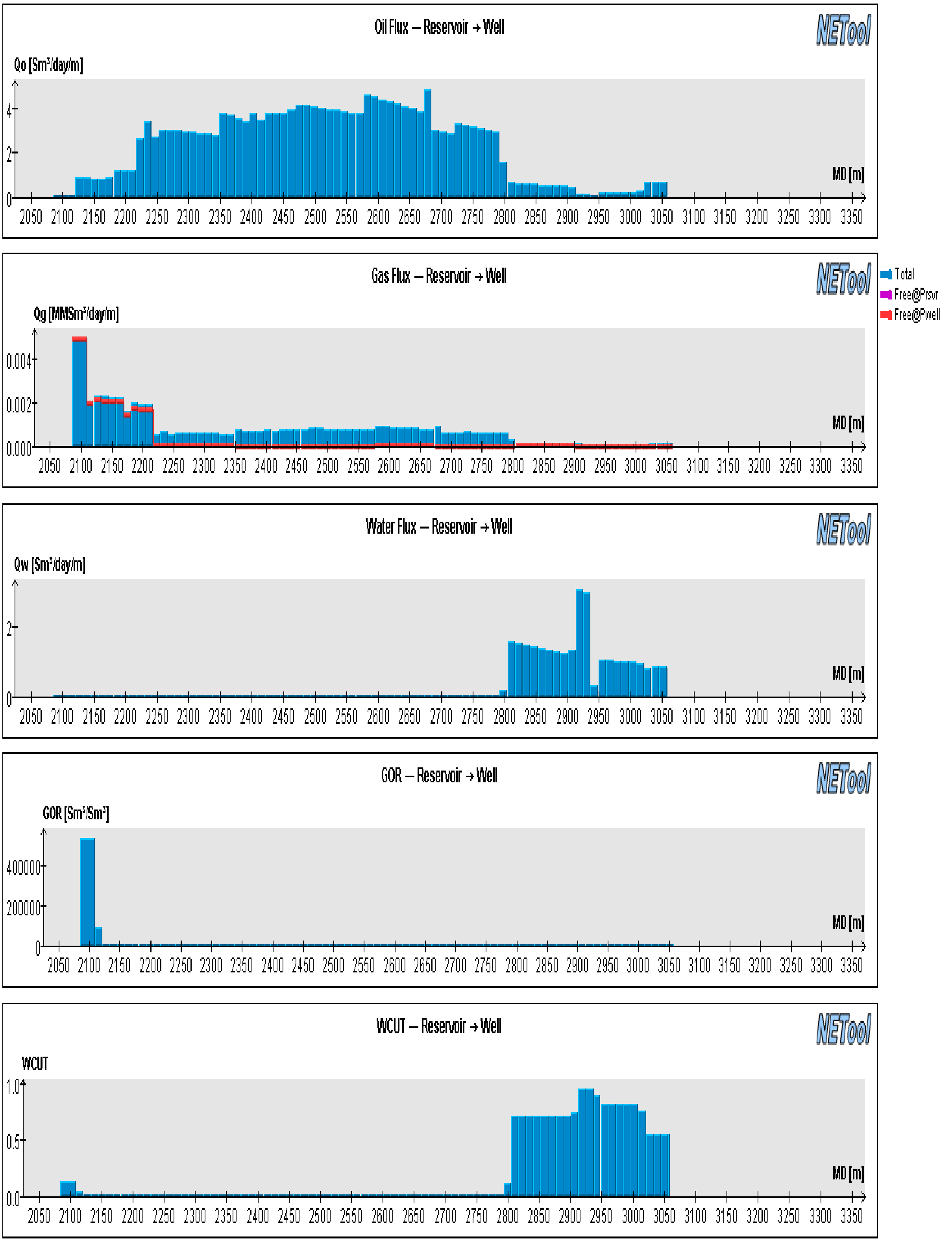
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	4	4	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	4	4	Yes	No	No	37	2457	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	4	4	Yes	Yes	No	38	2457	12,0	Nozzle ICD	4	4	Yes	No	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	4	Yes	No	No	40	2481	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2133	12,0	Nozzle ICD	4	4	Yes	Yes	No	41	2493	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2145	12,0	Nozzle ICD	4	4	Yes	Yes	No	42	2505	12,0	Nozzle ICD	4	4	Yes	Yes	No
8	2157	12,0	Nozzle ICD	4	4	Yes	Yes	No	43	2517	12,0	Nozzle ICD	4	4	Yes	Yes	No
9	2169	11,7	Nozzle ICD	4	4	Yes	Yes	No	44	2529	12,0	Nozzle ICD	4	4	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	4	4	Yes	Yes	No
11	2181	12,0	Nozzle ICD	4	4	Yes	No	No	46	2553	11,7	Nozzle ICD	4	4	Yes	Yes	No
12	2193	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2565	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2565	12,0	Nozzle ICD	4	4	Yes	No	No
14	2217	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2577	12,0	Nozzle ICD	4	4	Yes	Yes	No
15	2229	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2589	12,0	Nozzle ICD	4	4	Yes	Yes	No
16	2241	11,7	Nozzle ICD	4	4	Yes	Yes	No	51	2601	12,0	Nozzle ICD	4	4	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	4	4	Yes	Yes	No
18	2253	12,0	Nozzle ICD	4	4	Yes	No	No	53	2625	12,0	Nozzle ICD	4	4	Yes	Yes	No
19	2265	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	2637	12,0	Nozzle ICD	4	4	Yes	Yes	No
20	2277	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	2649	12,0	Nozzle ICD	4	4	Yes	Yes	No
21	2289	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	2661	12,0	Nozzle ICD	4	4	Yes	Yes	No
22	2301	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	2673	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	4	4	Yes	Yes	No	58	2673	11,7	Nozzle ICD	4	4	Yes	No	No
24	2325	12,0	Nozzle ICD	4	4	Yes	Yes	No	59	2685	12,0	Nozzle ICD	4	4	Yes	Yes	No
25	2337	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	2697	12,0	Nozzle ICD	4	4	Yes	Yes	No
26	2349	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	4	4	Yes	Yes	No
27	2349,3	11,7	Nozzle ICD	4	4	Yes	No	No	62	2721	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	2721	12,0	Nozzle ICD	4	4	Yes	No	No
29	2373	12,0	Nozzle ICD	4	4	Yes	Yes	No	64	2733	12,0	Nozzle ICD	4	4	Yes	Yes	No
30	2385	12,0	Nozzle ICD	4	4	Yes	Yes	No	65	2745	12,0	Nozzle ICD	4	4	Yes	Yes	No
31	2397	11,7	Nozzle ICD	4	4	Yes	Yes	No	66	2757	12,0	Nozzle ICD	4	4	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2769	12,0	Nozzle ICD	4	4	Yes	Yes	No
33	2409	12,0	Nozzle ICD	4	4	Yes	No	No	68	2781	12,0	Nozzle ICD	4	4	Yes	Yes	No
34	2421	12,0	Nozzle ICD	4	4	Yes	Yes	No	69	2793	11,7	Nozzle ICD	4	4	Yes	Yes	No
35	2433	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	2805	0,3	Packer	-	-	No	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	2805	12,0	Blank pipe	-	-	Yes	No	No
72	2817	12,0	Nozzle ICD	4	4	Yes	Yes	No
73	2829	12,0	Blank pipe	-	-	Yes	Yes	No
74	2841	12,0	Blank pipe	-	-	Yes	Yes	No
75	2853	12,0	Nozzle ICD	4	4	Yes	Yes	No
76	2865	12,0	Blank pipe	-	-	Yes	Yes	No
77	2877	12,0	Blank pipe	-	-	Yes	Yes	No
78	2889	12,0	Nozzle ICD	4	4	Yes	Yes	No
79	2901	11,7	Blank pipe	-	-	Yes	Yes	No
80	2912,7	0,3	Packer	-	-	No	No	N/A
81	2913	12,0	Blank pipe	-	-	Yes	No	No
82	2925	12,0	Nozzle ICD	4	4	Yes	Yes	No
83	2937	11,7	Blank pipe	-	-	Yes	Yes	No
84	2948,7	0,3	Packer	-	-	No	No	N/A
85	2949	12,0	Nozzle ICD	4	4	Yes	No	No
86	2961	12,0	Nozzle ICD	4	4	Yes	Yes	No
87	2973	12,0	Nozzle ICD	4	4	Yes	Yes	No
88	2985	12,0	Nozzle ICD	4	4	Yes	Yes	No
89	2997	11,7	Nozzle ICD	4	4	Yes	Yes	No
90	3008,7	0,3	Packer	-	-	No	No	N/A
91	3009	12,0	Nozzle ICD	4	4	Yes	No	No
92	3021	12,0	Nozzle ICD	4	4	Yes	Yes	No
93	3033	0,3	Packer	-	-	No	No	N/A
94	3033,3	11,7	Nozzle ICD	4	4	Yes	No	No
95	3045	12,0	Nozzle ICD	4	4	Yes	Yes	No
96	3057	12,0	Nozzle ICD	4	4	Yes	No	No
97	3069	12,0	Nozzle ICD	4	4	Yes	No	No
98	3081	12,0	Nozzle ICD	4	4	Yes	No	No
99	3093	12,0	Nozzle ICD	4	4	Yes	No	No
100	3105	11,7	Nozzle ICD	4	4	Yes	No	No
101	3116,7	0,3	Packer	-	-	No	No	N/A

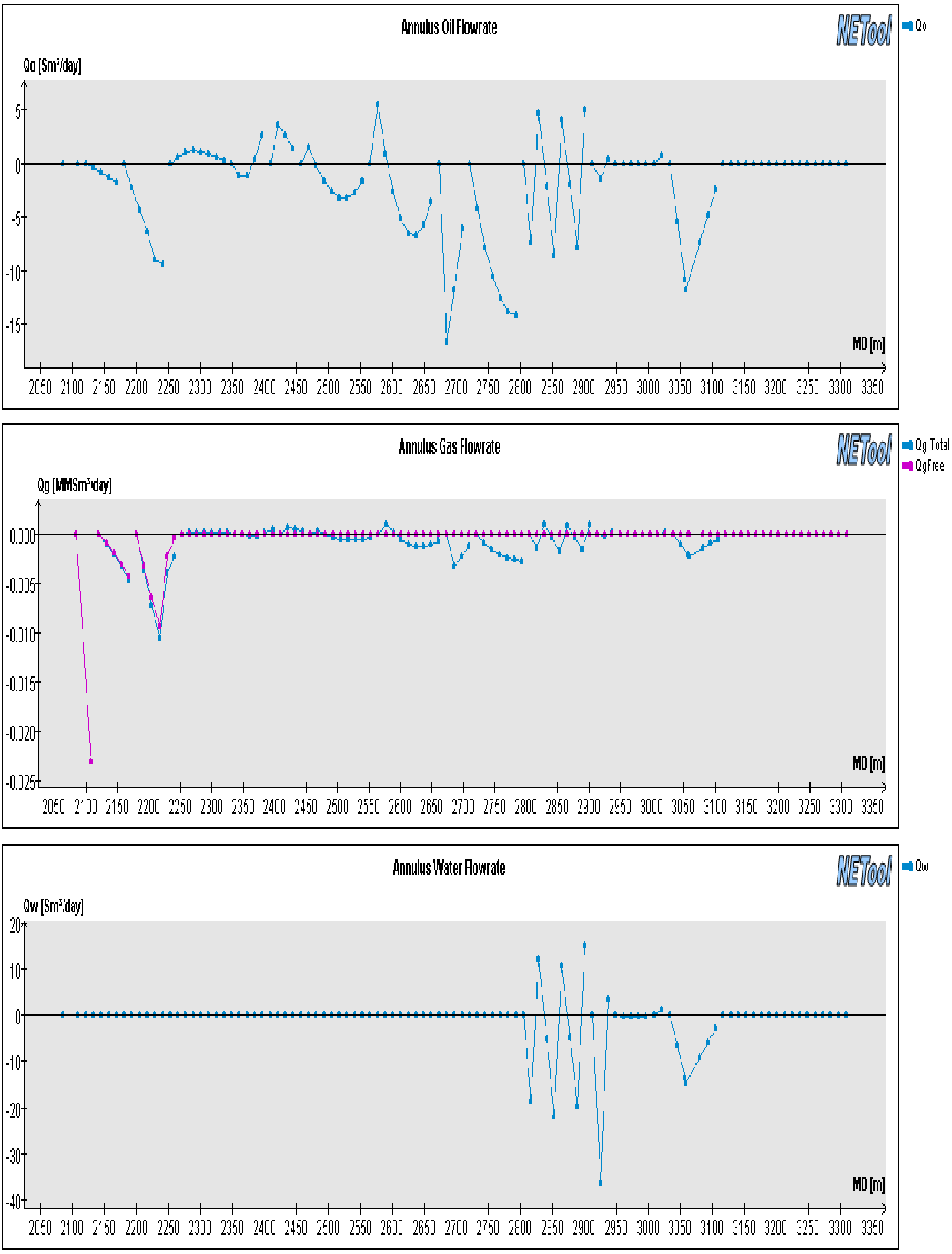
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
102	3117	12,0	Nozzle ICD	4	4	No	No	No
103	3129	12,0	Nozzle ICD	4	4	No	Yes	No
104	3141	12,0	Nozzle ICD	4	4	No	Yes	No
105	3153	12,0	Nozzle ICD	4	4	No	Yes	No
106	3165	12,0	Nozzle ICD	4	4	No	Yes	No
107	3177	12,0	Nozzle ICD	4	4	No	Yes	No
108	3189	12,0	Nozzle ICD	4	4	No	Yes	No
109	3201	11,7	Nozzle ICD	4	4	No	Yes	No
110	3213	0,3	Packer	-	-	No	No	N/A
111	3213	12,0	Nozzle ICD	4	4	No	No	No
112	3225	12,0	Nozzle ICD	4	4	No	Yes	No
113	3237	12,0	Nozzle ICD	4	4	No	Yes	No
114	3249	12,0	Nozzle ICD	4	4	No	Yes	No
115	3261	12,0	Nozzle ICD	4	4	No	Yes	No
116	3273	12,0	Nozzle ICD	4	4	No	Yes	No
117	3285	12,0	Nozzle ICD	4	4	No	Yes	No
118	3297	12,4	Nozzle ICD	4	4	No	Yes	No
TOE	3309							



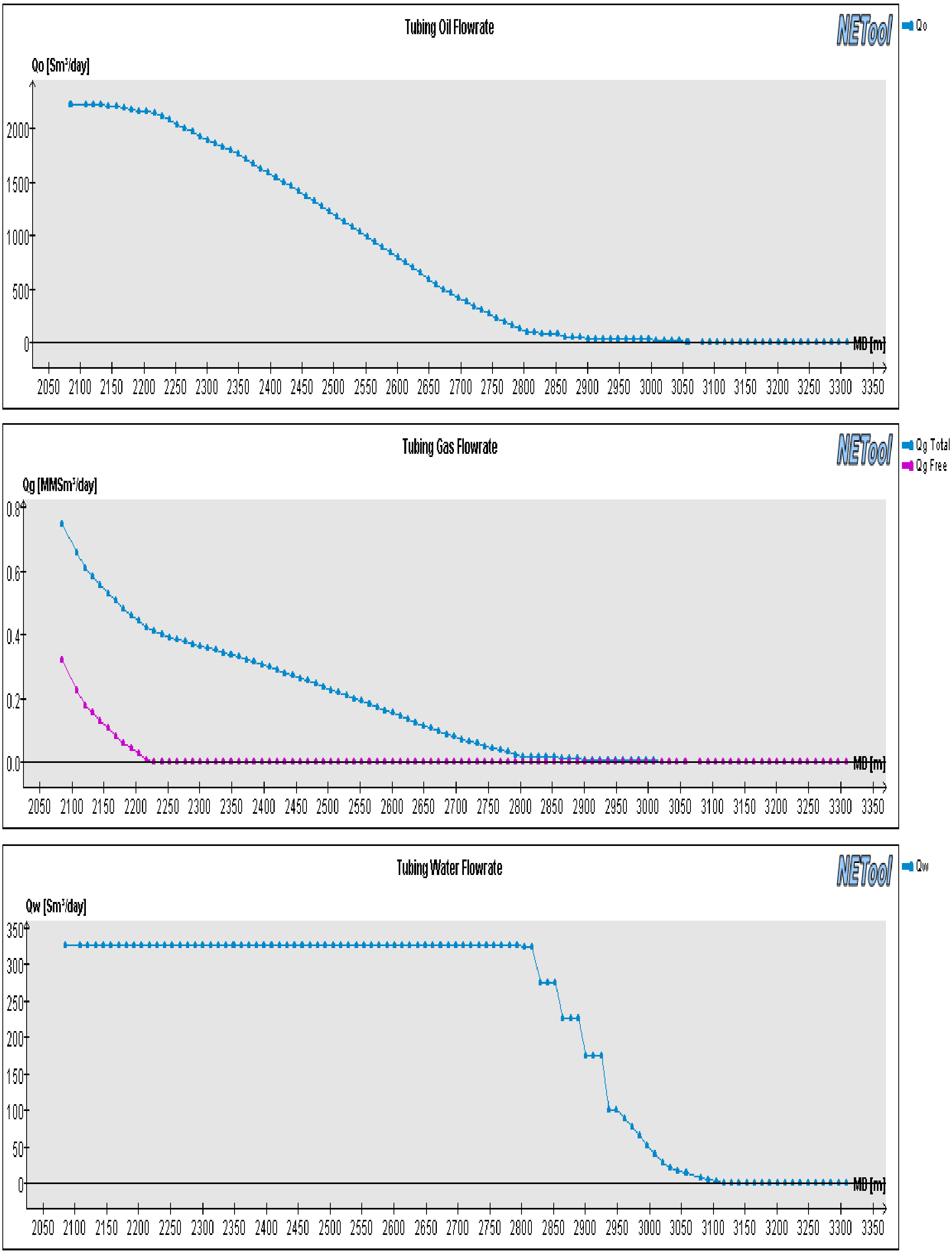
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



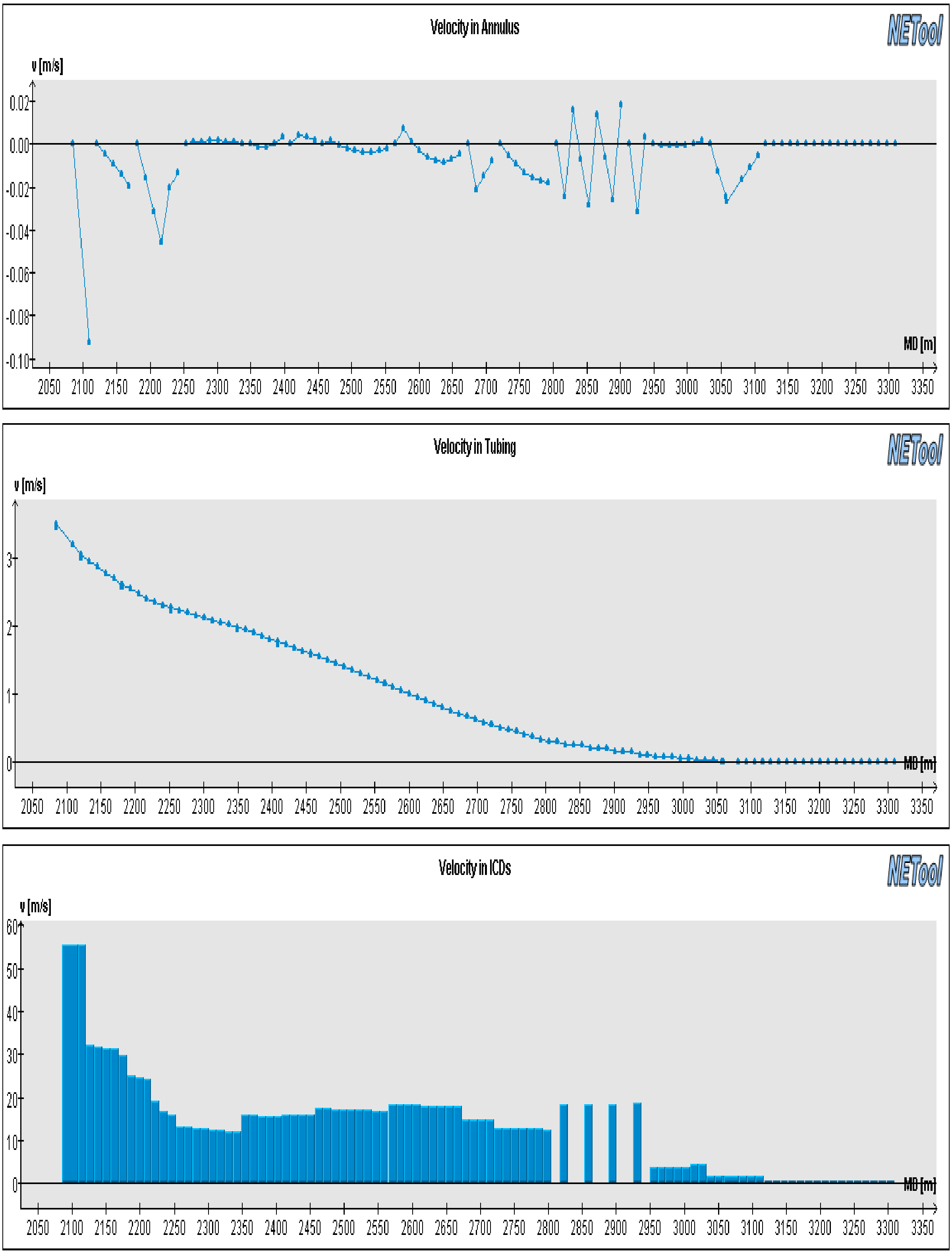
Influx of oil, gas and water from the reservoir and into the well along the wellbore



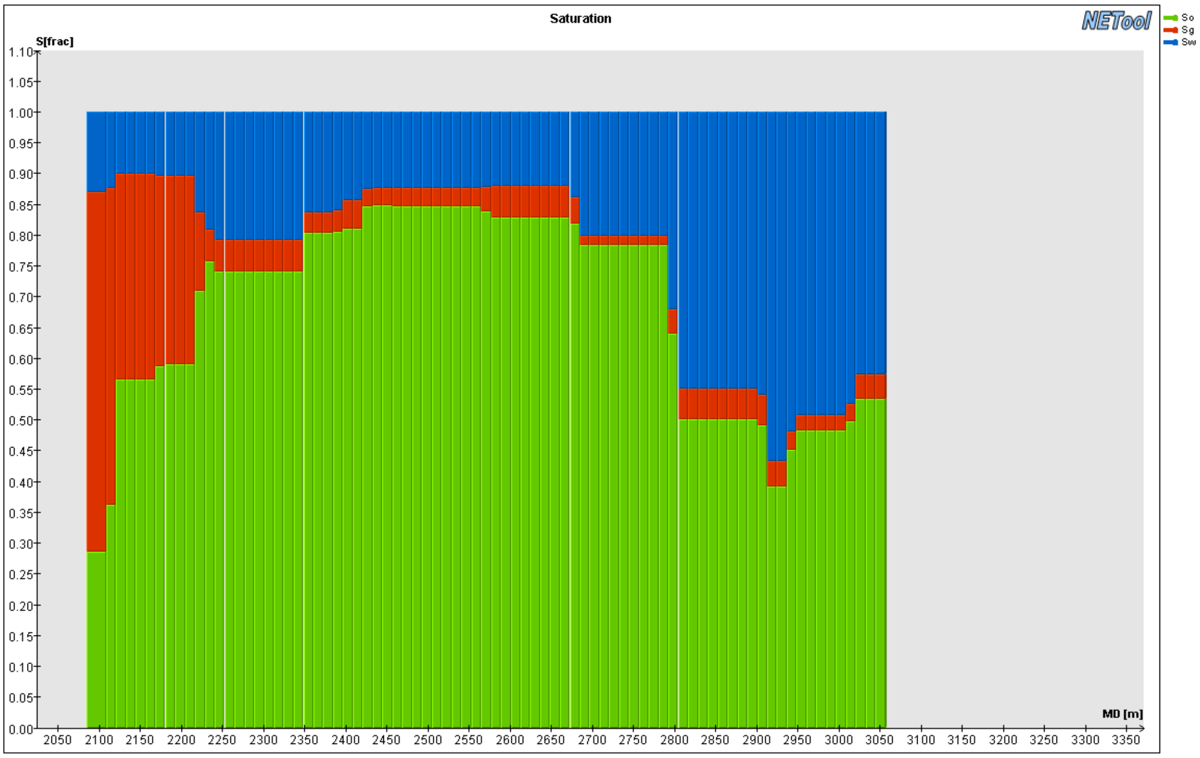
Annulus oil, gas and water flow rate along the wellbore



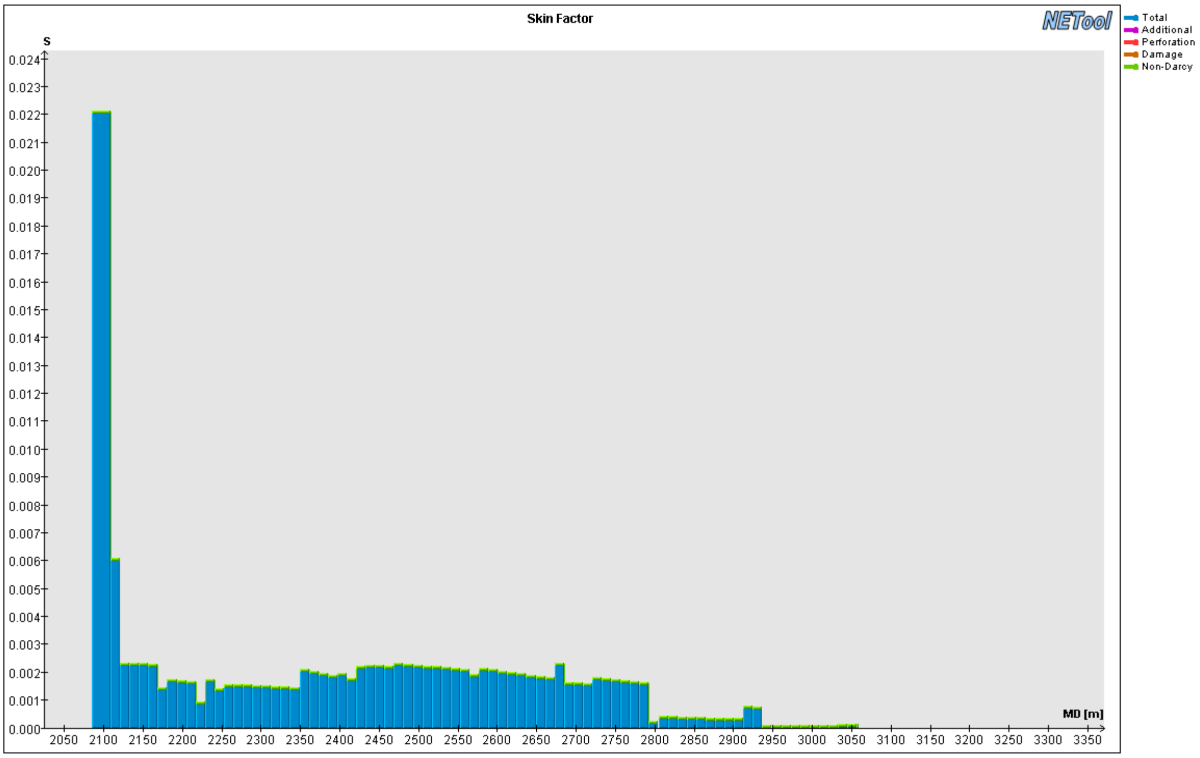
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

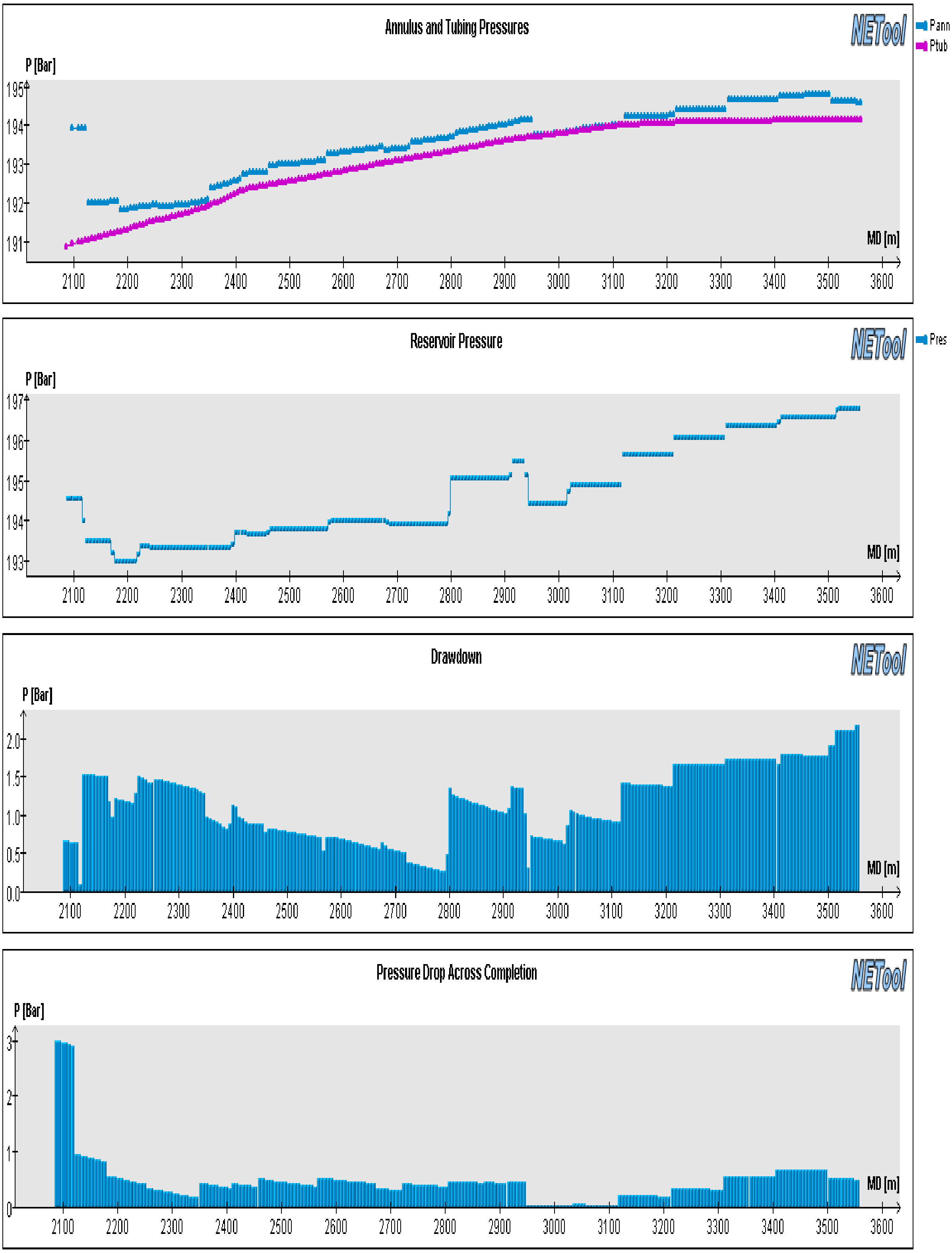
A.22 Plots for well KP7, 1826 days, Recommended ICD 250m longer wellbore.

Completion overview for the case:

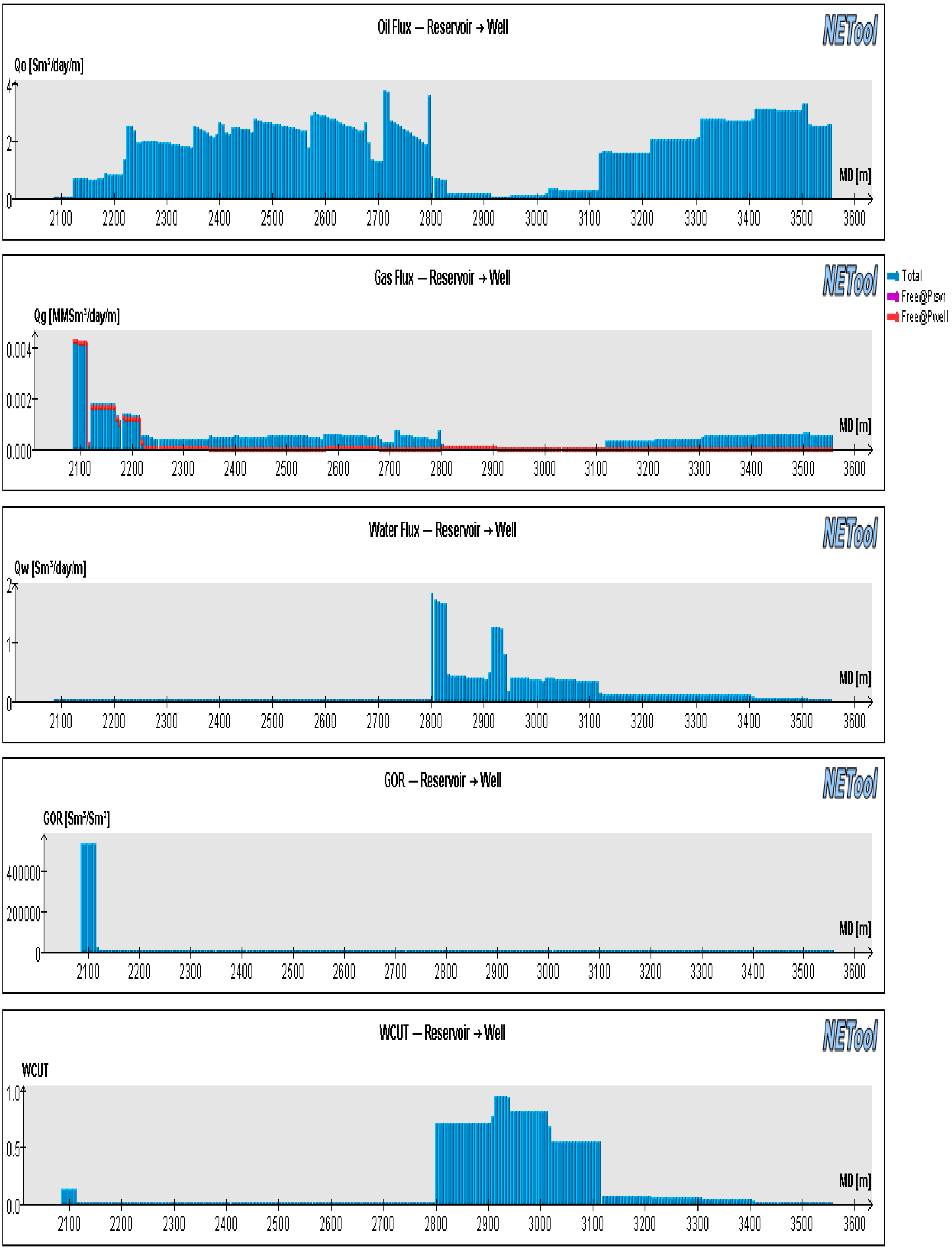
Reservoir section OD	8 ½"
Completion OD	5 ½""
Completion ID	4,77"
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2445	11,7	Nozzle ICD	4	4	Yes	Yes	No
2	2085,3	23,7	Nozzle ICD	4	4	Yes	Yes	No	37	2456,7	0,3	Packer	-	-	No	No	N/A
3	2109	11,7	Nozzle ICD	4	4	Yes	Yes	No	38	2457,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2120,7	0,3	Packer	-	-	No	No	N/A	39	2469	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2121	12,0	Nozzle ICD	4	4	Yes	Yes	No	40	2481	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2133	12,0	Nozzle ICD	4	4	Yes	Yes	No	41	2493	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2145	12,0	Nozzle ICD	4	4	Yes	Yes	No	42	2505	12,0	Nozzle ICD	4	4	Yes	Yes	No
8	2157	12,0	Nozzle ICD	4	4	Yes	Yes	No	43	2517	12,0	Nozzle ICD	4	4	Yes	Yes	No
9	2169	11,7	Nozzle ICD	4	4	Yes	Yes	No	44	2529	12,0	Nozzle ICD	4	4	Yes	Yes	No
10	2180,7	0,3	Packer	-	-	No	No	N/A	45	2541	12,0	Nozzle ICD	4	4	Yes	Yes	No
11	2181	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2553	11,7	Nozzle ICD	4	4	Yes	Yes	No
12	2193	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2564,7	0,3	Packer	-	-	No	No	N/A
13	2205	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2565	12,0	Nozzle ICD	4	4	Yes	Yes	No
14	2217	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2577	12,0	Nozzle ICD	4	4	Yes	Yes	No
15	2229	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2589	12,0	Nozzle ICD	4	4	Yes	Yes	No
16	2241	11,7	Nozzle ICD	4	4	Yes	Yes	No	51	2601	12,0	Nozzle ICD	4	4	Yes	Yes	No
17	2252,7	0,3	Packer	-	-	No	No	N/A	52	2613	12,0	Nozzle ICD	4	4	Yes	Yes	No
18	2253	12,0	Nozzle ICD	4	4	Yes	Yes	No	53	2625	12,0	Nozzle ICD	4	4	Yes	Yes	No
19	2265	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	2637	12,0	Nozzle ICD	4	4	Yes	Yes	No
20	2277	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	2649	12,0	Nozzle ICD	4	4	Yes	Yes	No
21	2289	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	2661	11,7	Nozzle ICD	4	4	Yes	Yes	No
22	2301	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	2672,7	0,3	Packer	-	-	No	No	N/A
23	2313	12,0	Nozzle ICD	4	4	Yes	Yes	No	58	2673	12,0	Nozzle ICD	4	4	Yes	Yes	No
24	2325	12,0	Nozzle ICD	4	4	Yes	Yes	No	59	2685	12,0	Nozzle ICD	4	4	Yes	Yes	No
25	2337	11,7	Nozzle ICD	4	4	Yes	Yes	No	60	2697	12,0	Nozzle ICD	4	4	Yes	Yes	No
26	2348,7	0,3	Packer	-	-	No	No	N/A	61	2709	11,7	Nozzle ICD	4	4	Yes	Yes	No
27	2349	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	2720,7	0,3	Packer	-	-	No	No	N/A
28	2361	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	2721	12,0	Nozzle ICD	4	4	Yes	Yes	No
29	2373	12,0	Nozzle ICD	4	4	Yes	Yes	No	64	2733	12,0	Nozzle ICD	4	4	Yes	Yes	No
30	2385	12,0	Nozzle ICD	4	4	Yes	Yes	No	65	2745	12,0	Nozzle ICD	4	4	Yes	Yes	No
31	2397	11,7	Nozzle ICD	4	4	Yes	Yes	No	66	2757	0,3	Nozzle ICD	4	4	Yes	Yes	No
32	2408,7	0,3	Packer	-	-	No	No	N/A	67	2757,3	11,7	Nozzle ICD	4	4	Yes	Yes	No
33	2409	12,0	Nozzle ICD	4	4	Yes	Yes	No	68	2769	12,0	Nozzle ICD	4	4	Yes	Yes	No
34	2421	12,0	Nozzle ICD	4	4	Yes	Yes	No	69	2781	11,7	Nozzle ICD	4	4	Yes	Yes	No
35	2433	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	2792,7	0,3	Packer	-	-	No	No	N/A

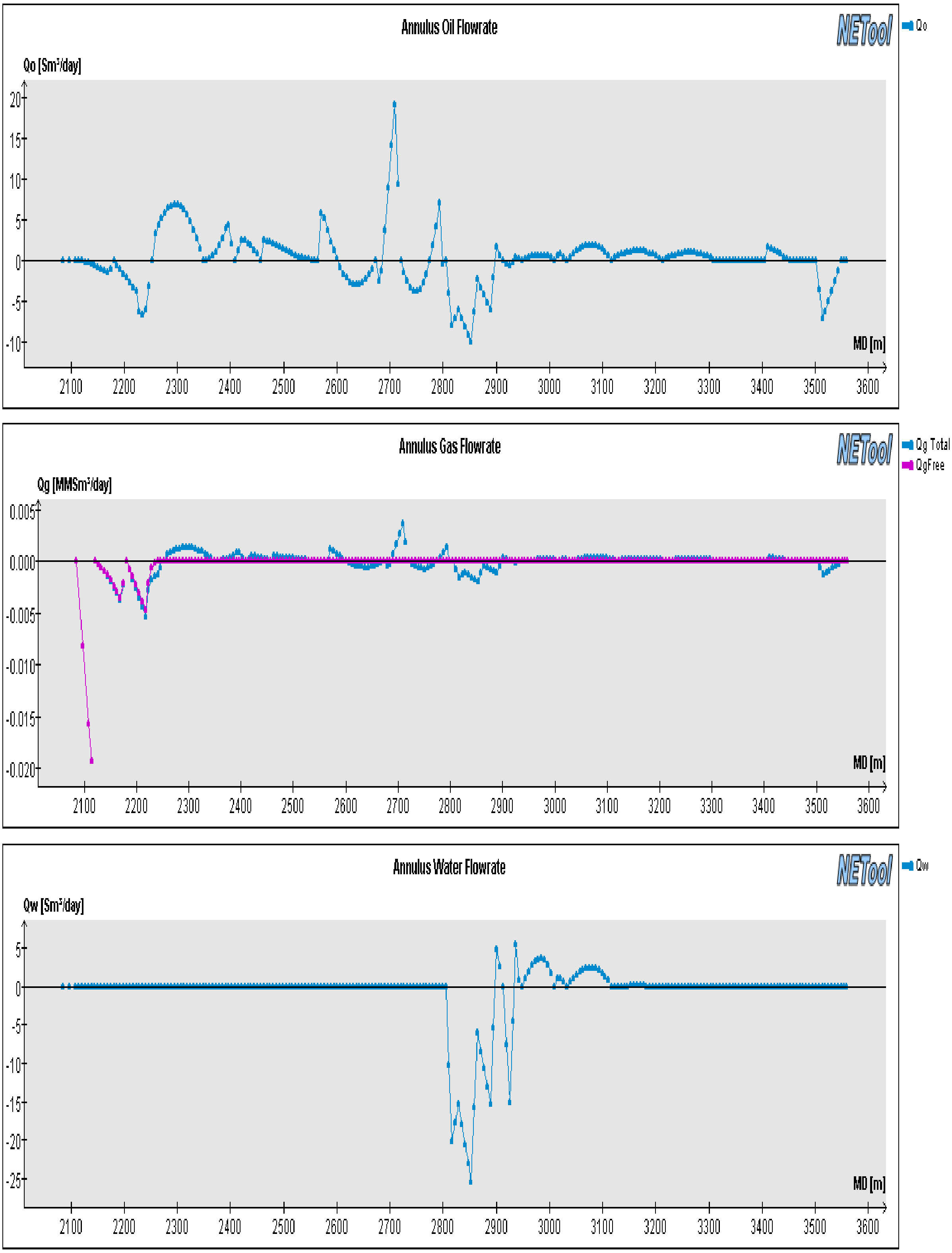
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	2793,0	12,0	Blank pipe	-	-	Yes	Yes	No	110	3200,7	0,3	Packer	-	-	No	No	N/A
72	2805	12,0	Nozzle ICD	4	4	Yes	Yes	No	111	3201,0	12,0	Nozzle ICD	4	4	Yes	No	No
73	2817	12,0	Blank pipe	-	-	Yes	Yes	No	112	3213,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
74	2829	12,0	Blank pipe	-	-	Yes	Yes	No	113	3225,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
75	2841	12,0	Nozzle ICD	4	4	Yes	Yes	No	114	3237,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
76	2853	12,0	Blank pipe	-	-	Yes	Yes	No	115	3249,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
77	2865	12,0	Blank pipe	-	-	Yes	Yes	No	116	3261,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
78	2877	12,0	Nozzle ICD	4	4	Yes	Yes	No	117	3273,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
79	2889	11,7	Blank pipe	-	-	Yes	Yes	No	118	3285,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
80	2900,7	0,3	Packer	-	-	No	No	N/A	119	3296,7	0,3	Packer	-	-	No	No	N/A
81	2901	12,0	Blank pipe	-	-	Yes	Yes	No	120	3297,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
82	2913	12,0	Nozzle ICD	4	4	Yes	Yes	No	121	3309,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
83	2925	11,7	Blank pipe	-	-	Yes	Yes	No	122	3321,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
84	2936,7	0,3	Packer	-	-	No	No	N/A	123	3333,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
85	2937	12,0	Nozzle ICD	4	4	Yes	Yes	No	124	3344,7	0,3	Packer	-	-	No	No	N/A
86	2949	12,0	Nozzle ICD	4	4	Yes	Yes	No	125	3345,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
87	2961	12,0	Nozzle ICD	4	4	Yes	Yes	No	126	3357,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
88	2973	12,0	Nozzle ICD	4	4	Yes	Yes	No	127	3369,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
89	2985	11,7	Nozzle ICD	4	4	Yes	Yes	No	128	3381,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
90	2996,7	0,3	Packer	-	-	No	No	N/A	129	3392,7	0,3	Packer	-	-	No	No	N/A
91	2997	12,0	Nozzle ICD	4	4	Yes	Yes	No	130	3393,0	12	Nozzle ICD	4	4	Yes	Yes	No
92	3009	11,7	Nozzle ICD	4	4	Yes	Yes	No	131	3405,0	12	Nozzle ICD	4	4	Yes	Yes	No
93	3020,7	0,3	Packer	-	-	No	No	N/A	132	3417,0	12	Nozzle ICD	4	4	Yes	Yes	No
94	3021	12,0	Nozzle ICD	4	4	Yes	Yes	No	133	3429,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
95	3033	12,0	Nozzle ICD	4	4	Yes	Yes	No	134	3440,7	0,3	Packer	-	-	No	No	N/A
96	3045	12,0	Nozzle ICD	4	4	Yes	Yes	No	135	3441,0	12	Nozzle ICD	4	4	Yes	Yes	No
97	3057	12,0	Nozzle ICD	4	4	Yes	Yes	No	136	3453,0	12	Nozzle ICD	4	4	Yes	Yes	No
98	3069	12,0	Nozzle ICD	4	4	Yes	Yes	No	137	3465,0	12	Nozzle ICD	4	4	Yes	Yes	No
99	3081	12,0	Nozzle ICD	4	4	Yes	Yes	No	138	3477,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
100	3093	11,7	Nozzle ICD	4	4	Yes	Yes	No	139	3488,7	0,3	Packer	-	-	No	No	N/A
101	3104,7	0,3	Packer	-	-	No	No	N/A	140	3489,0	12	Nozzle ICD	4	4	Yes	Yes	No
102	3105,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	141	3501,0	12	Nozzle ICD	4	4	Yes	Yes	No
103	3117,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	142	3513,0	12	Nozzle ICD	4	4	Yes	Yes	No
104	3129,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	143	3525,0	11,7	Nozzle ICD	4	4	Yes	Yes	No
105	3141,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	144	3536,7	0,3	Packer	-	-	No	No	N/A
106	3153,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	145	3537,0	12	Nozzle ICD	4	4	Yes	Yes	No
107	3165,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	146	3549,0	10	Nozzle ICD	4	4	Yes	Yes	No
108	3177,0	12,0	Nozzle ICD	4	4	Yes	Yes	No	Toe	3559,0							
109	3189,0	11,7	Nozzle ICD	4	4	Yes	Yes	No									



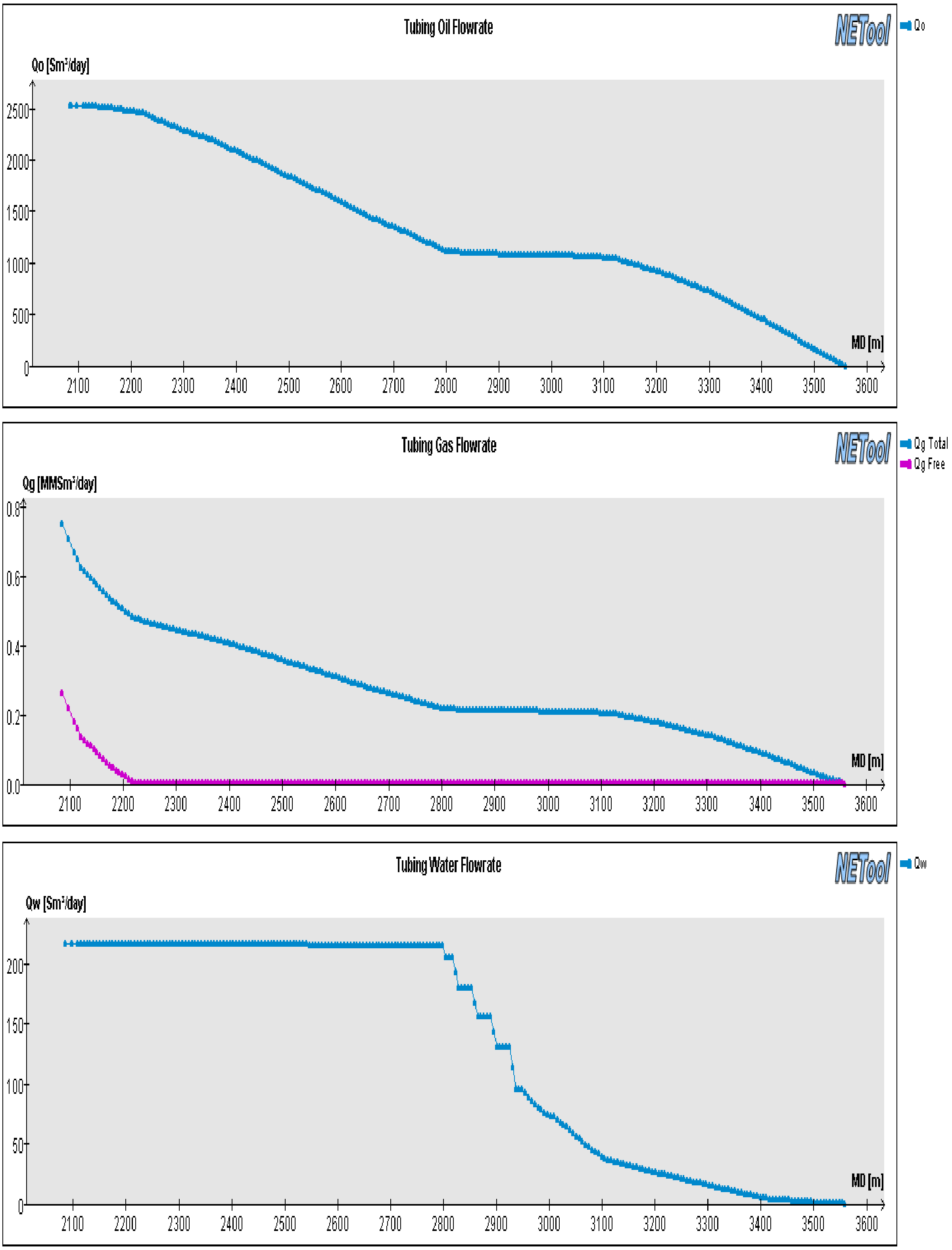
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



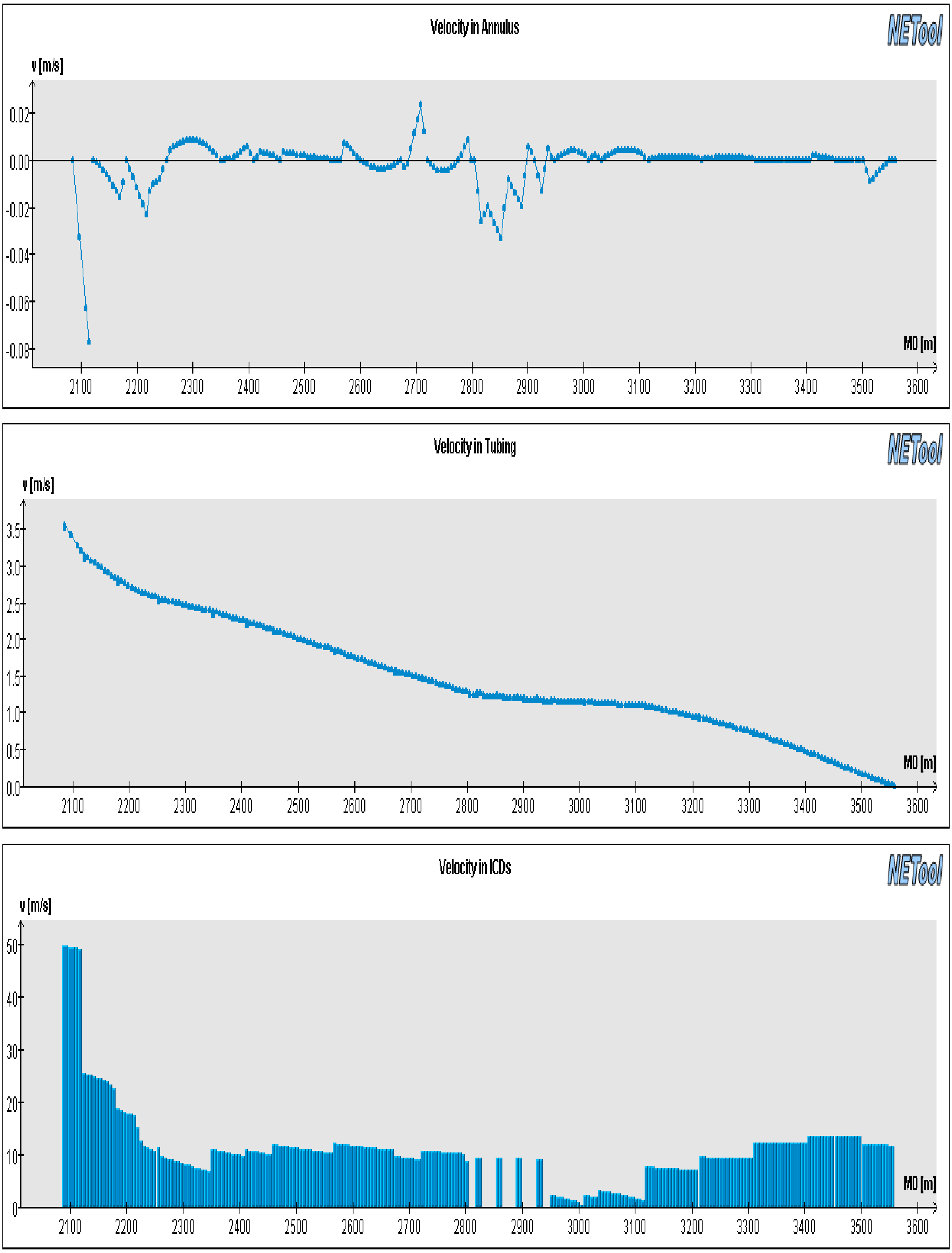
Influx of oil, gas and water from the reservoir and into the well along the wellbore



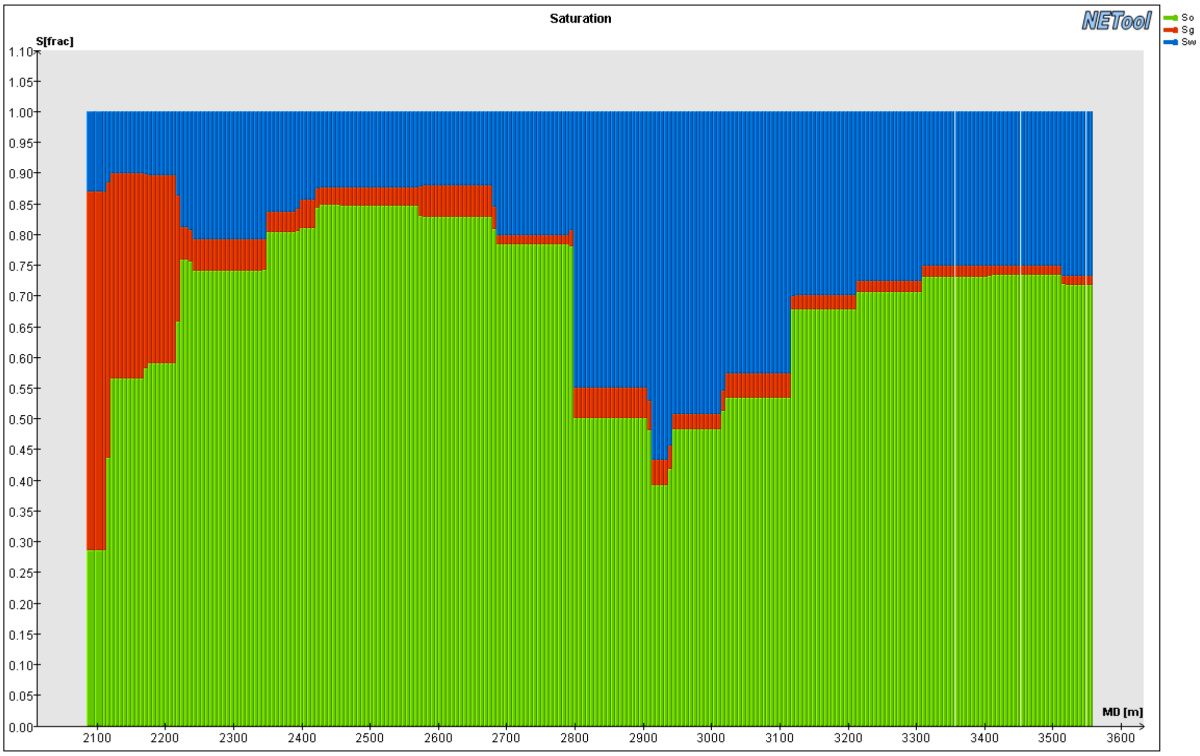
Annulus oil, gas and water flow rate along the wellbore



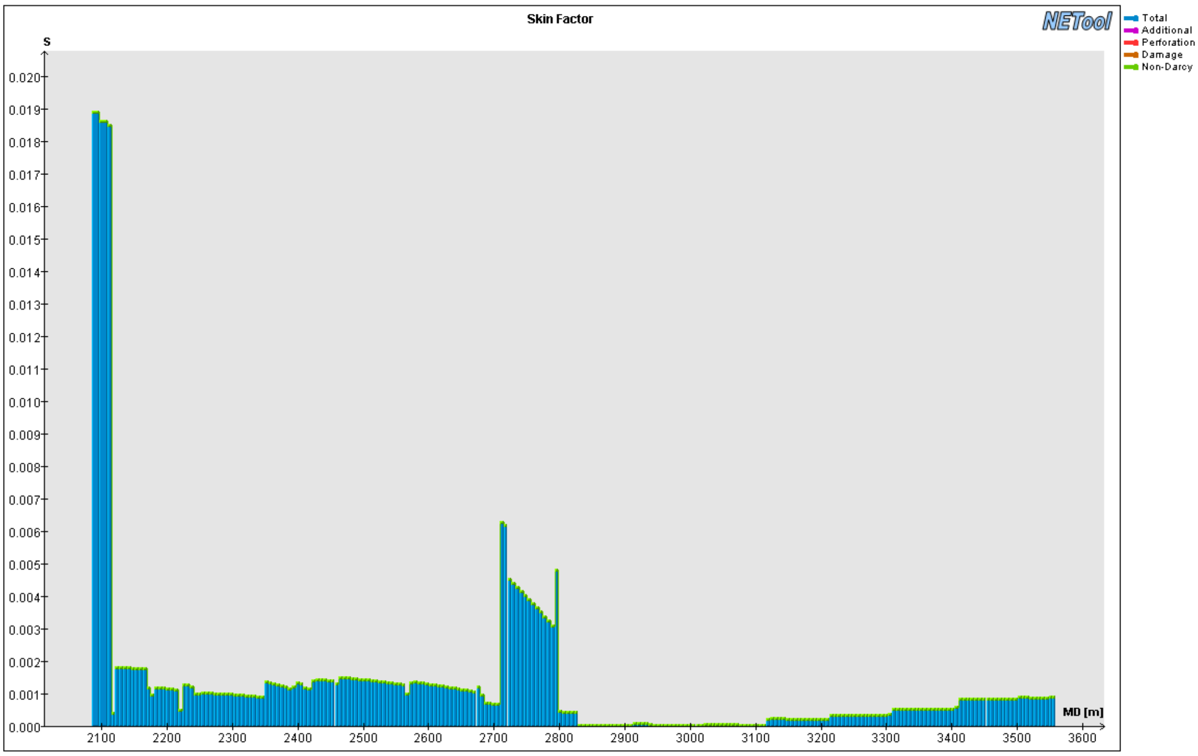
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



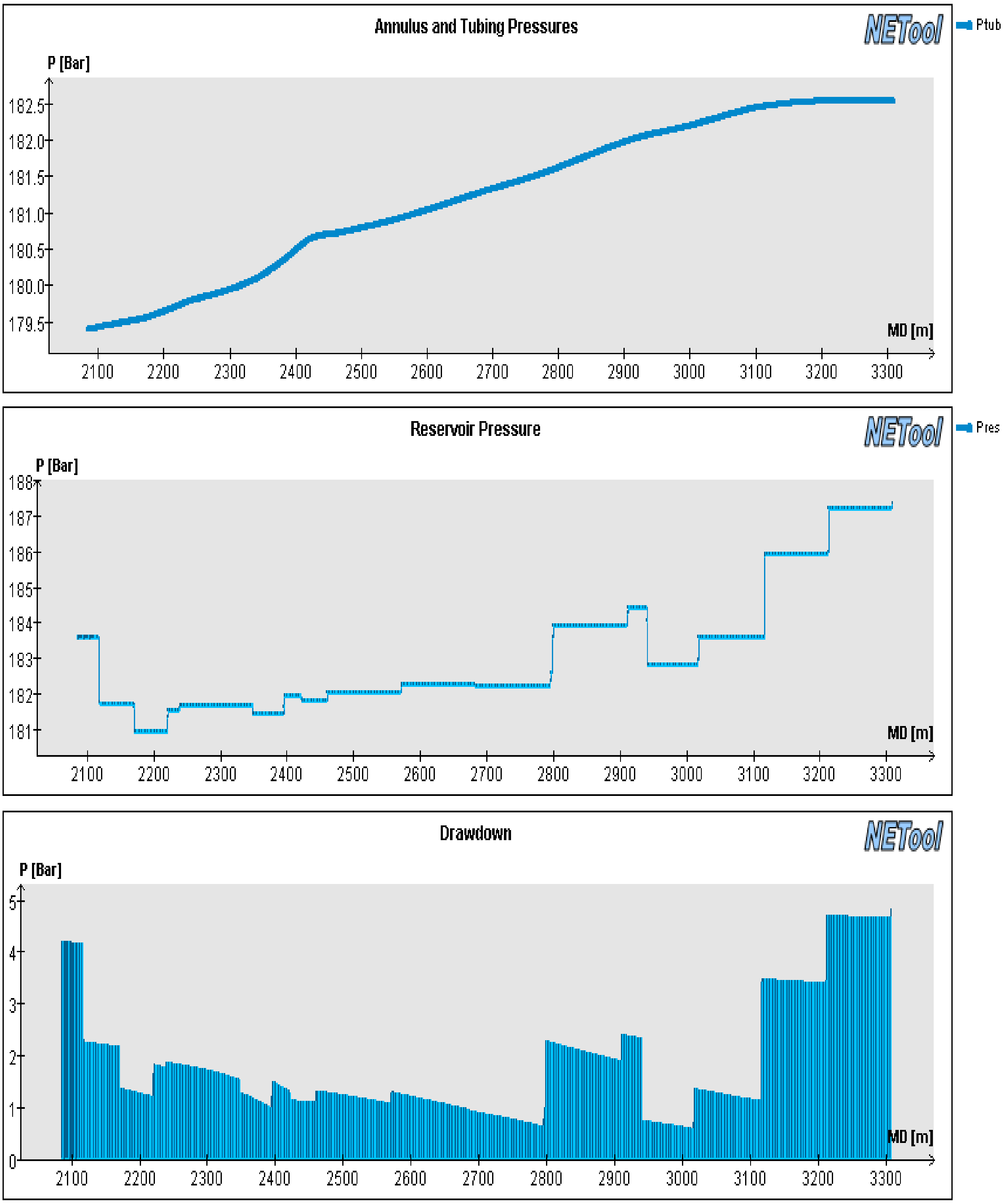
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



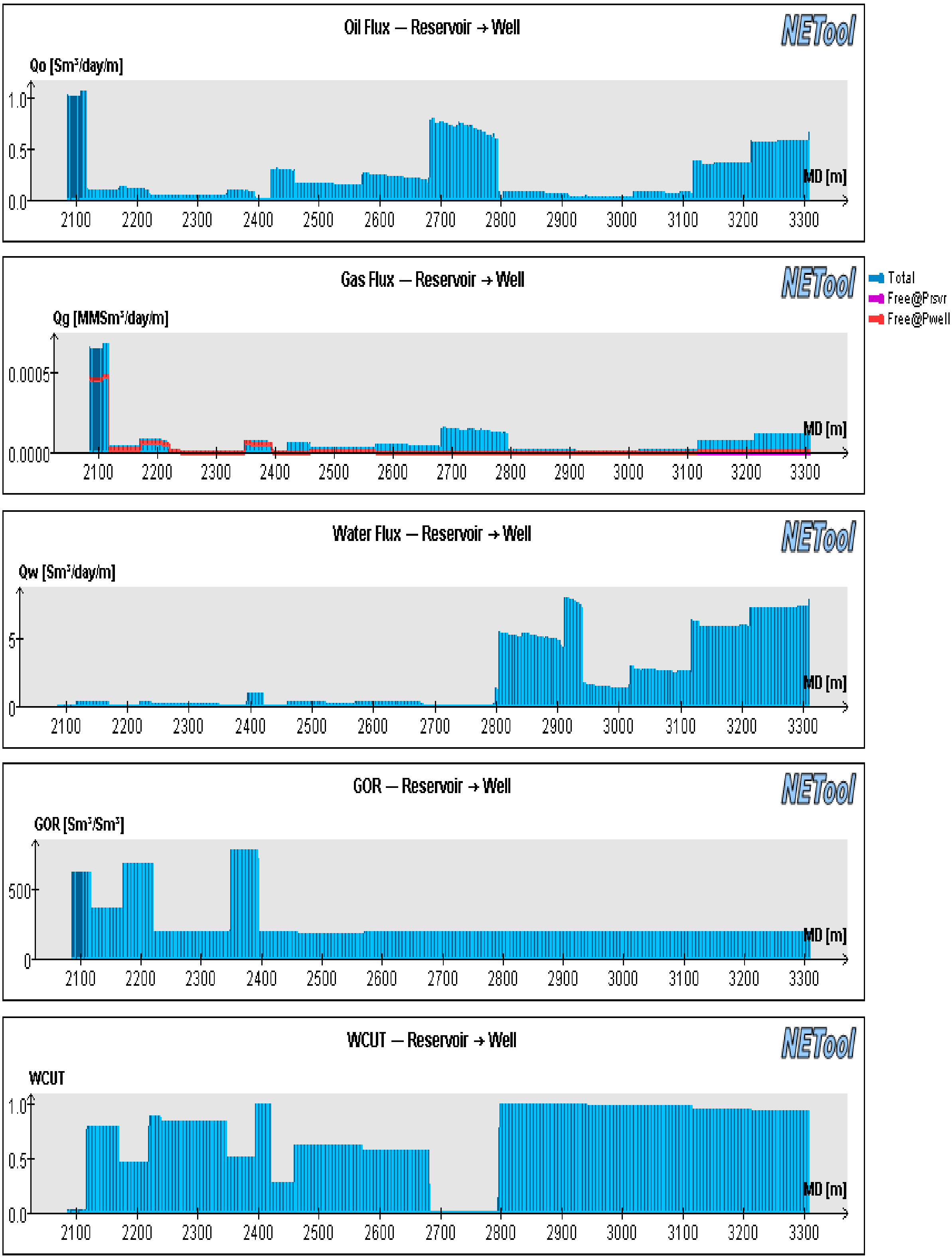
Skin factor plot for the well and given time step

A.23 Plots for well KP7, 7305 days, reference case with Open Hole

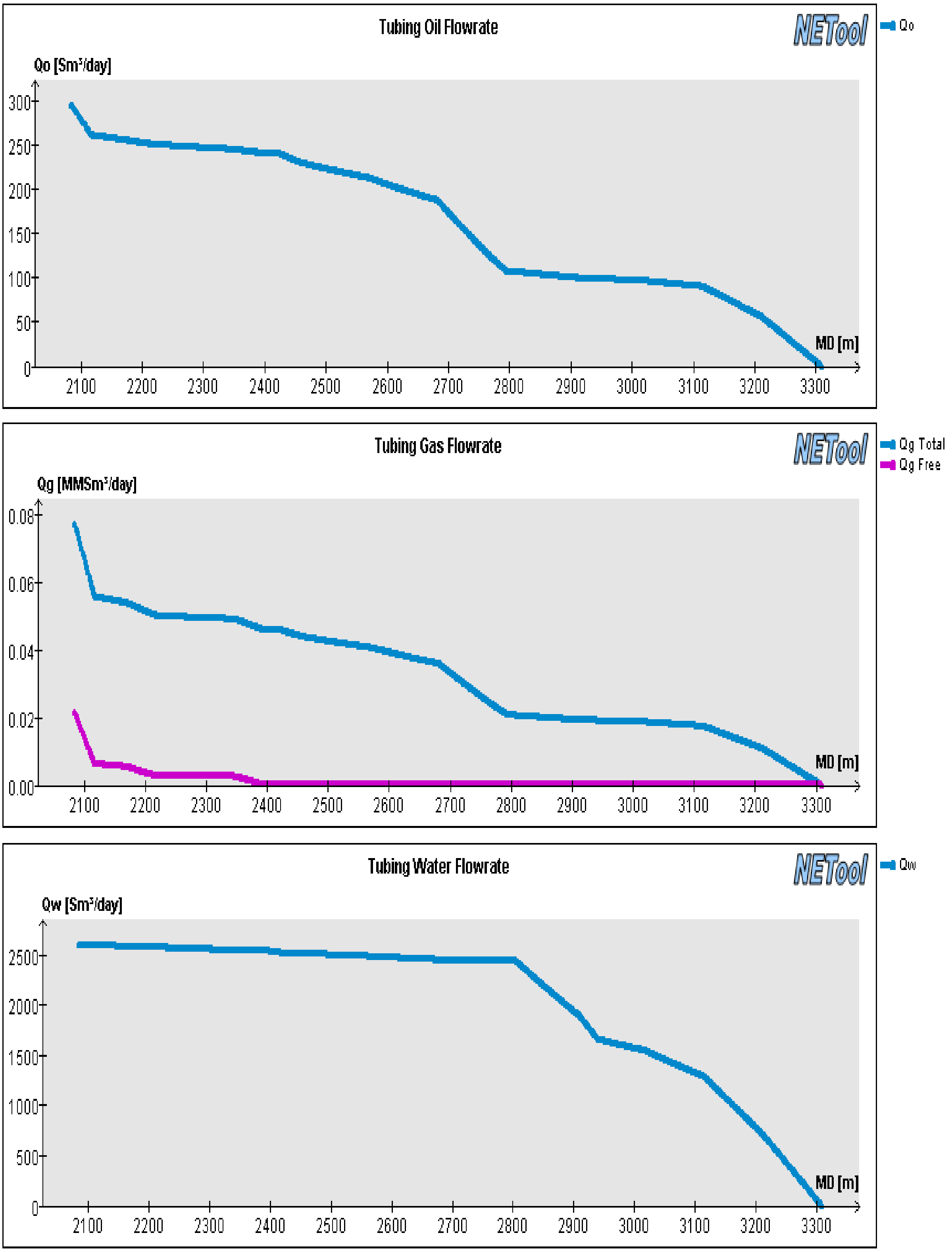
See appendix A.2 for completion set up.



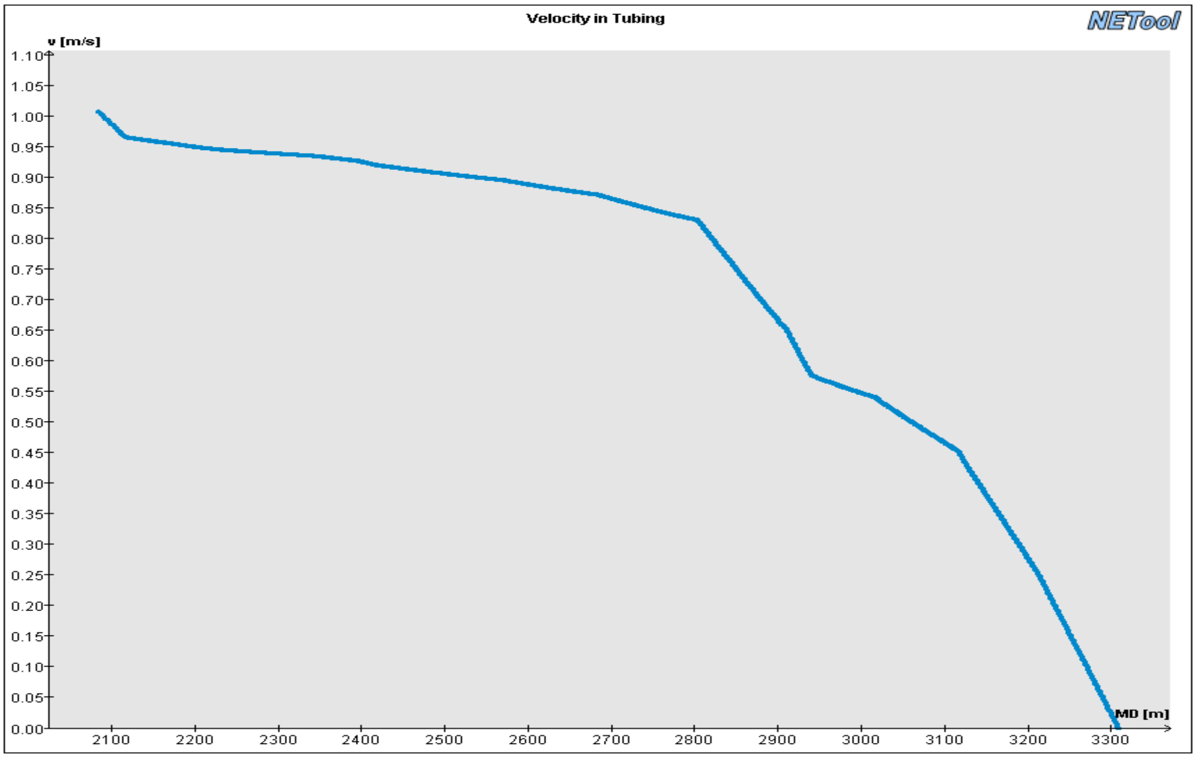
Annulus and tubing pressure, Reservoir pressure and Dradown along the wellbore.



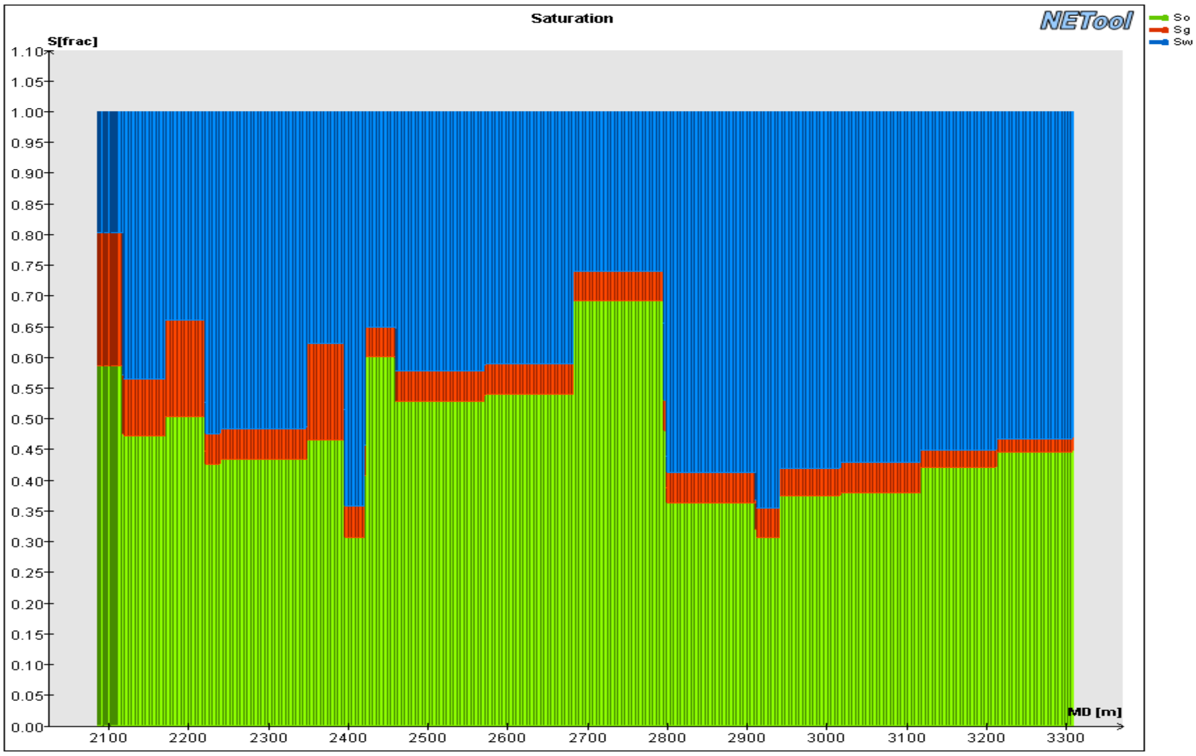
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



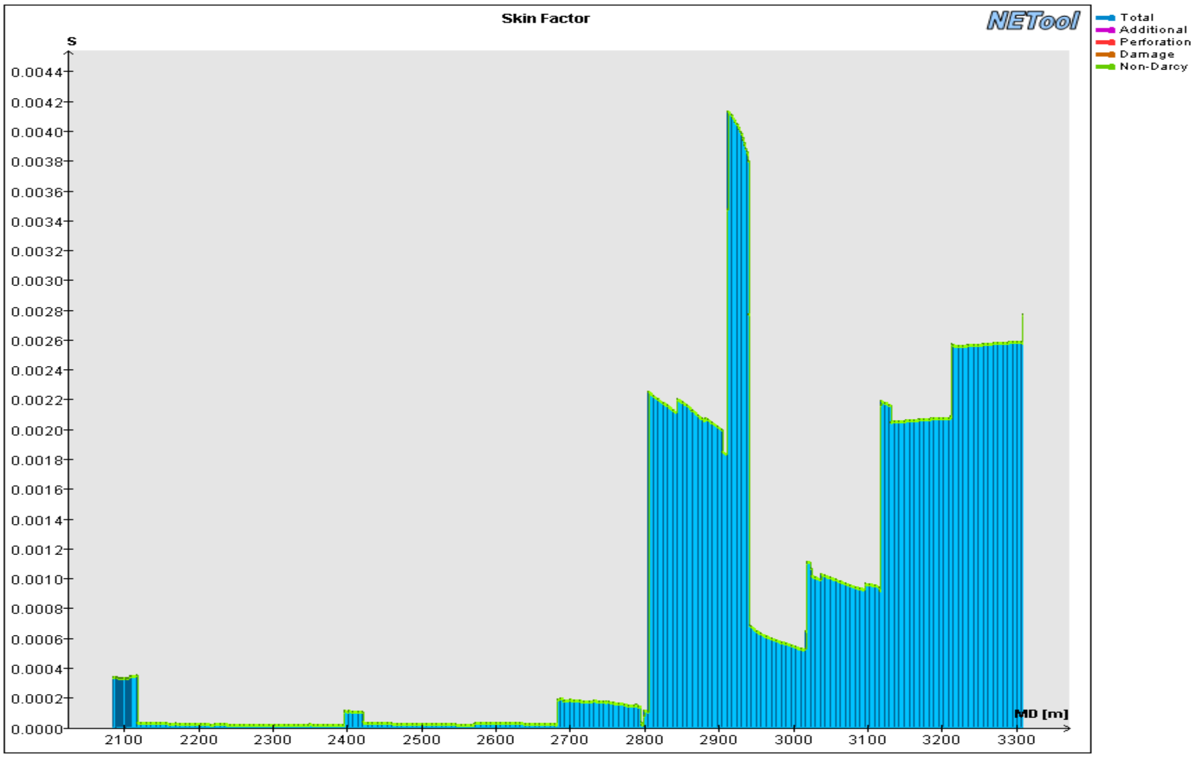
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the tubing along the wellbore.



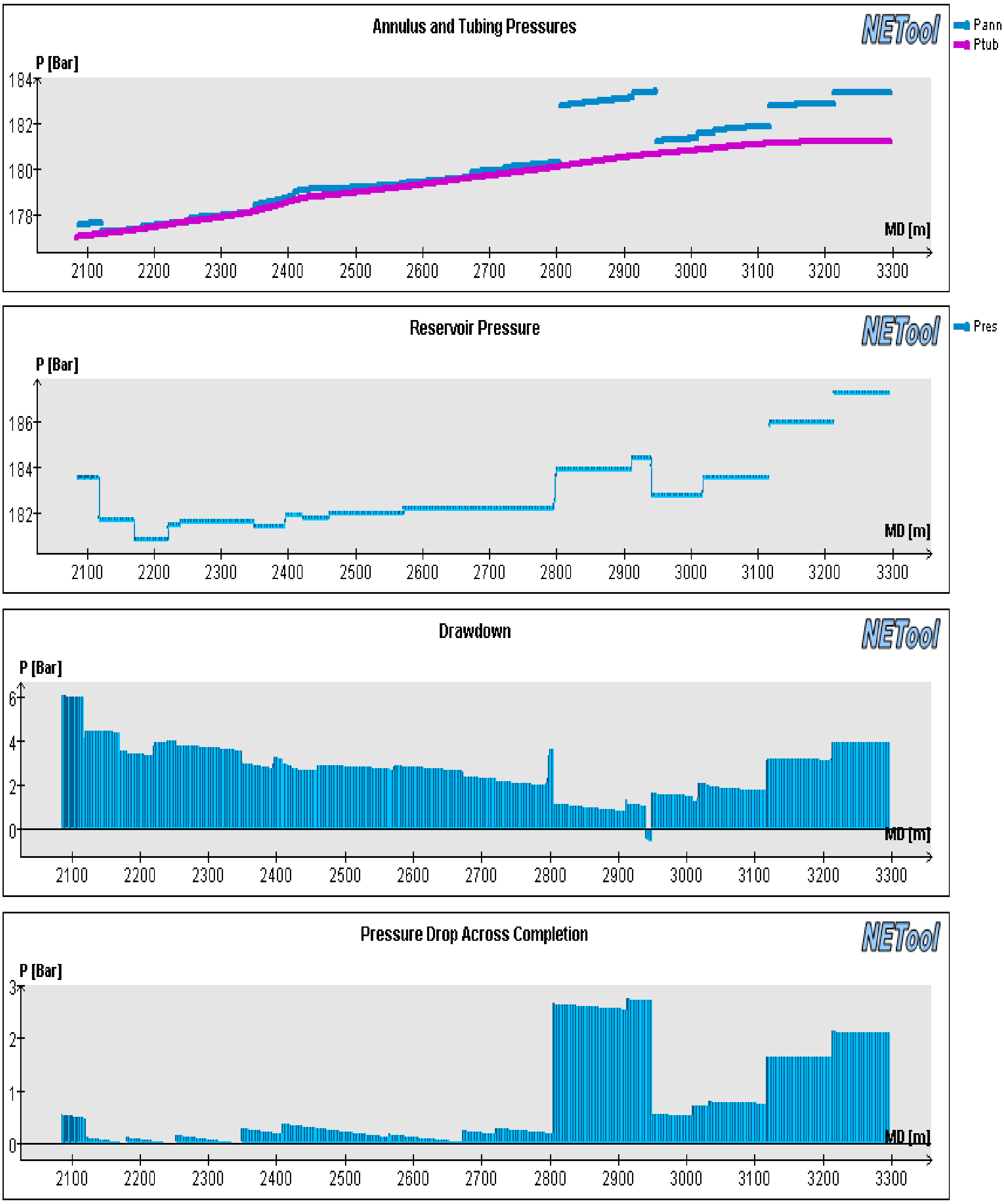
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



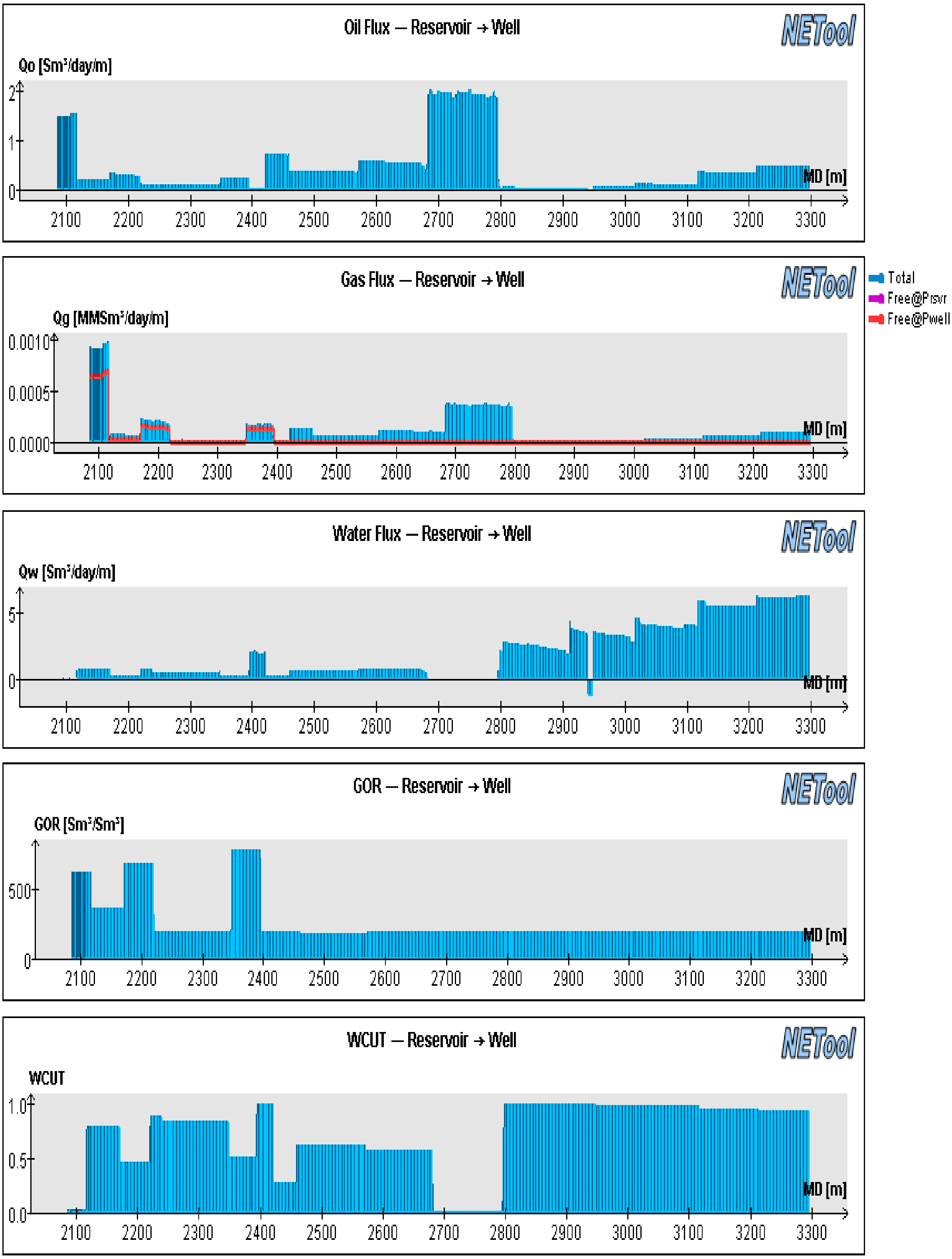
Skin factor plot for the well and given time step.

A.24 Plots for well KP7, 7305 days, Tailored solution, 4x4mm and 2x4mm ICD

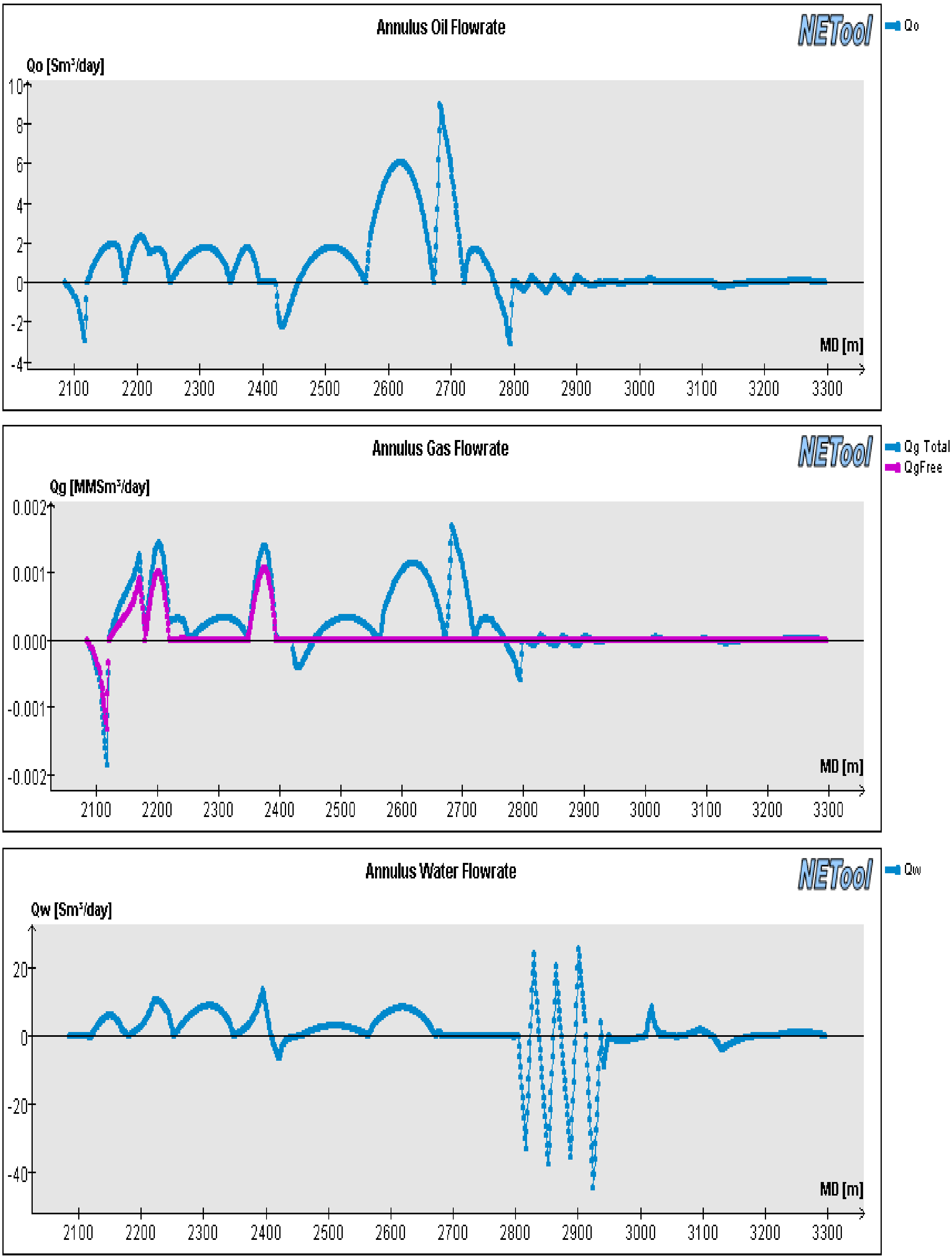
Completion overview for the case: see appendix A.11



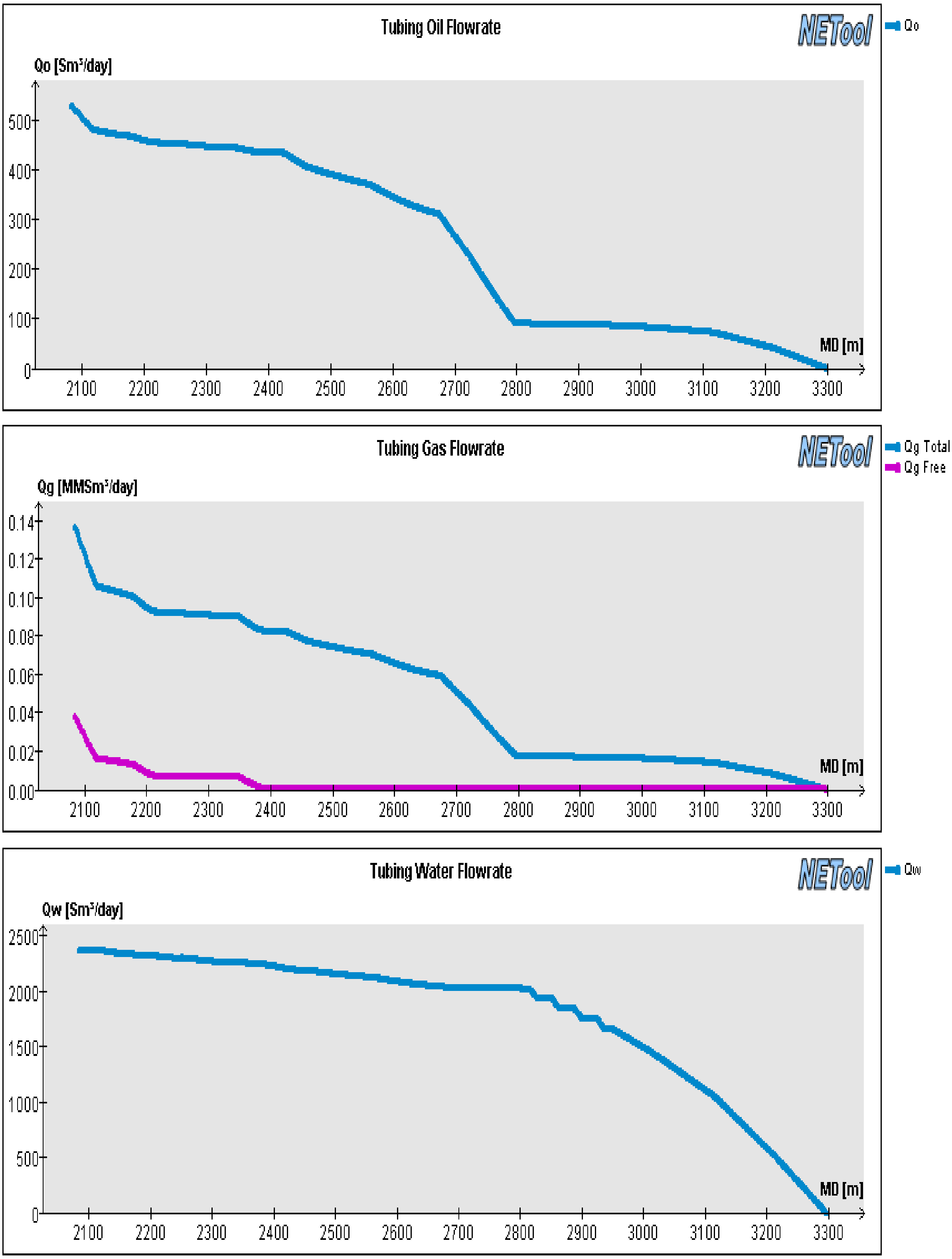
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



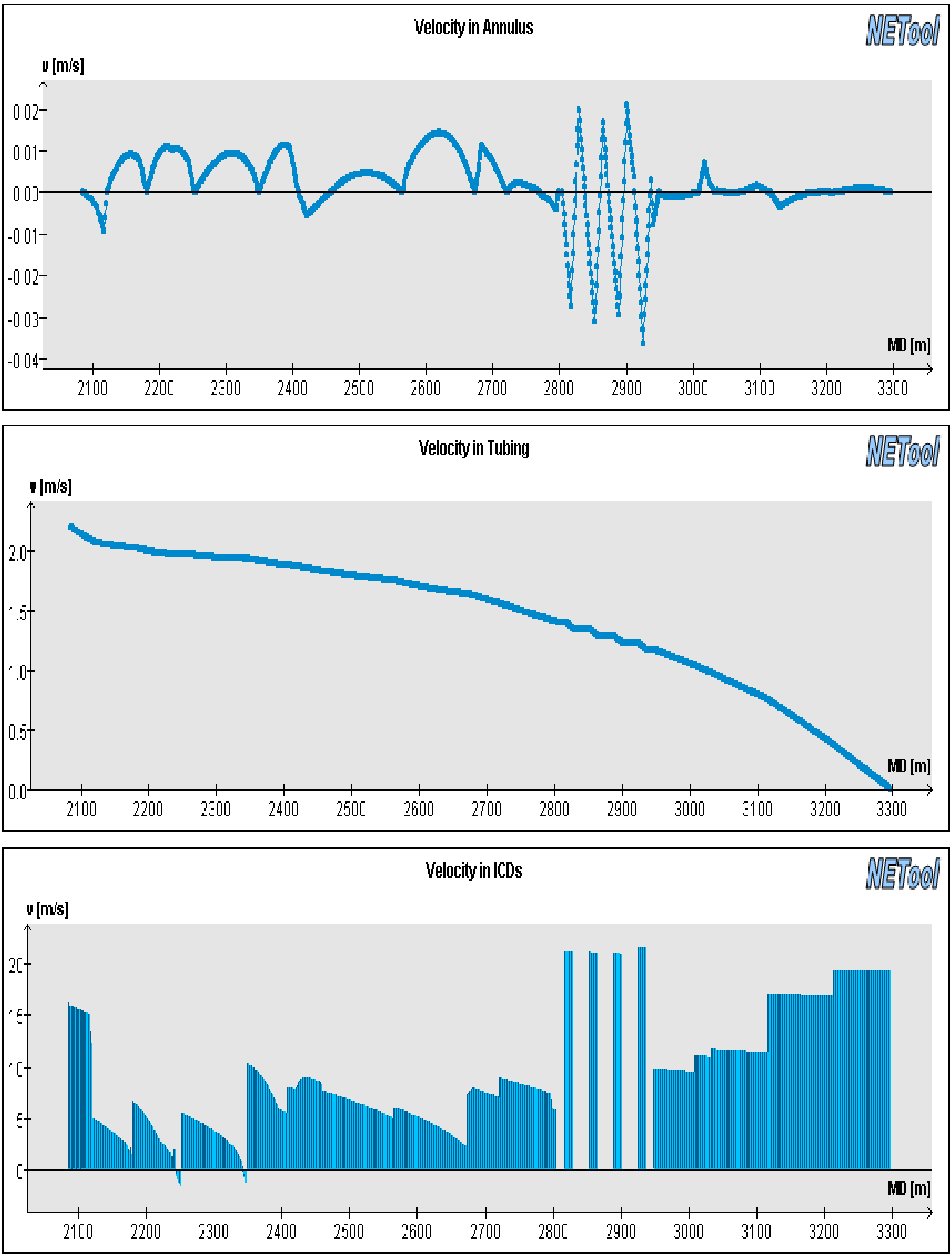
Influx of oil, gas and water from the reservoir and into the well along the wellbore



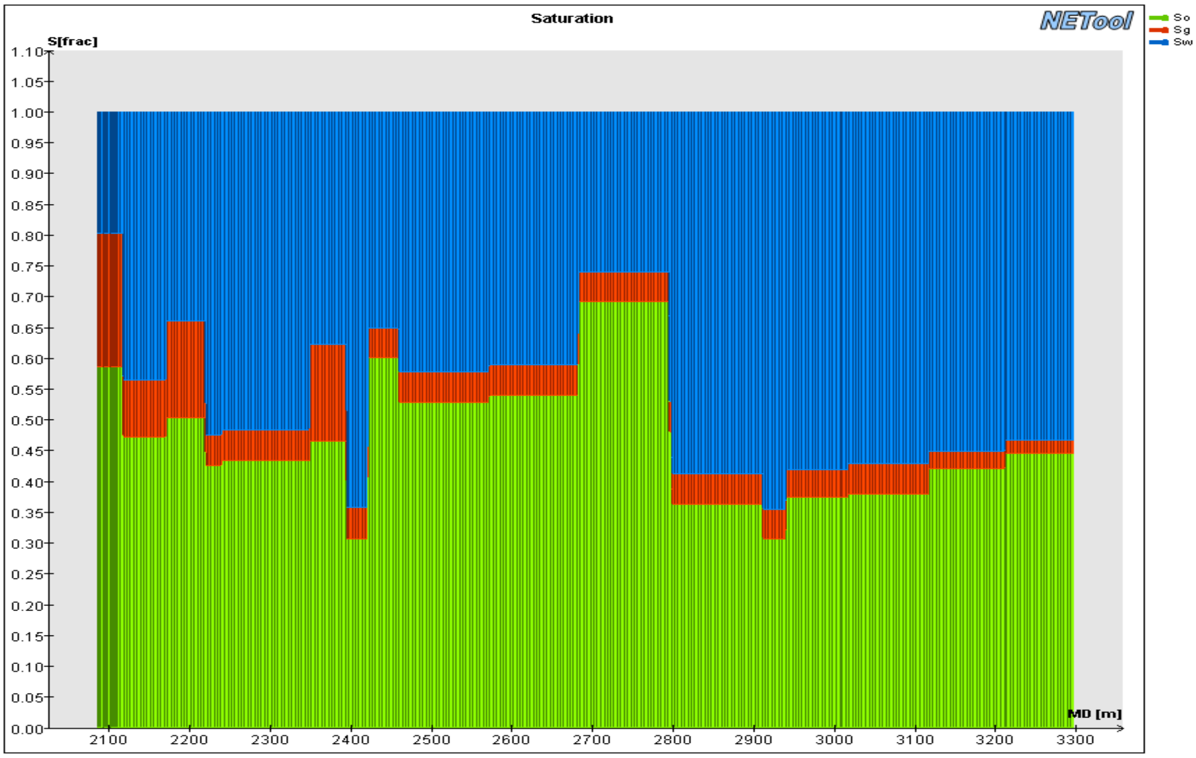
Annulus oil, gas and water flow rate along the wellbore



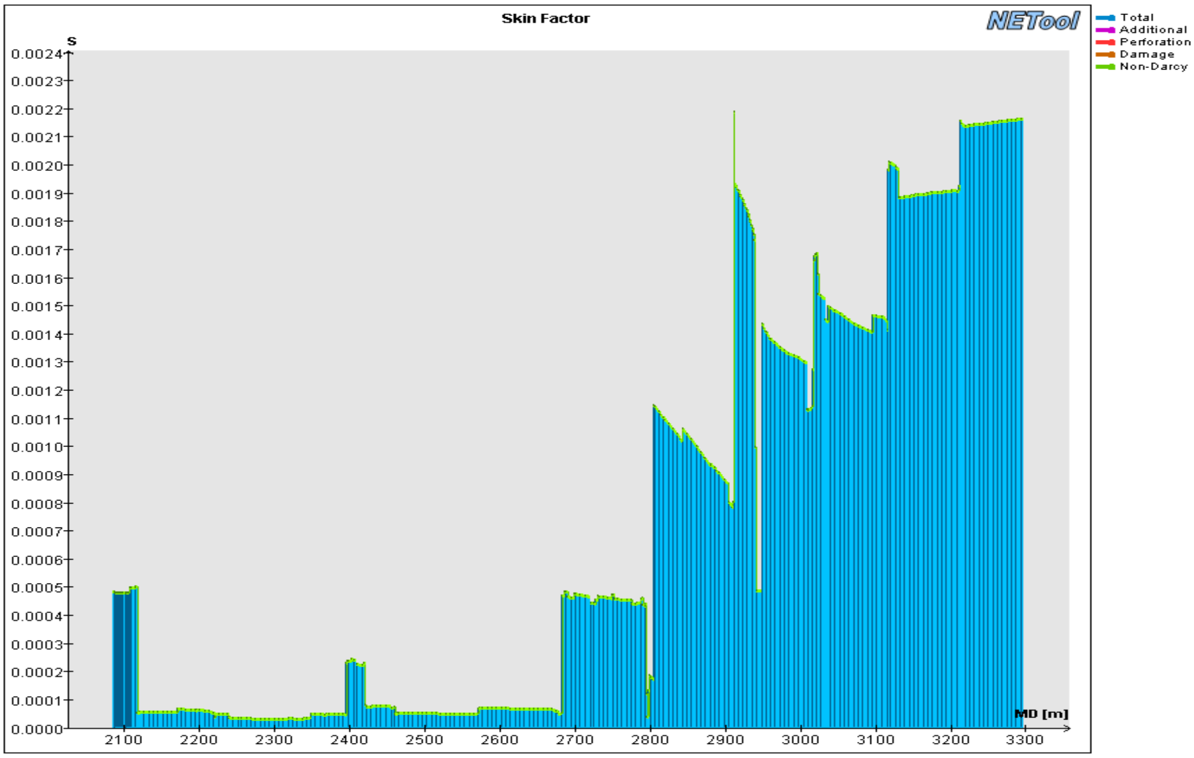
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



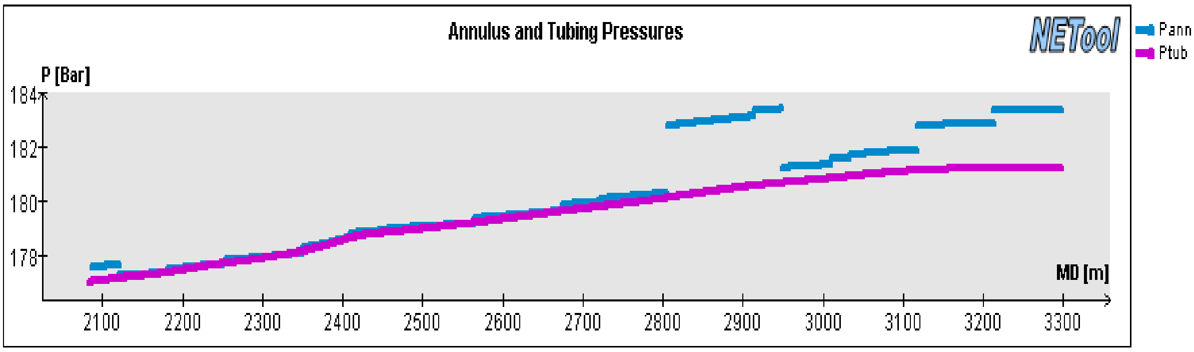
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

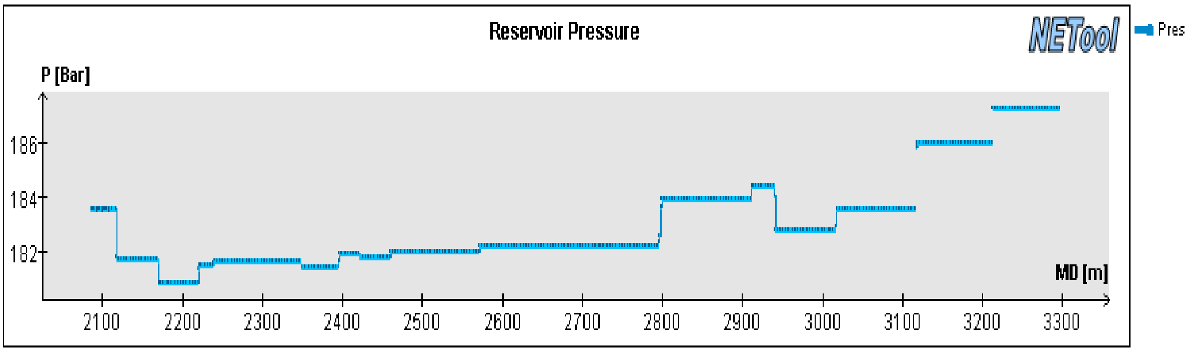


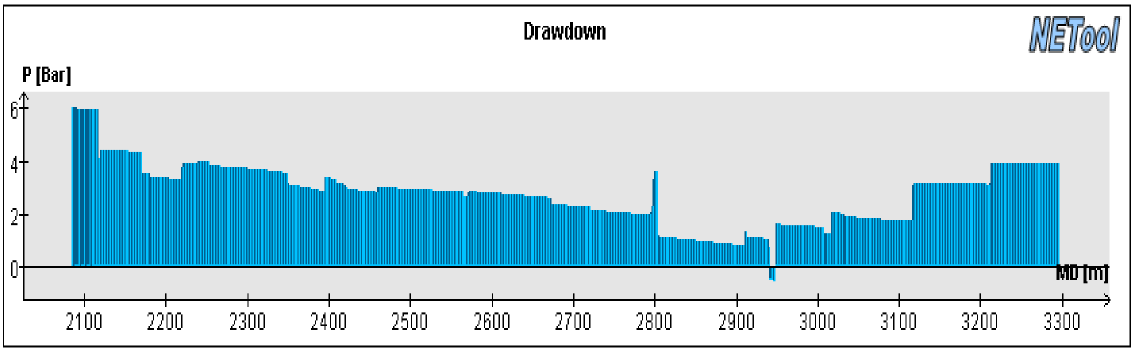
Skin factor plot for the well and given time step

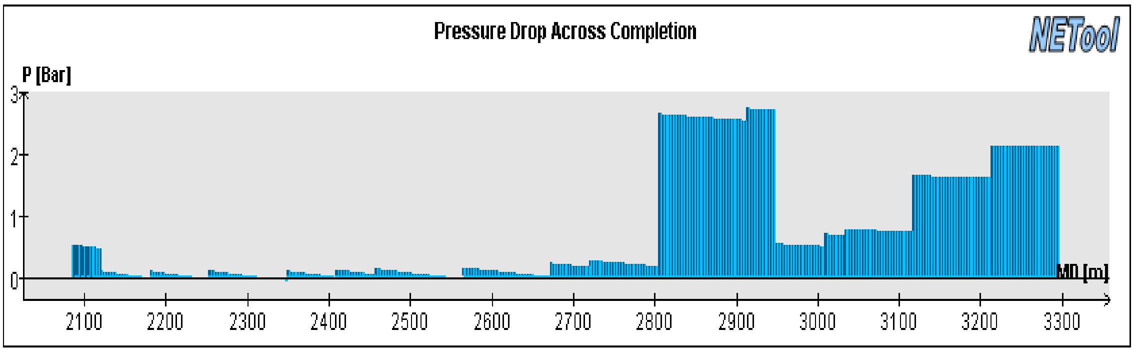
A.25 Plots for well KP7, 7305 days, Recommended ICD solution, 4x4mm ICD and BP

Completion overview for the case: see appendix A.10

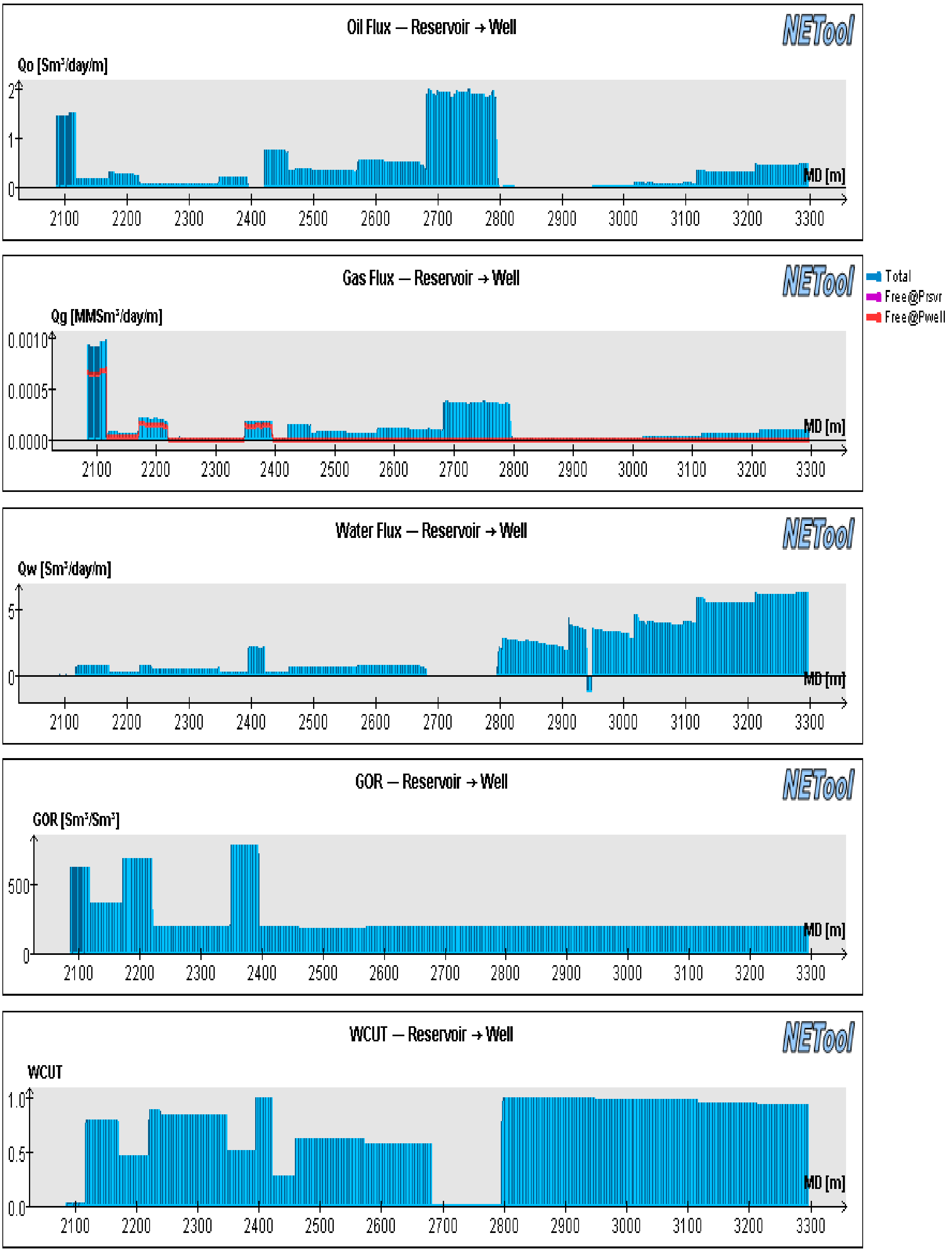




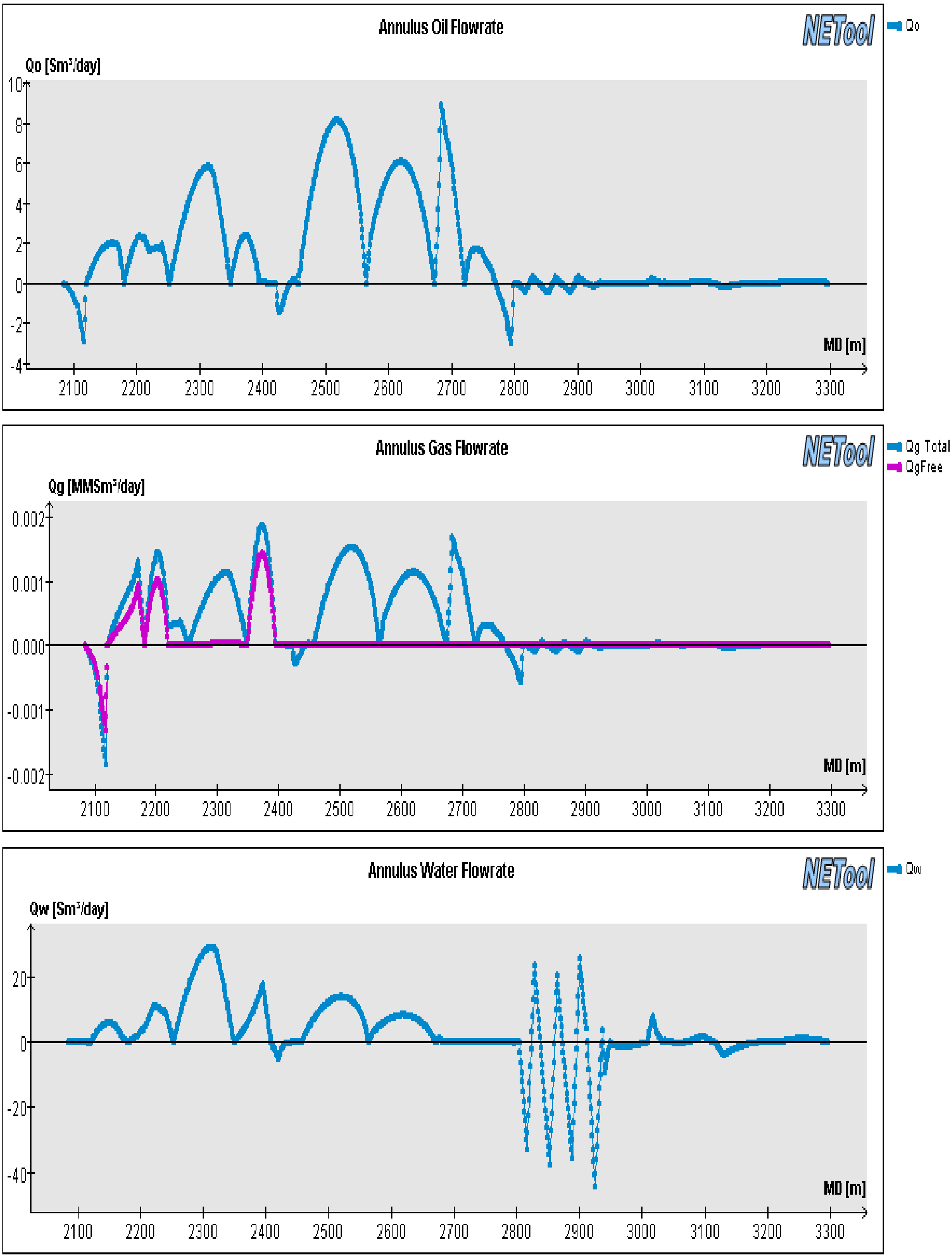




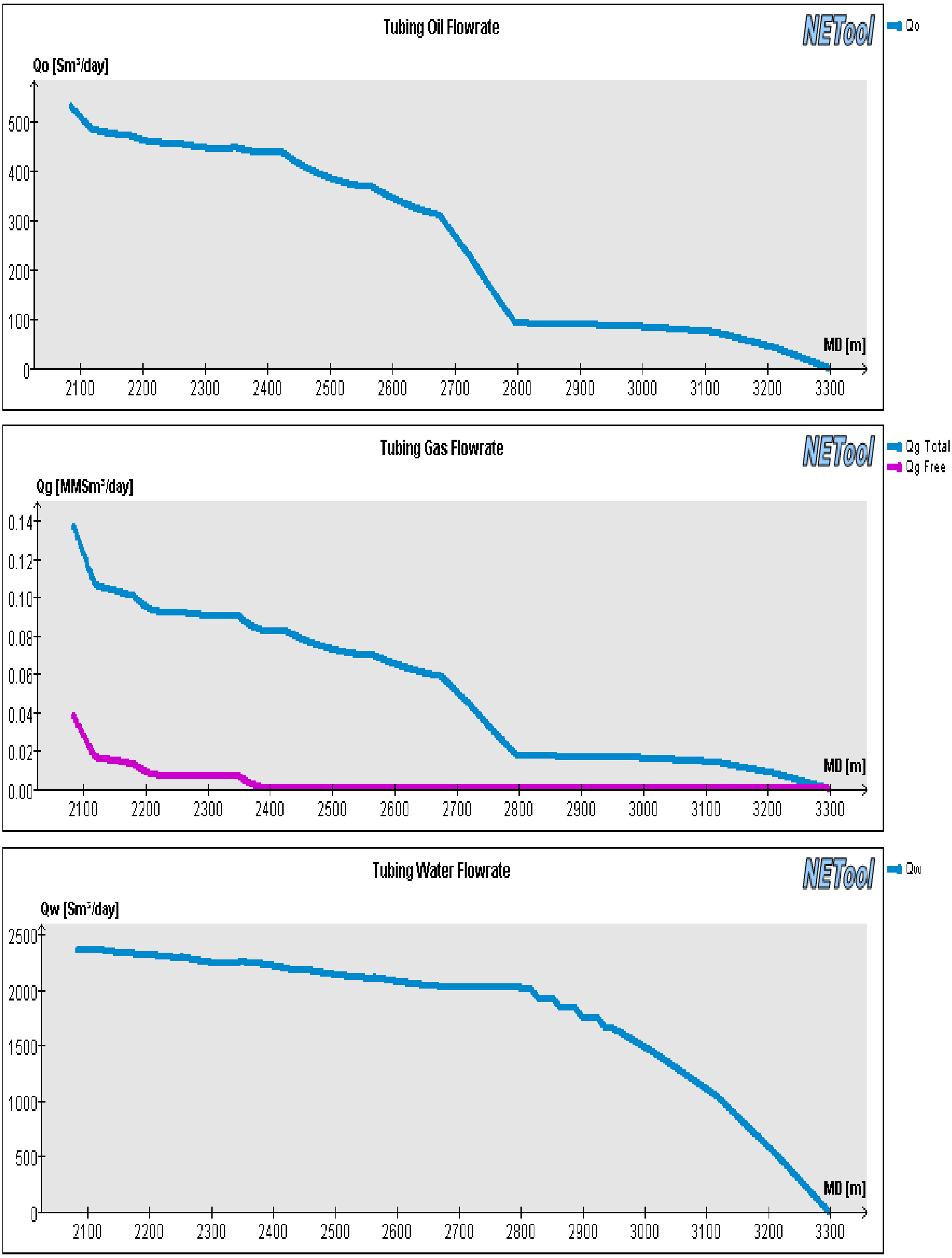
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



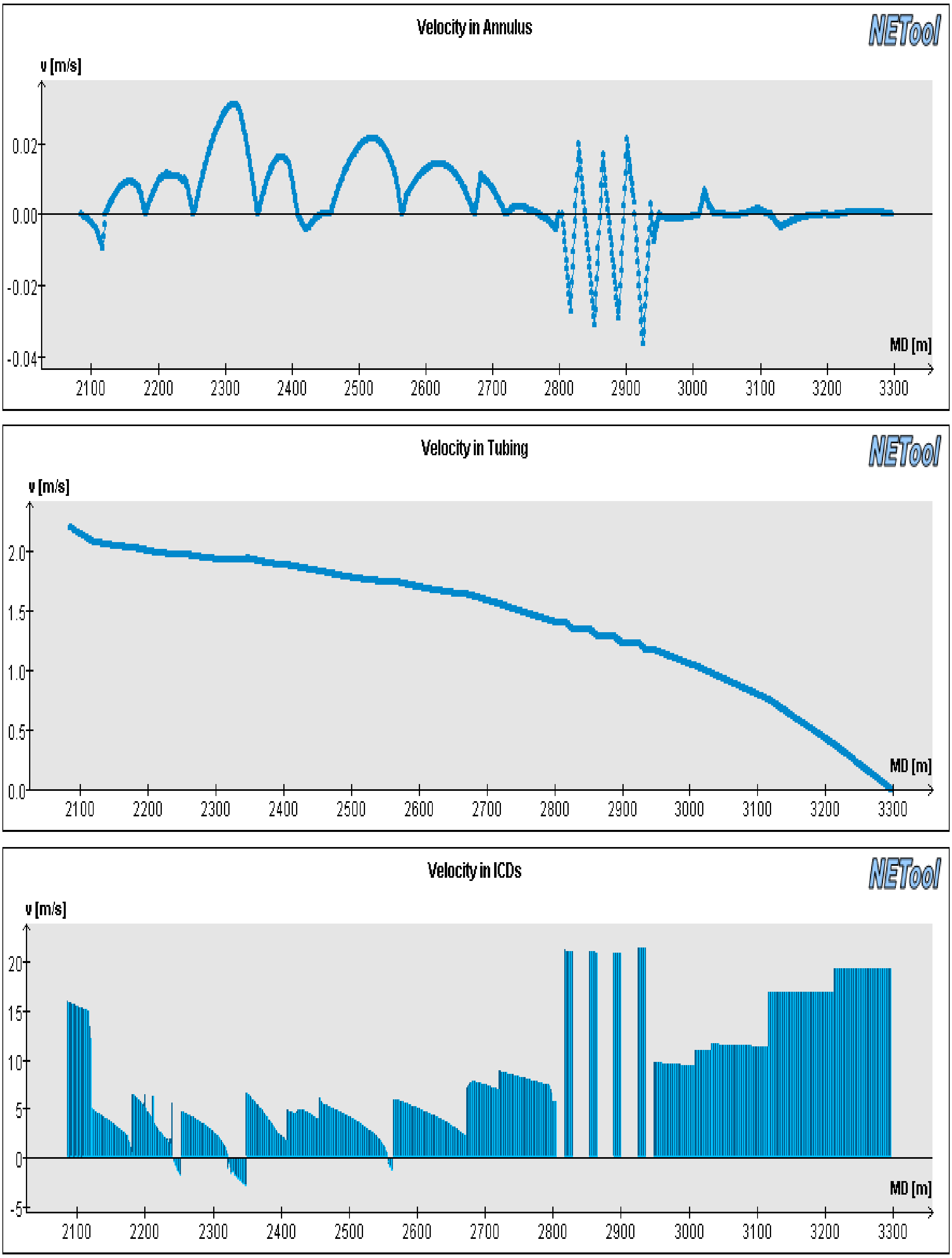
Influx of oil, gas and water from the reservoir and into the well along the wellbore



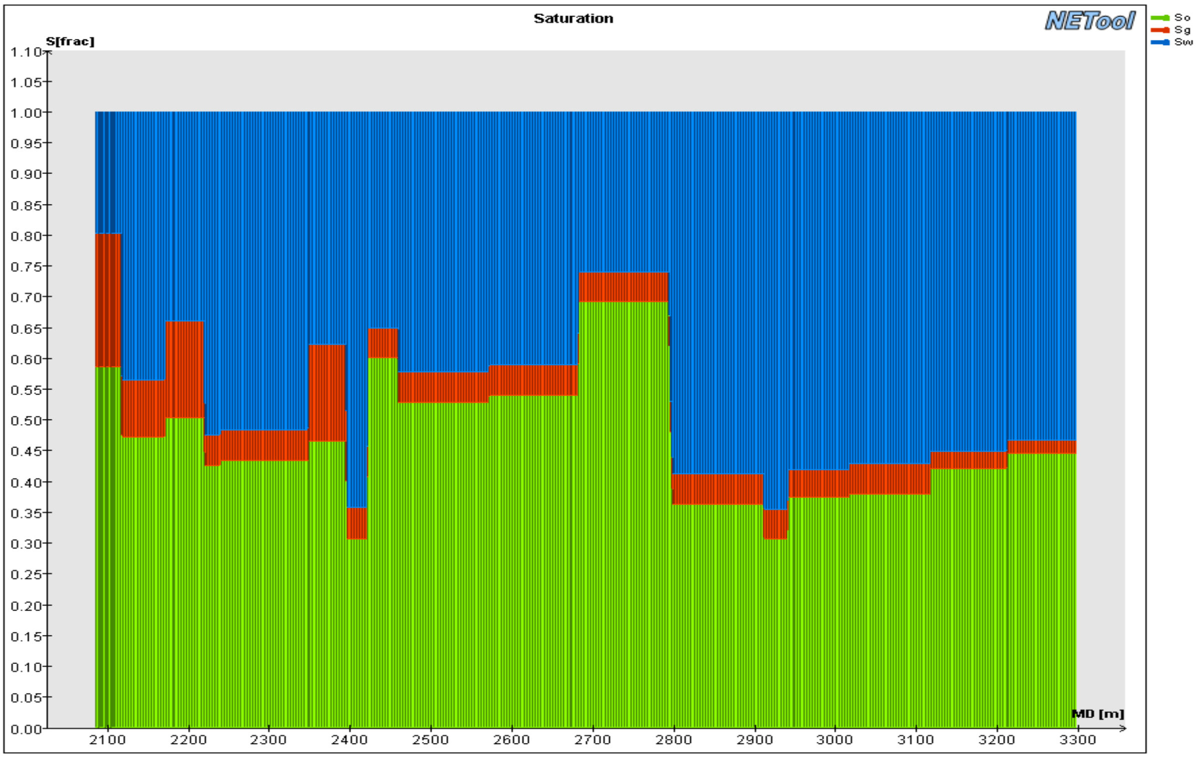
Annulus oil, gas and water flow rate along the wellbore



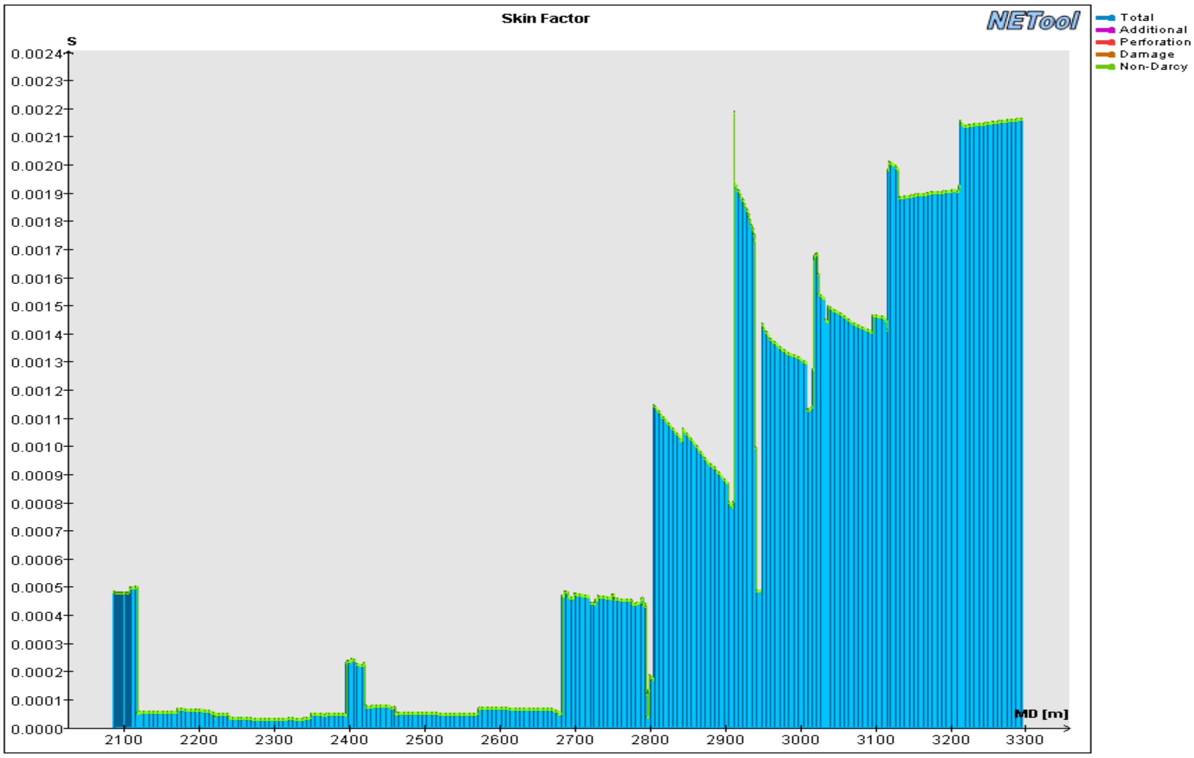
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



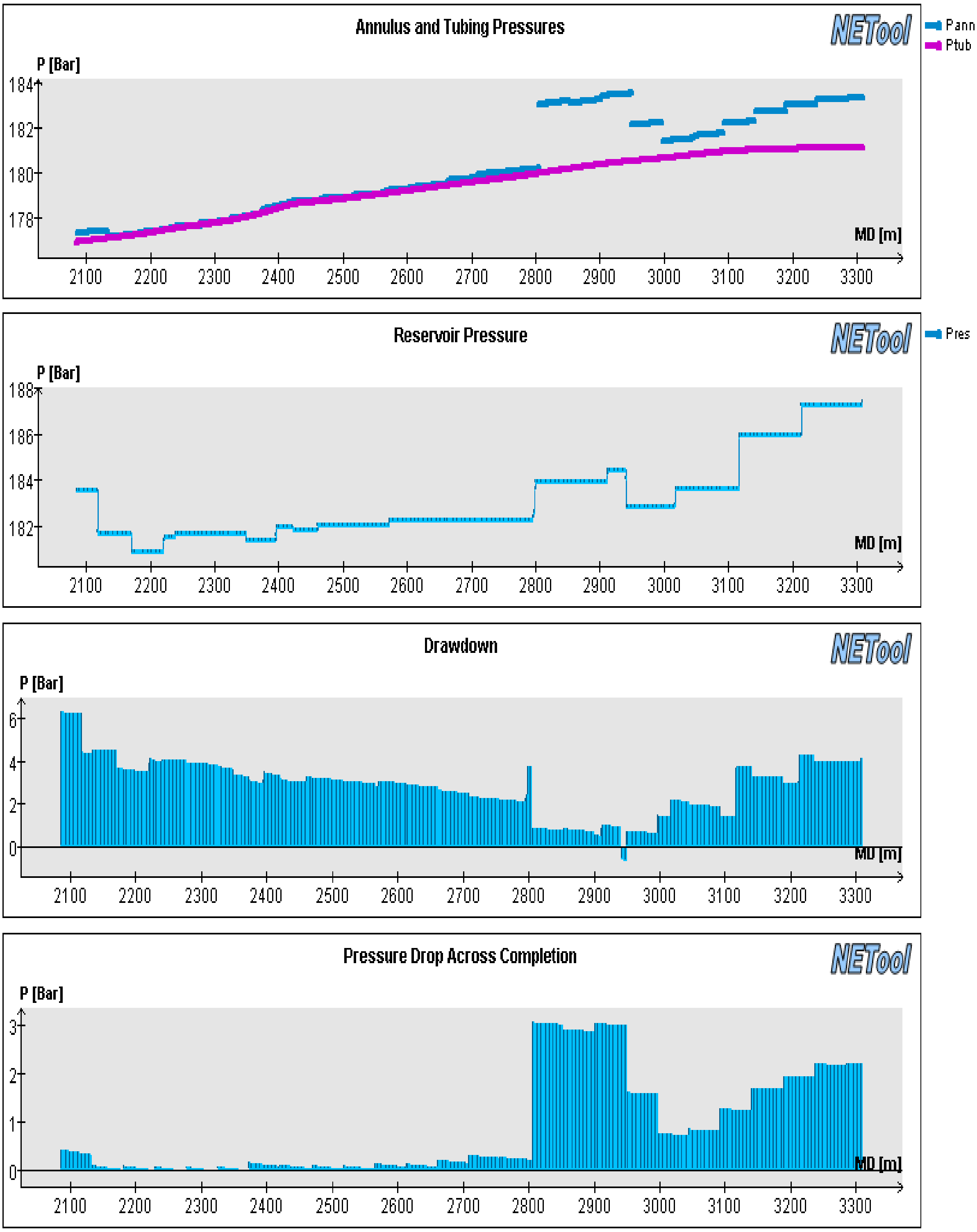
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



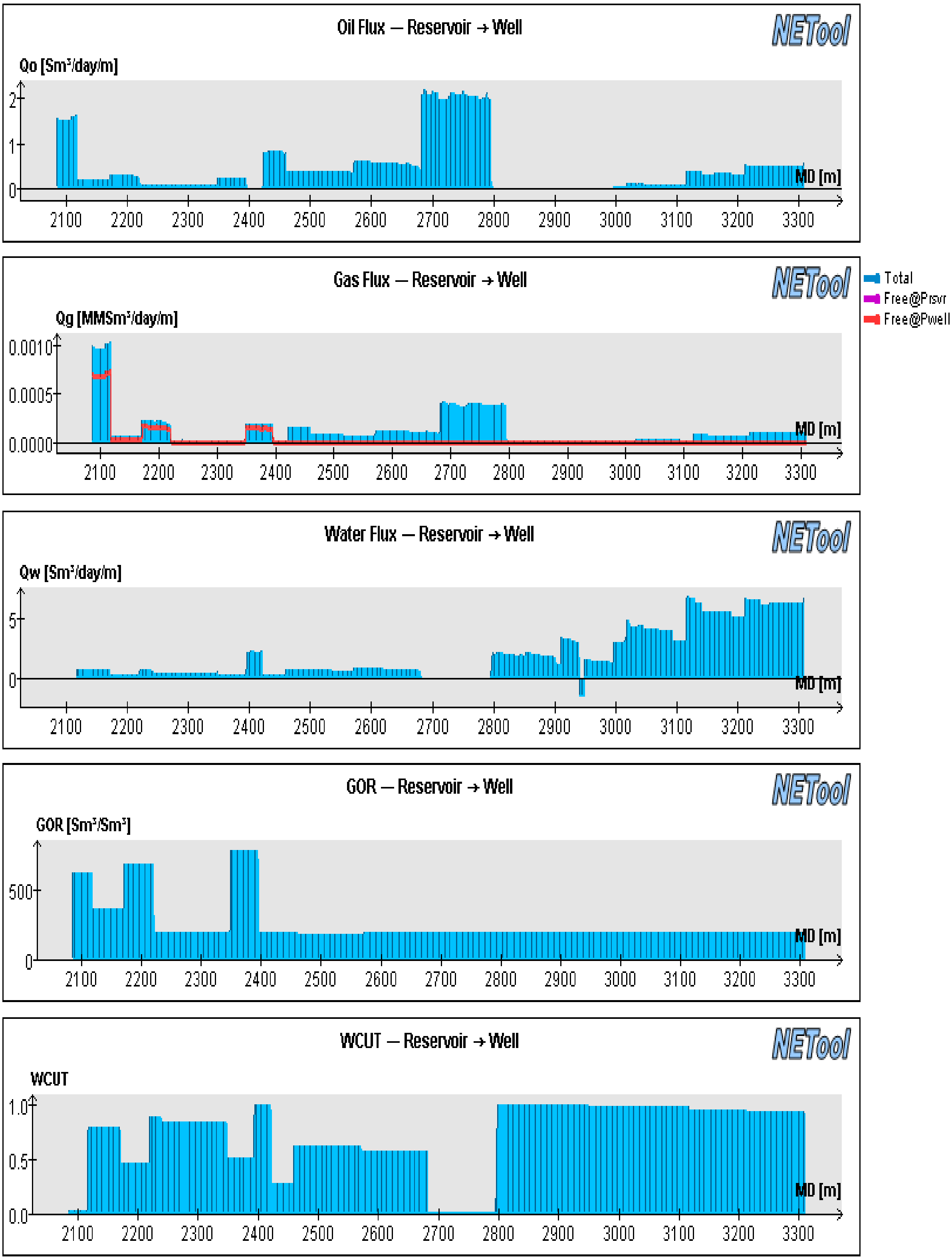
Skin factor plot for the well and given time step

A.26 Plots for well KP7, 7305 days, Practical ICD case, 4x4mm ICD and BP

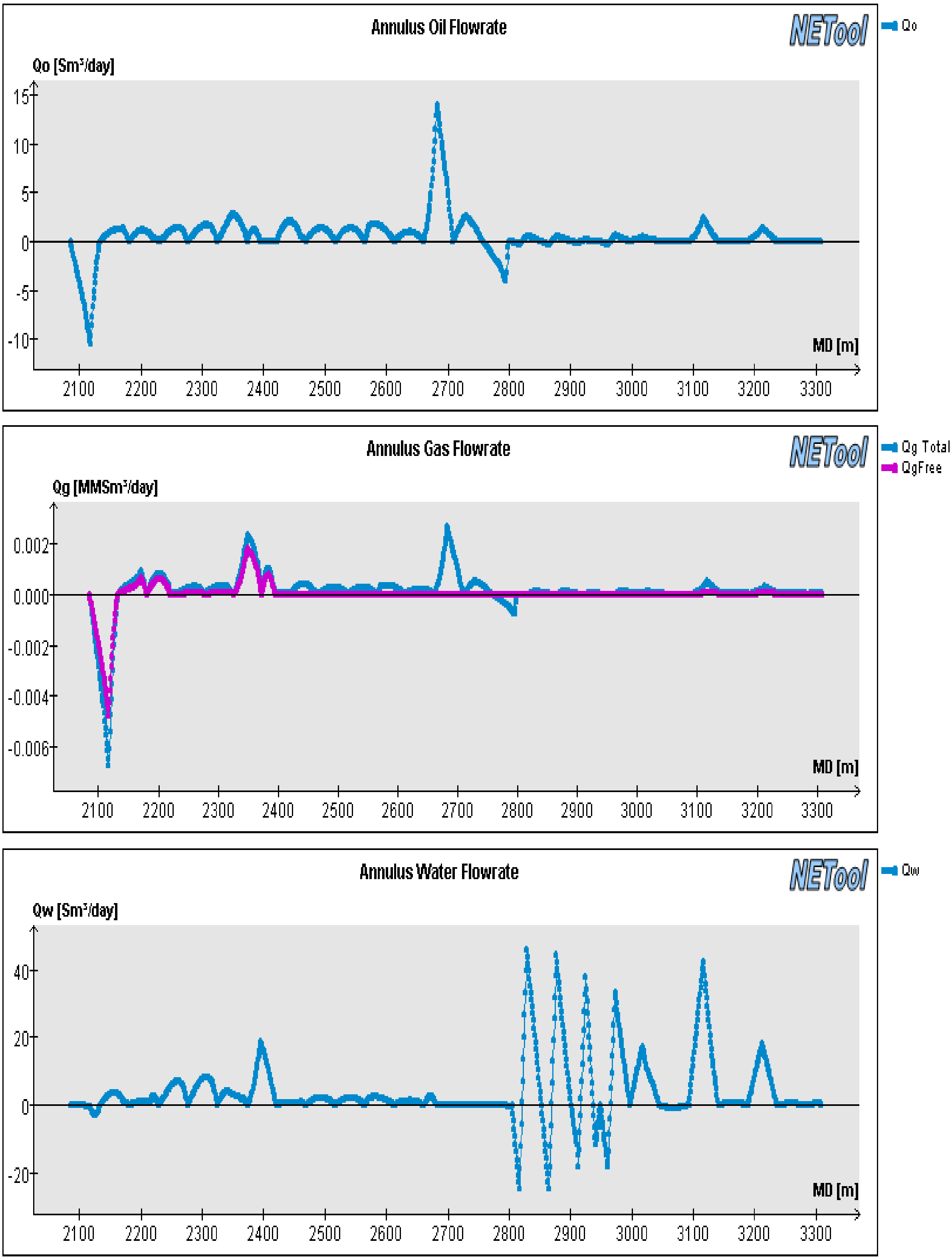
Completion overview for the case: see appendix A.12



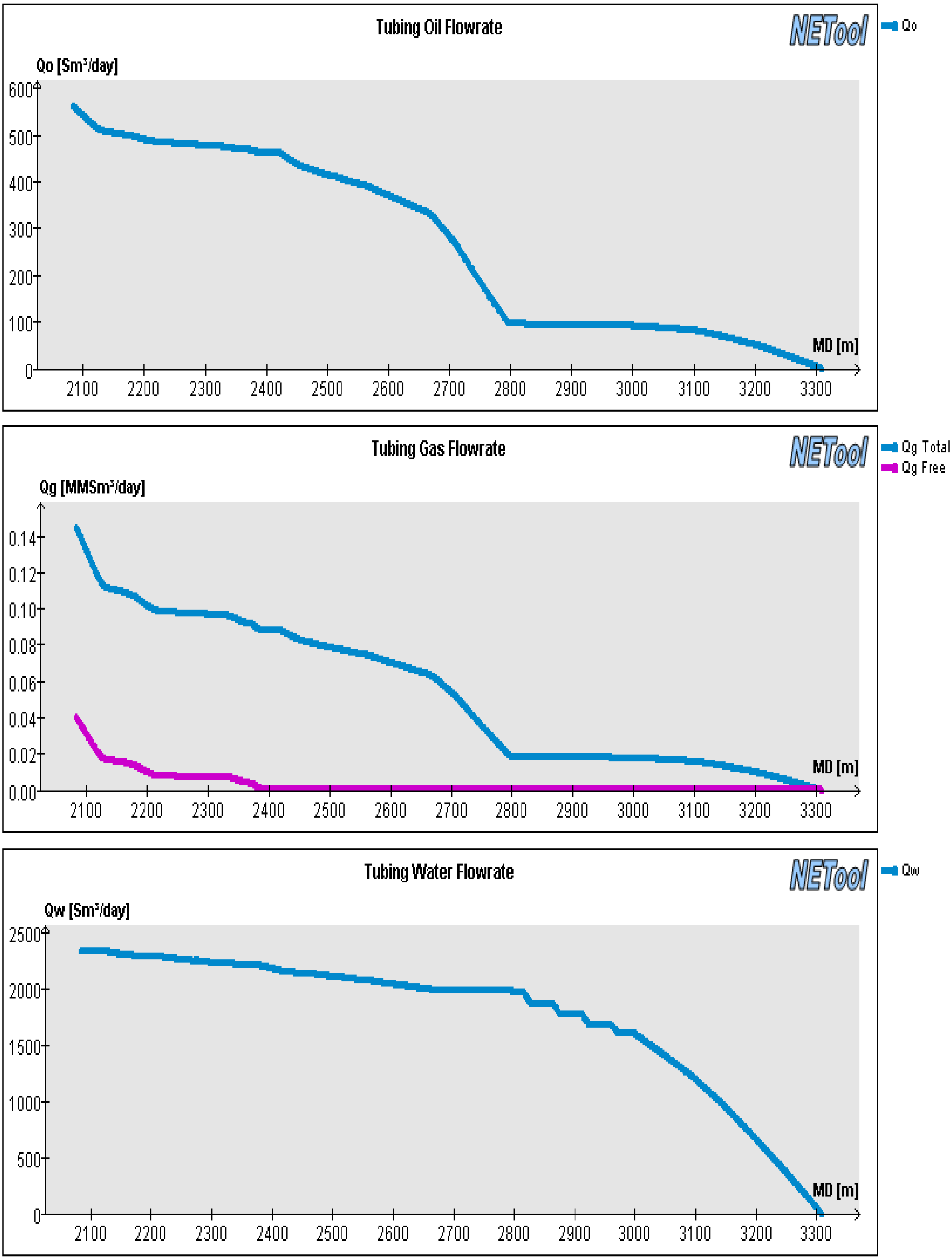
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



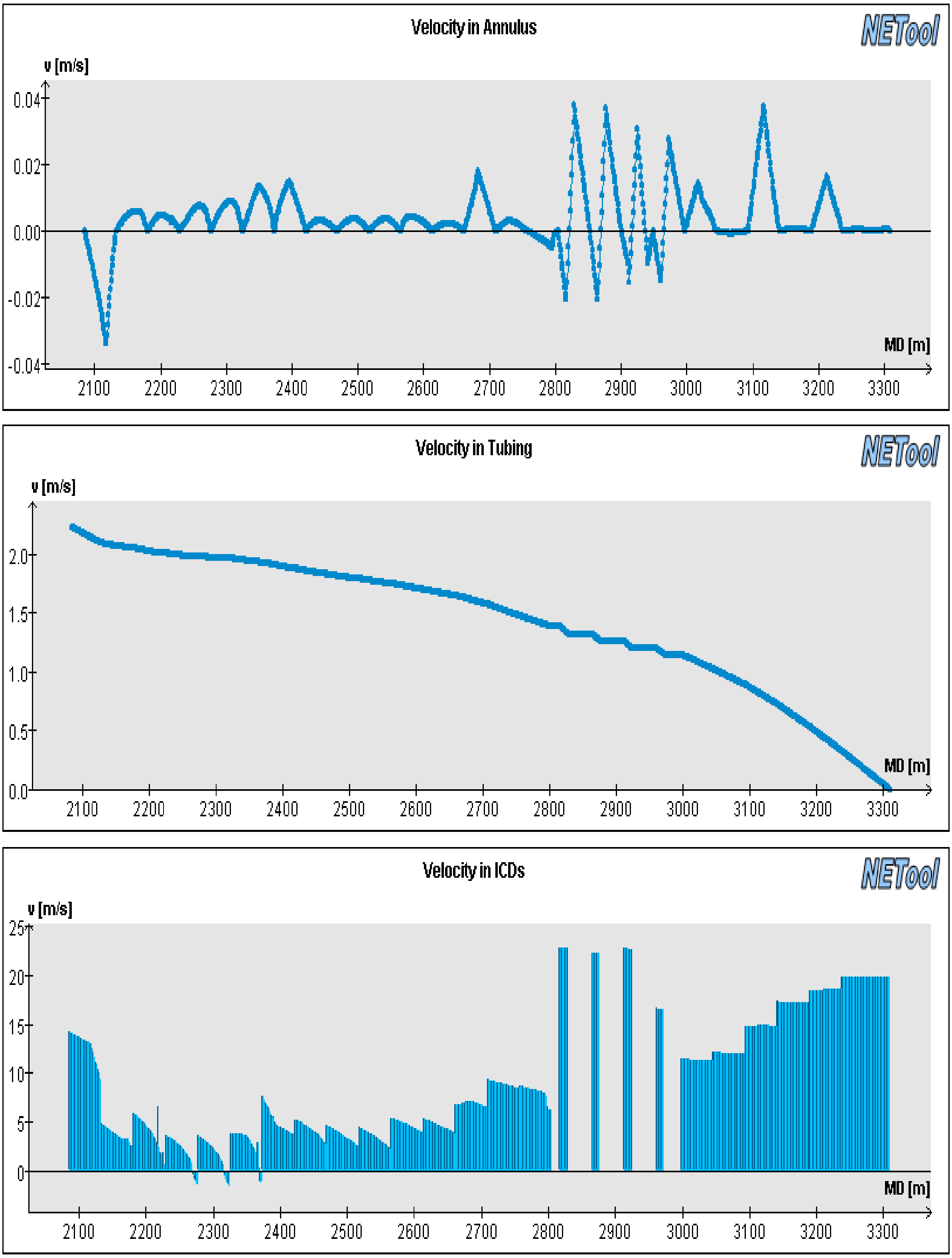
Influx of oil, gas and water from the reservoir and into the well along the wellbore



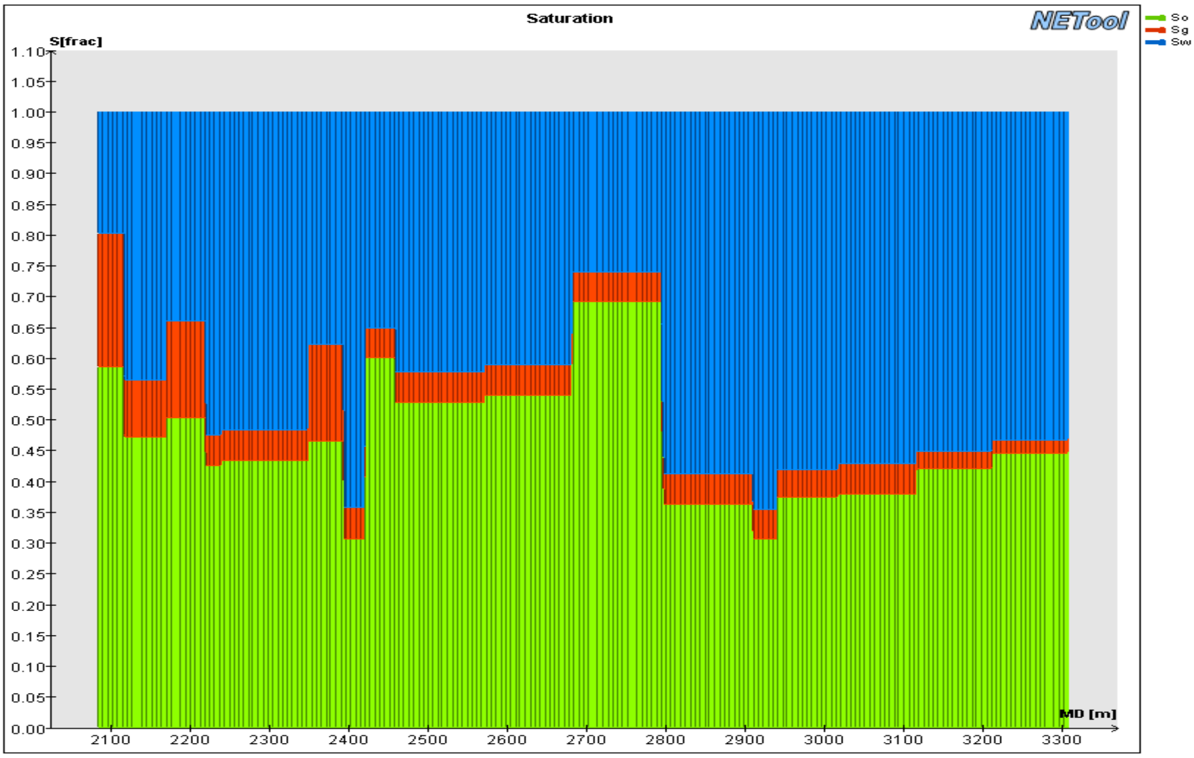
Annulus oil, gas and water flow rate along the wellbore



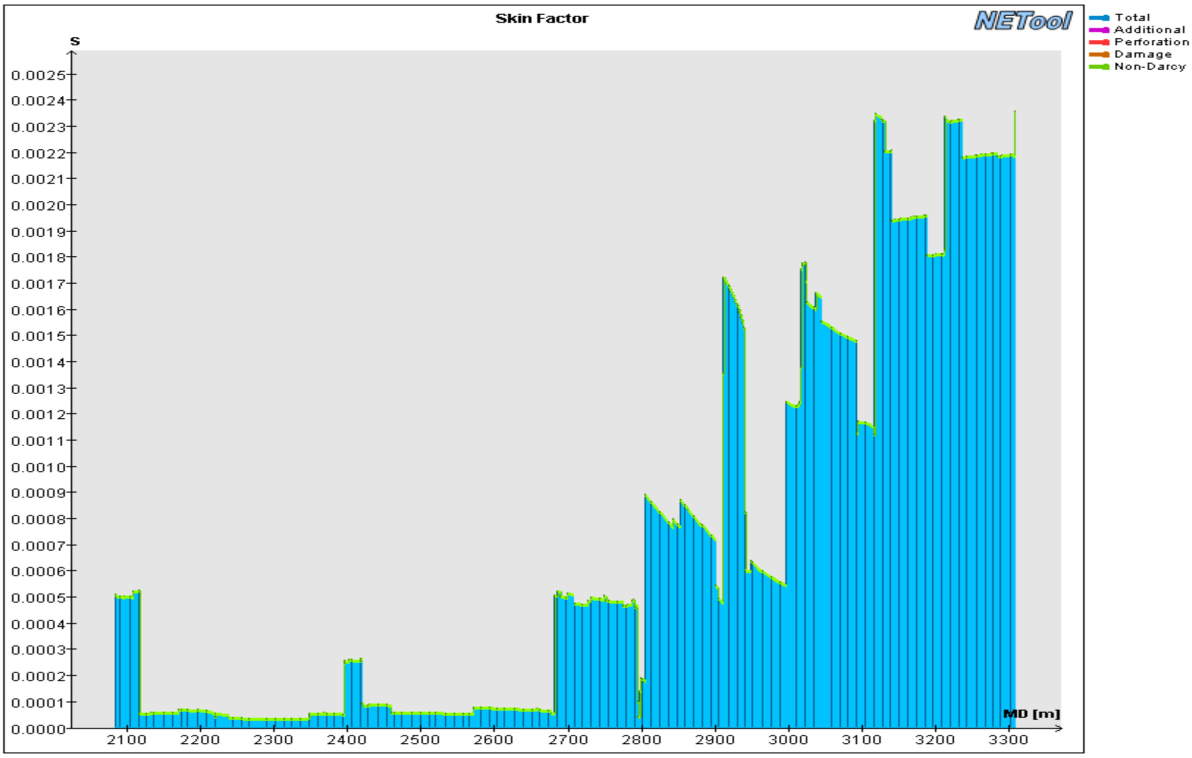
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



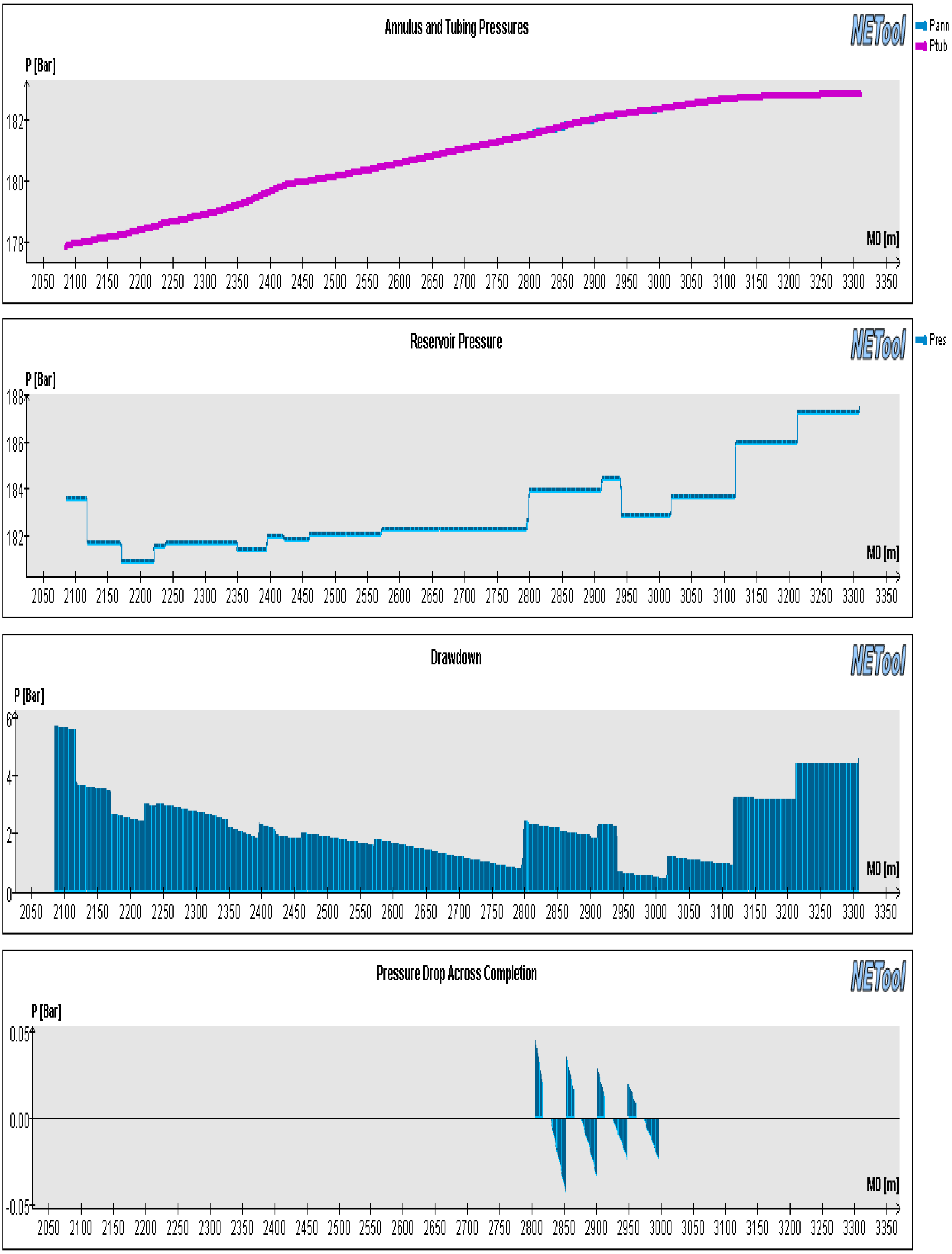
Skin factor plot for the well and given time step

A.27 Plots for well KP7, 7305 days, WWS case, no ICD

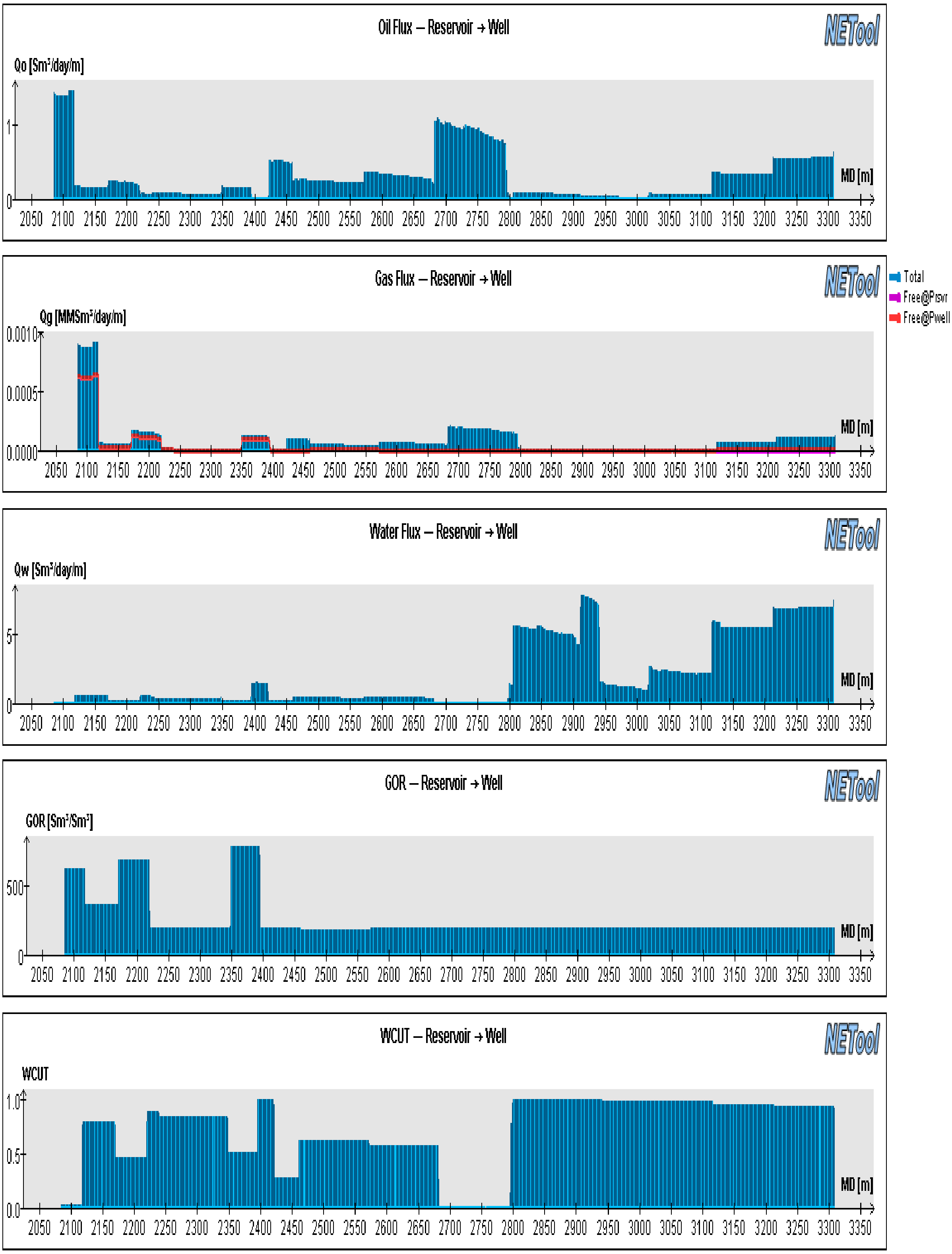
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2085	0,3	Cemented bp	-	-	No	No	N/A	36	2421	0,3	Packer	-	-	No	No	N/A
2	2085,3	11,7	WWS	-	-	Yes	Yes	No	37	2421	11,7	WWS	-	-	Yes	Yes	No
3	2097	12,0	WWS	-	-	Yes	Yes	No	38	2433,0	12,0	WWS	-	-	Yes	Yes	No
4	2109	12,0	WWS	-	-	Yes	Yes	No	39	2445	12,0	WWS	-	-	Yes	Yes	No
5	2121	12,0	WWS	-	-	Yes	Yes	No	40	2457	12,0	WWS	-	-	Yes	Yes	No
6	2133	0,3	Packer	-	-	No	No	N/A	41	2469	0,3	Packer	-	-	No	No	N/A
7	2133,3	11,7	WWS	-	-	Yes	Yes	No	42	2469	11,7	WWS	-	-	Yes	Yes	No
8	2145	12,0	WWS	-	-	Yes	Yes	No	43	2481	12,0	WWS	-	-	Yes	Yes	No
9	2157	12,0	WWS	-	-	Yes	Yes	No	44	2493	12,0	WWS	-	-	Yes	Yes	No
10	2169	12,0	WWS	-	-	Yes	Yes	No	45	2505	12,0	WWS	-	-	Yes	Yes	No
11	2181	0,3	Packer	-	-	No	No	N/A	46	2517	0,3	Packer	-	-	No	No	N/A
12	2181,3	11,7	WWS	-	-	Yes	Yes	No	47	2517	11,7	WWS	-	-	Yes	Yes	No
13	2193	12,0	WWS	-	-	Yes	Yes	No	48	2529	12,0	WWS	-	-	Yes	Yes	No
14	2205	12,0	WWS	-	-	Yes	Yes	No	49	2541	12,0	WWS	-	-	Yes	Yes	No
15	2217	12,0	WWS	-	-	Yes	Yes	No	50	2553	12,0	WWS	-	-	Yes	Yes	No
16	2229	0,3	Packer	-	-	No	No	N/A	51	2565	0,3	Packer	-	-	No	No	N/A
17	2229,3	11,7	WWS	-	-	Yes	Yes	No	52	2565	11,7	WWS	-	-	Yes	Yes	No
18	2241	12,0	WWS	-	-	Yes	Yes	No	53	2577	12,0	WWS	-	-	Yes	Yes	No
19	2253	12,0	WWS	-	-	Yes	Yes	No	54	2589	12,0	WWS	-	-	Yes	Yes	No
20	2265	12,0	WWS	-	-	Yes	Yes	No	55	2601	12,0	WWS	-	-	Yes	Yes	No
21	2277	0,3	Packer	-	-	No	No	N/A	56	2613	0,3	Packer	-	-	No	No	N/A
22	2277,3	11,7	WWS	-	-	Yes	Yes	No	57	2613	11,7	WWS	-	-	Yes	Yes	No
23	2289	12,0	WWS	-	-	Yes	Yes	No	58	2625	11,7	WWS	-	-	Yes	Yes	No
24	2301	12,0	WWS	-	-	Yes	Yes	No	59	2637	12,0	WWS	-	-	Yes	Yes	No
25	2313	12,0	WWS	-	-	Yes	Yes	No	60	2649	12,0	WWS	-	-	Yes	Yes	No
26	2325	0,3	Packer	-	-	No	No	N/A	61	2661	0,3	Packer	-	-	No	No	N/A
27	2325,3	11,7	WWS	-	-	Yes	Yes	No	62	2661	11,7	WWS	-	-	Yes	Yes	No
28	2337	12,0	WWS	-	-	Yes	Yes	No	63	2673	12,0	WWS	-	-	Yes	Yes	No
29	2349	12,0	WWS	-	-	Yes	Yes	No	64	2685	12,0	WWS	-	-	Yes	Yes	No
30	2361	12,0	WWS	-	-	Yes	Yes	No	65	2697	12,0	WWS	-	-	Yes	Yes	No
31	2373	0,3	Packer	-	-	No	No	N/A	66	2709	0,3	Packer	-	-	No	No	N/A
32	2373,3	11,7	WWS	-	-	Yes	Yes	No	67	2709	11,7	WWS	-	-	Yes	Yes	No
33	2385	12,0	WWS	-	-	Yes	Yes	No	68	2721	12,0	WWS	-	-	Yes	Yes	No
34	2397	12,0	WWS	-	-	Yes	Yes	No	69	2733	12,0	WWS	-	-	Yes	Yes	No
35	2409	12,0	WWS	-	-	Yes	Yes	No	70	2745	12,0	WWS	-	-	Yes	Yes	No

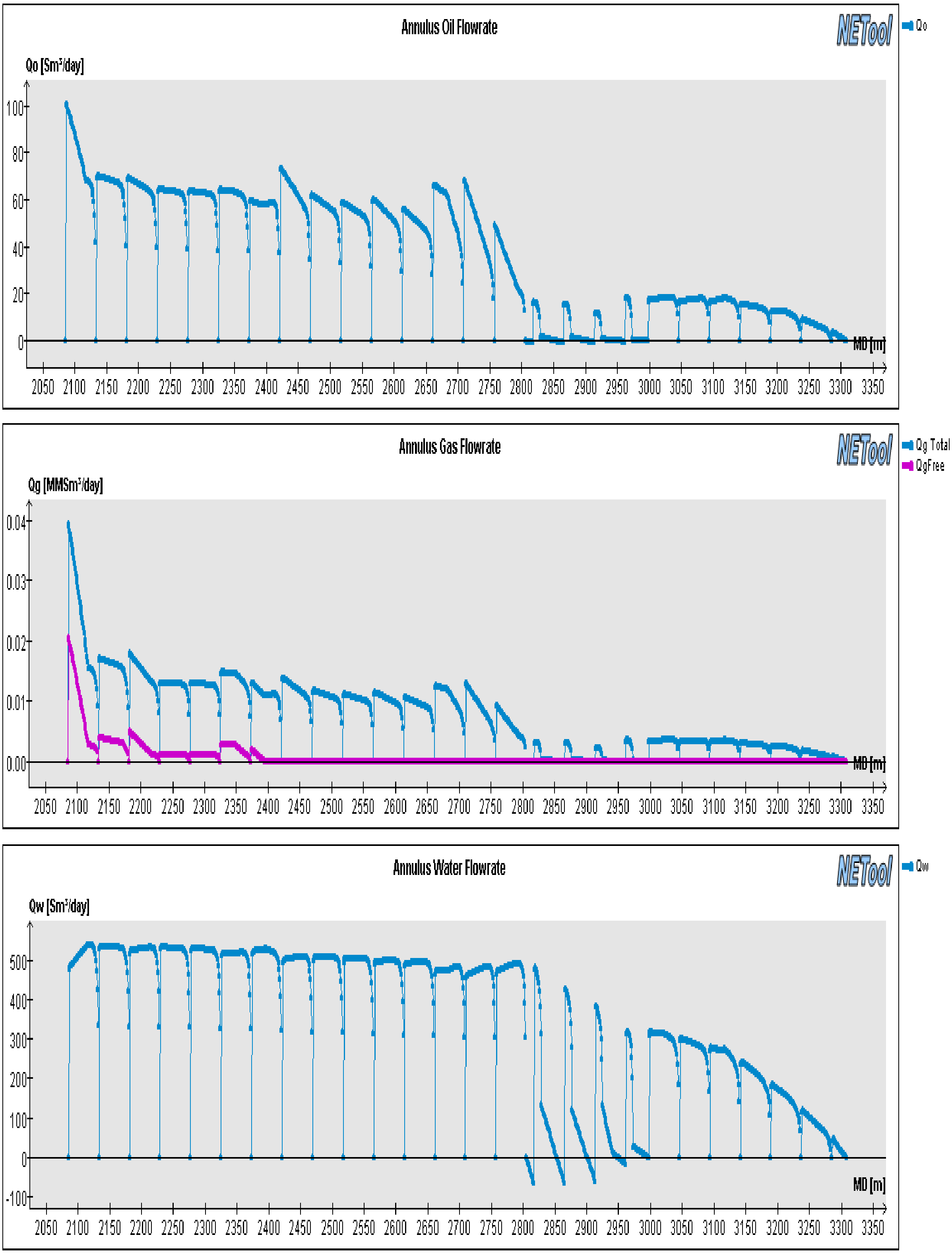
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	2756,7	0,3	Packer	-	-	No	No	N/A	102	3033,3	12,0	WWS	-	-	Yes	Yes	No
72	2757	11,7	WWS	-	-	Yes	Yes	No	103	3045,3	12,0	WWS	-	-	Yes	Yes	No
73	2768,7	12,0	WWS	-	-	Yes	Yes	No	104	3057,3	12,0	WWS	-	-	Yes	Yes	No
74	2780,7	12,0	WWS	-	-	Yes	Yes	No	105	3069,3	12,0	WWS	-	-	Yes	Yes	No
75	2792,7	12,0	WWS	-	-	Yes	Yes	No	106	3081,3	0,3	Packer	-	-	No	No	N/A
76	2804,7	0,3	WWS	-	-	No	No	N/A	107	3081,6	11,7	WWS	-	-	Yes	Yes	No
77	2805	11,7	WWS	-	-	Yes	Yes	No	108	3093,3	12,0	WWS	-	-	Yes	Yes	No
78	2816,7	12,0	WWS	-	-	Yes	Yes	No	109	3105,3	12,0	WWS	-	-	Yes	Yes	No
79	2828,7	12,0	WWS	-	-	Yes	Yes	No	110	3117,3	12,0	WWS	-	-	Yes	Yes	No
80	2840,7	0,3	WWS	-	-	Yes	Yes	No	111	3129,3	0,3	Packer	-	-	No	No	N/A
81	2841	0,3	WWS	-	-	No	No	N/A	112	3129,6	11,7	WWS	-	-	Yes	Yes	No
82	2841,3	11,7	WWS	-	-	Yes	Yes	No	113	3141,3	12,0	WWS	-	-	Yes	Yes	No
83	2853	12,0	WWS	-	-	Yes	Yes	No	114	3153,3	12,0	WWS	-	-	Yes	Yes	No
84	2865	12,0	WWS	-	-	Yes	Yes	No	115	3165,3	12,0	WWS	-	-	Yes	Yes	No
85	2877	12,0	WWS	-	-	Yes	Yes	No	116	3177,3	0,3	Packer	-	-	No	No	N/A
86	2889	0,3	WWS	-	-	No	No	N/A	117	3177,6	12,0	WWS	-	-	Yes	Yes	No
87	2889,3	11,7	WWS	-	-	Yes	Yes	No	118	3189,6	12,0	WWS	-	-	Yes	Yes	No
88	2901	12,0	WWS	-	-	Yes	Yes	No	119	3201,6	12,0	WWS	-	-	Yes	Yes	No
89	2913	12,0	WWS	-	-	Yes	Yes	No	120	3213,6	12,0	WWS	-	-	Yes	Yes	No
90	2925	12,0	WWS	-	-	Yes	Yes	No	121	3225,6	0,3	Packer	-	-	No	No	N/A
91	2937	0,3	WWS	-	-	No	No	N/A	122	3225,9	11,7	WWS	-	-	Yes	Yes	No
92	2937,3	11,7	WWS	-	-	Yes	Yes	No	123	3237,6	12,0	WWS	-	-	Yes	Yes	No
93	2949	12,0	WWS	-	-	Yes	Yes	No	124	3249,6	12,0	WWS	-	-	Yes	Yes	No
94	2961	12,0	WWS	-	-	Yes	Yes	No	125	3261,6	12,0	WWS	-	-	Yes	Yes	No
95	2973	12,0	WWS	-	-	Yes	Yes	No	126	3273,6	0,3	Packer	-	-	No	No	N/A
96	2985	0,3	WWS	-	-	No	No	N/A	127	3273,9	11,7	WWS	-	-	Yes	Yes	No
97	2985,3	11,7	WWS	-	-	Yes	Yes	No	128	3285,6	12	WWS	-	-	Yes	Yes	No
98	2997	12,0	WWS	-	-	Yes	Yes	No	129	3297,6	12,4	WWS	-	-	Yes	Yes	No
99	3009	12,0	WWS	-	-	Yes	Yes	No	TOE	3310,0							
100	3021	12,0	WWS	-	-	Yes	Yes	No									
101	3033	0,3	Packer	-	-	No	No	N/A									



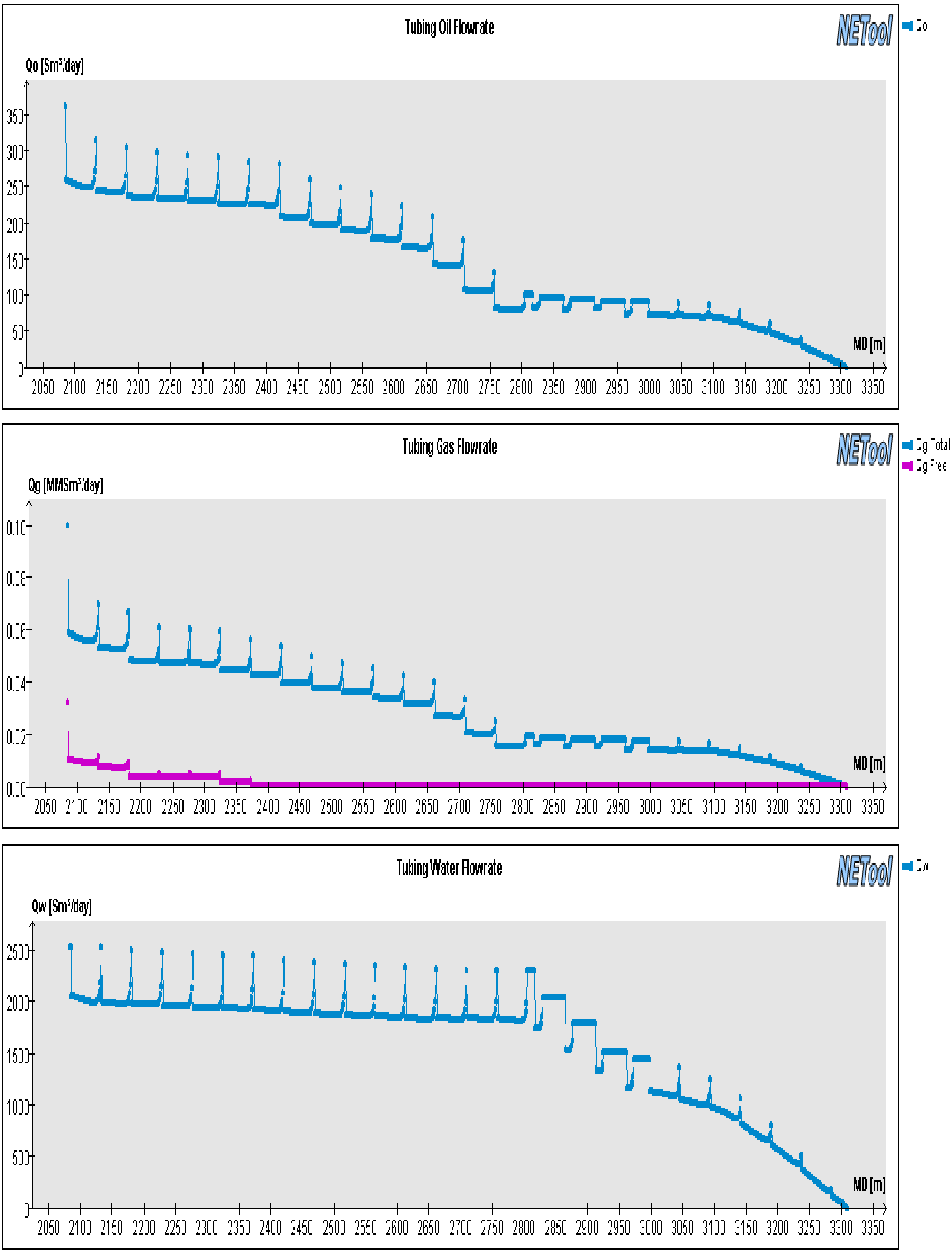
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



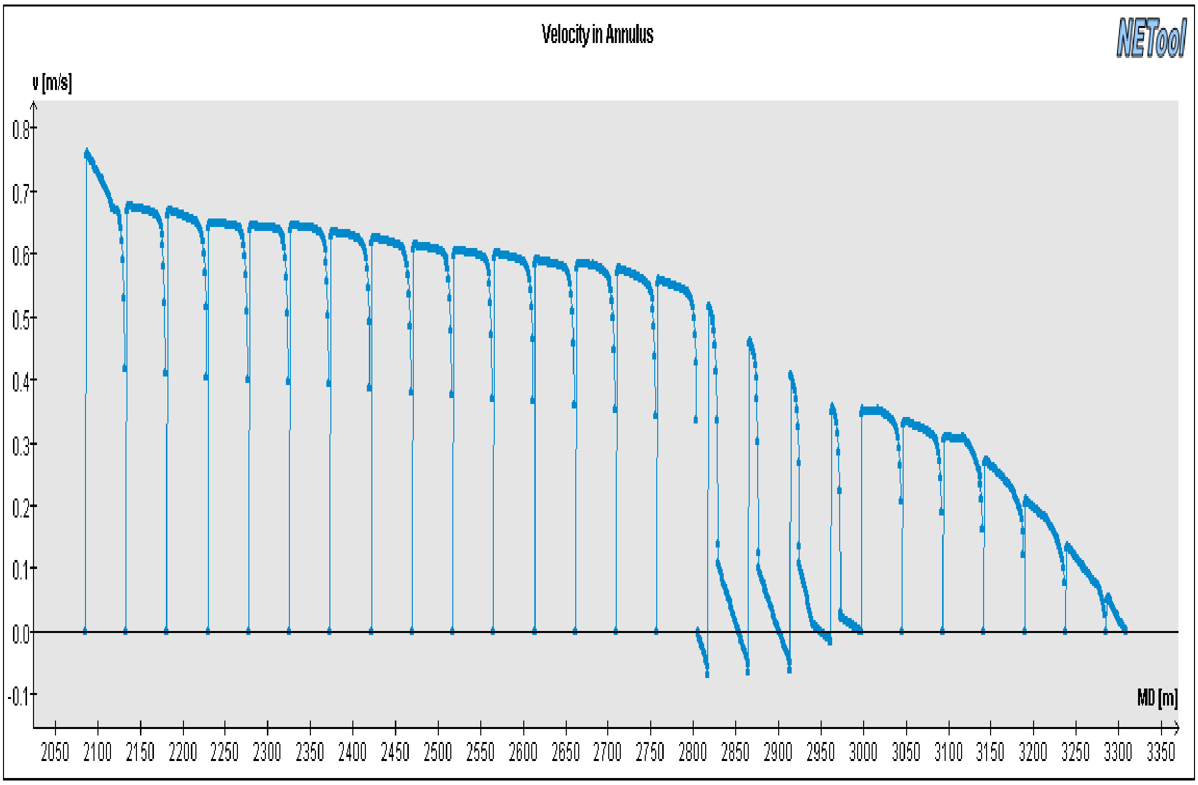
Influx of oil, gas and water from the reservoir and into the well along the wellbore

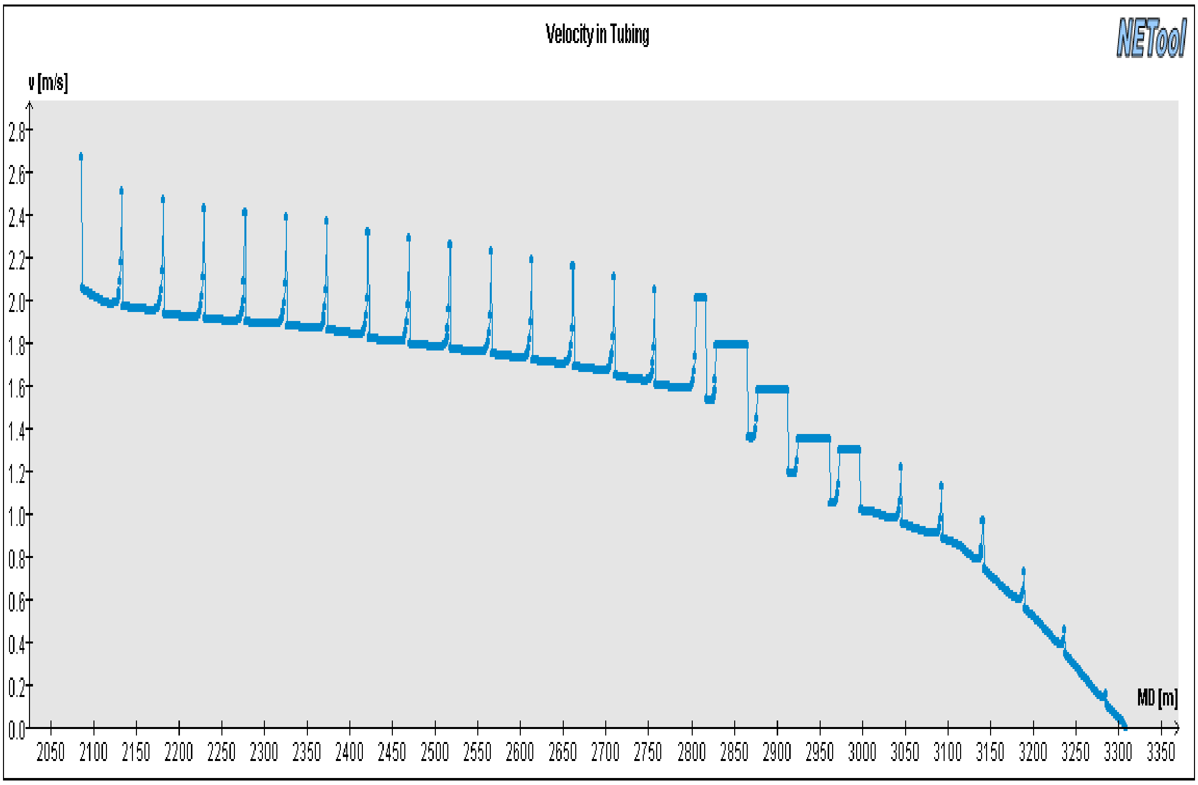


Annulus oil, gas and water flow rate along the wellbore

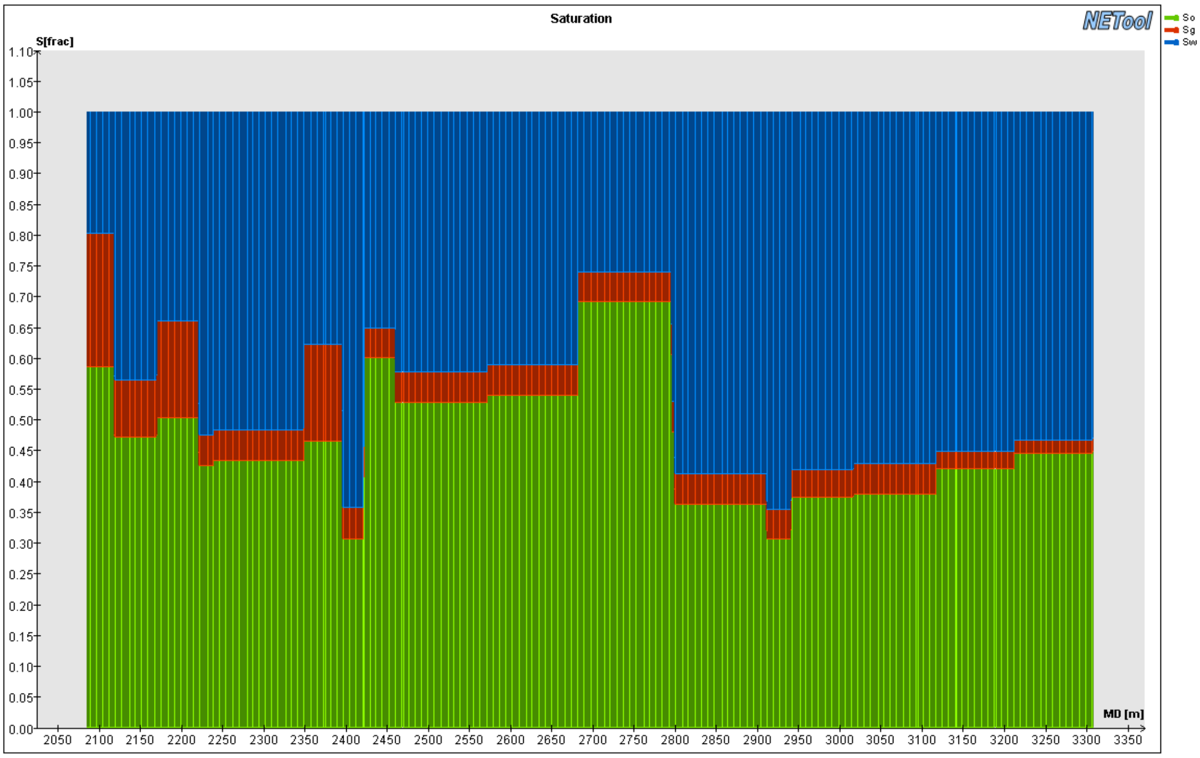


Tubing flow of oil, gas and water along the wellbore

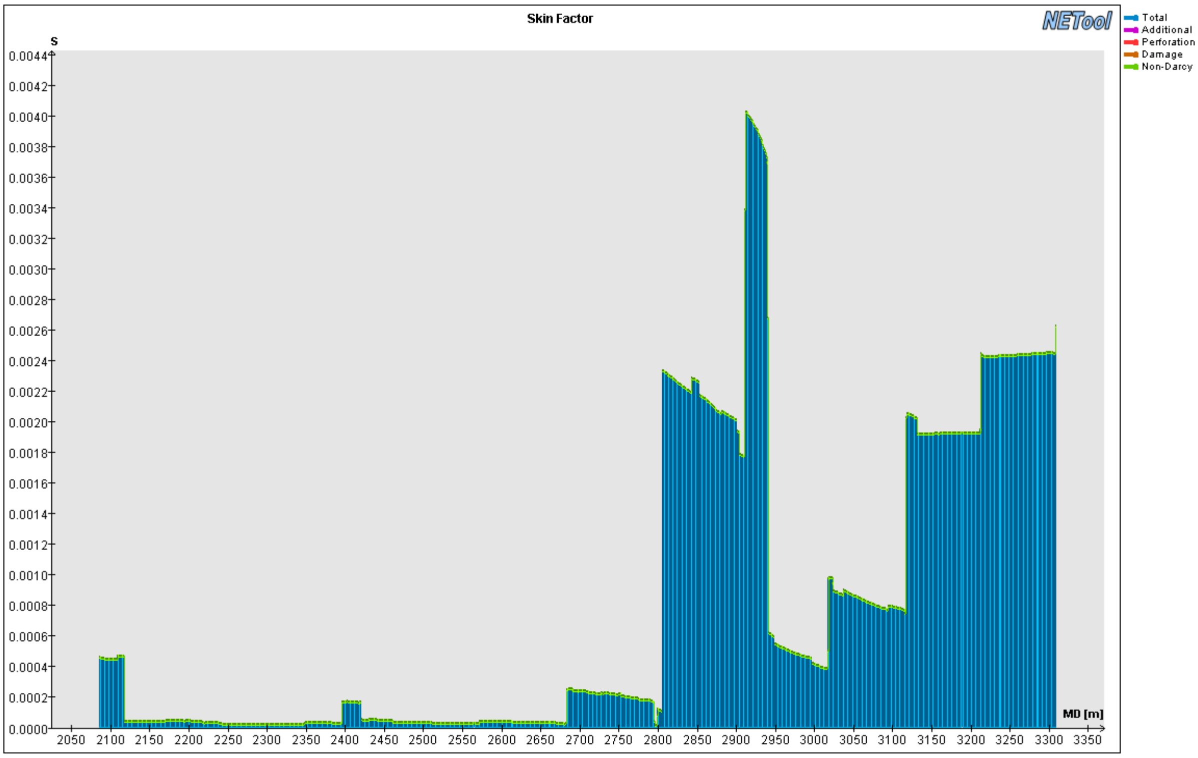




Velocity of the flow in the Annulus and tubing



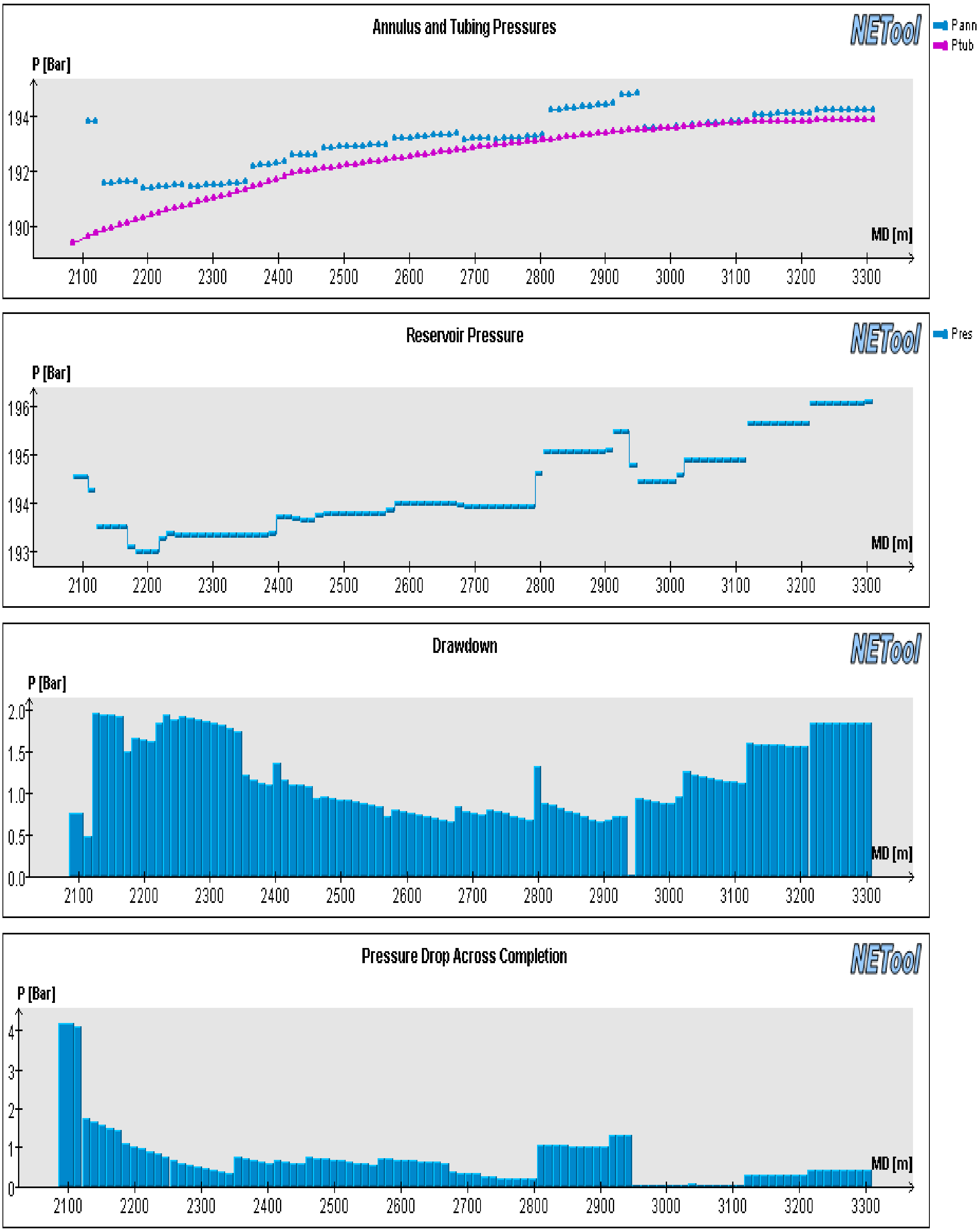
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



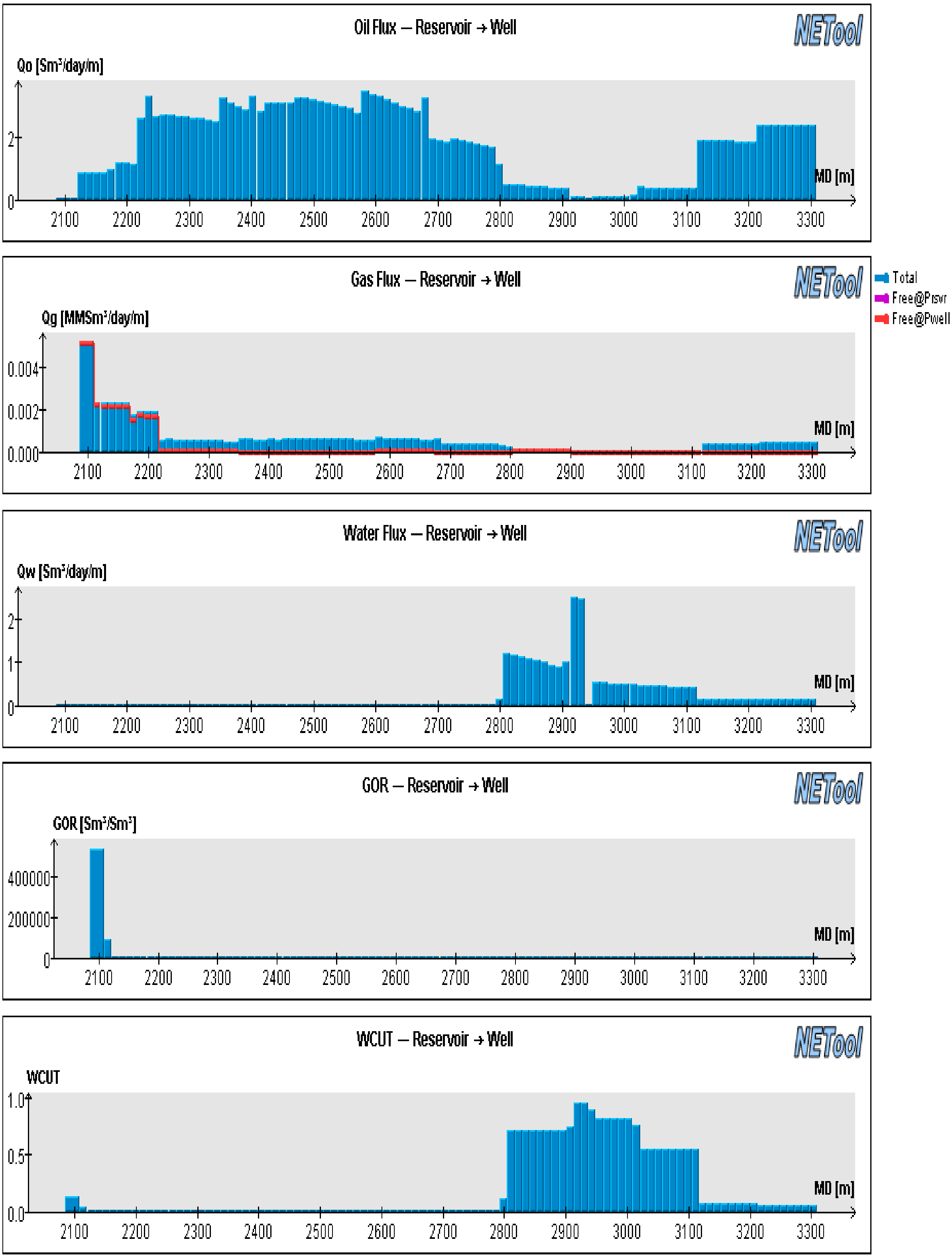
Skin factor plot for the well and given time step

A.28 Plots for well KP7, 7305 days, 5 ½” ICD Screen, 4x4mm ICD and BP

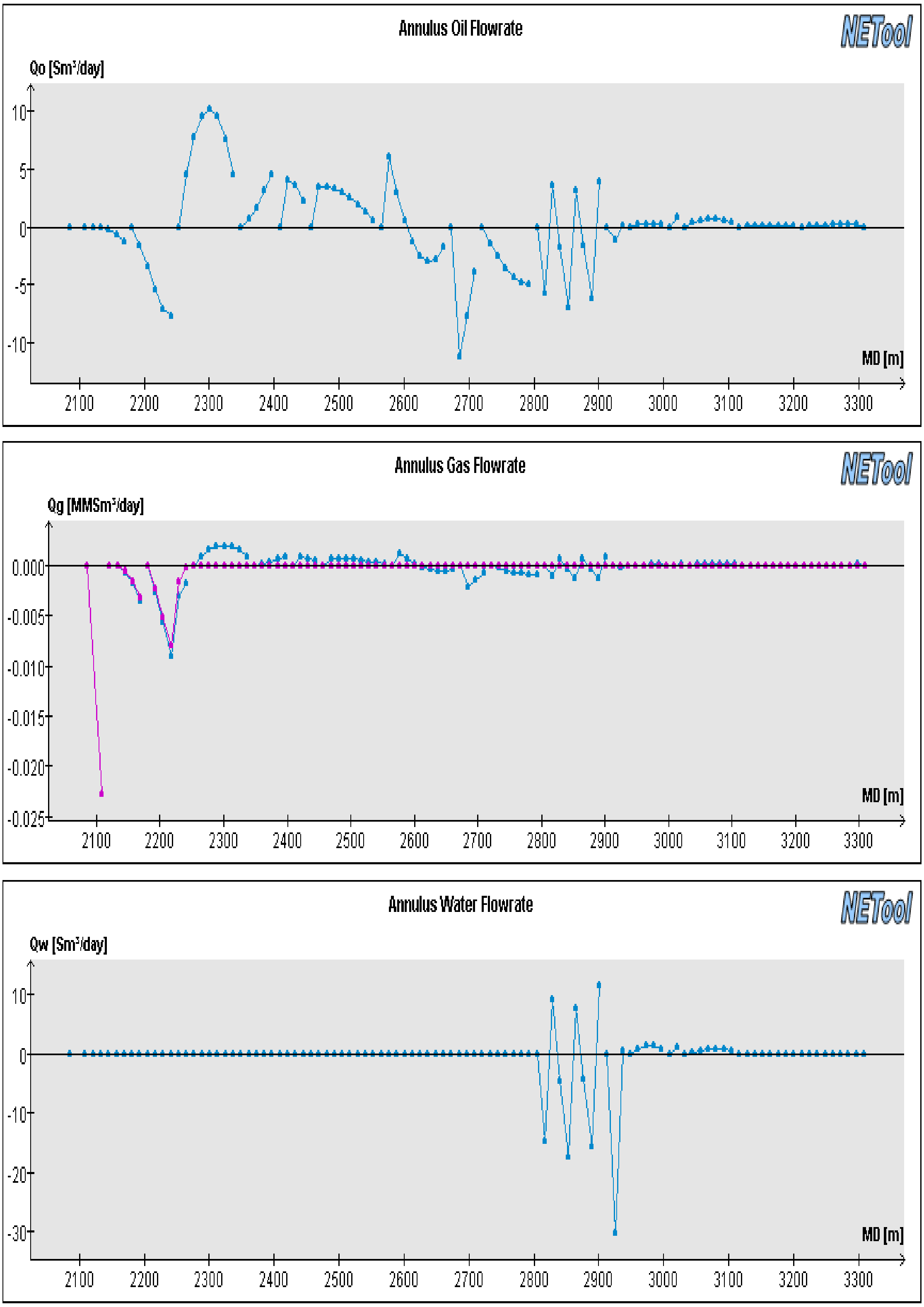
Completion overview for the case: see appendix A.13



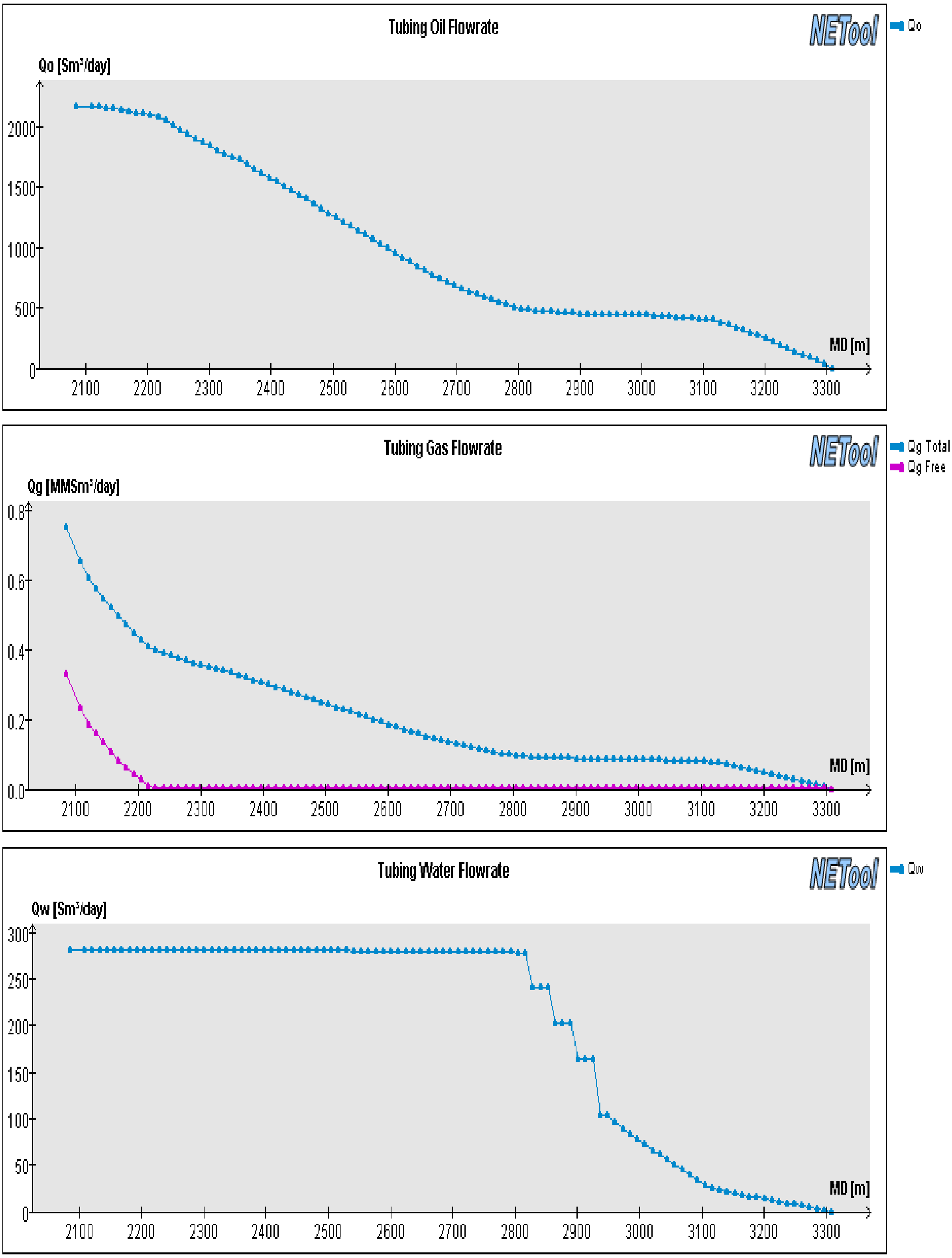
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



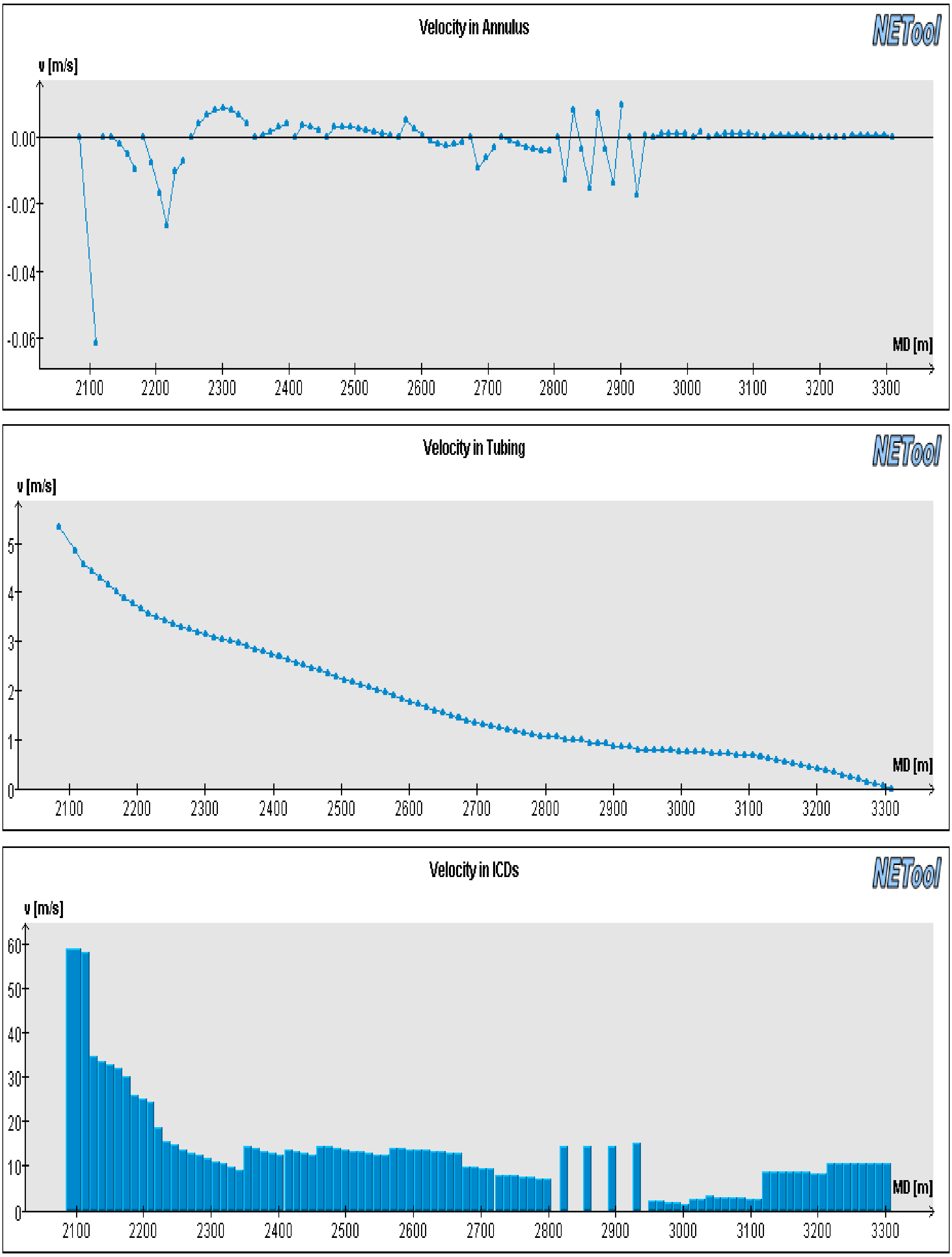
Influx of oil, gas and water from the reservoir and into the well along the wellbore



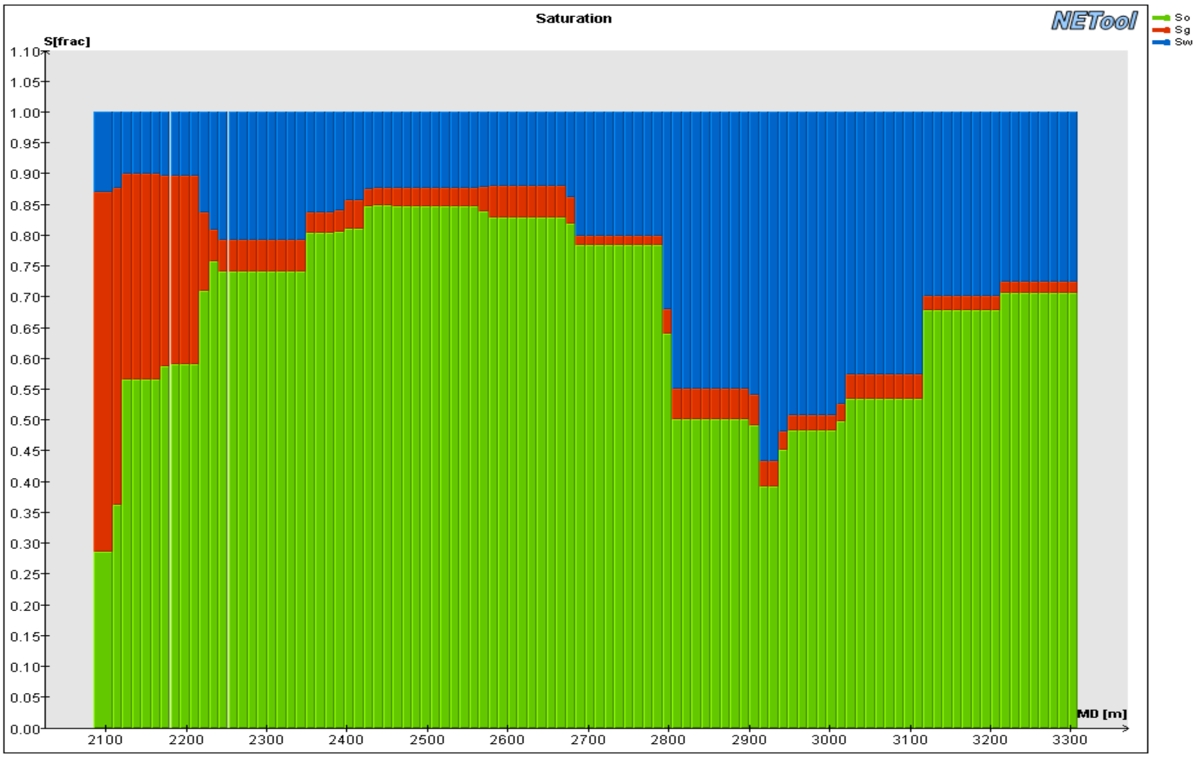
Annulus oil, gas and water flow rate along the wellbore



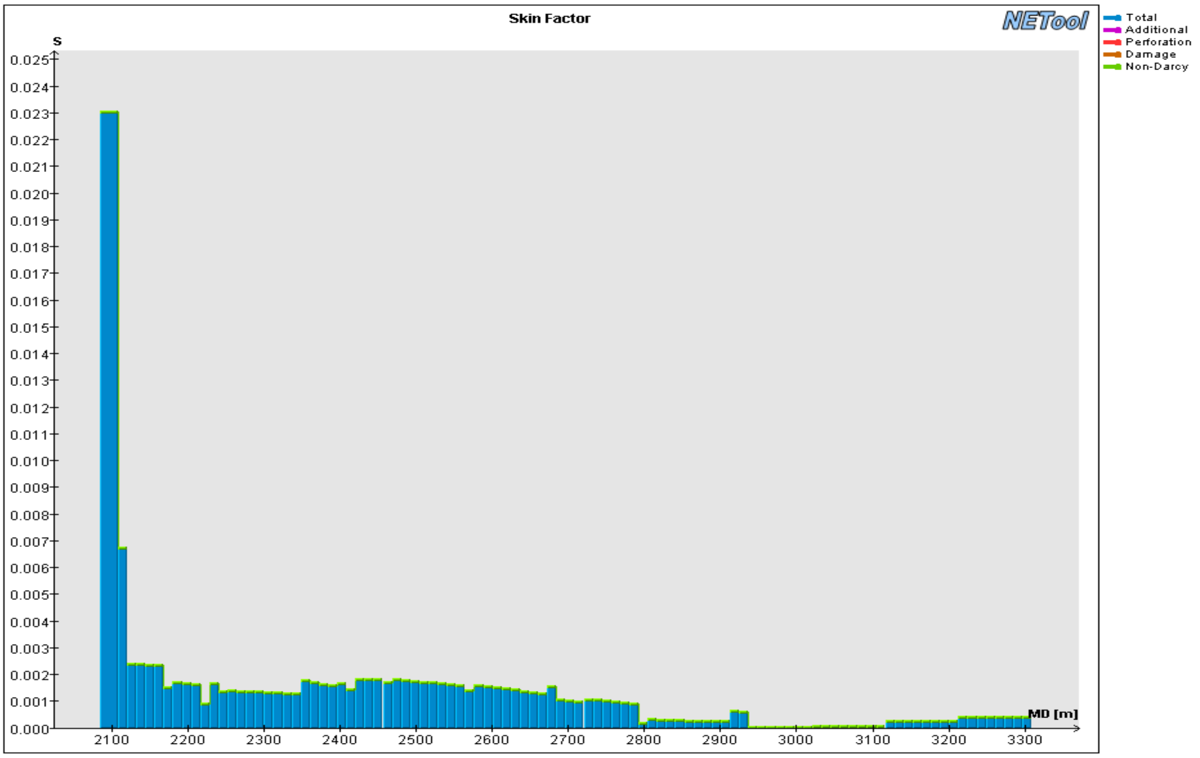
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



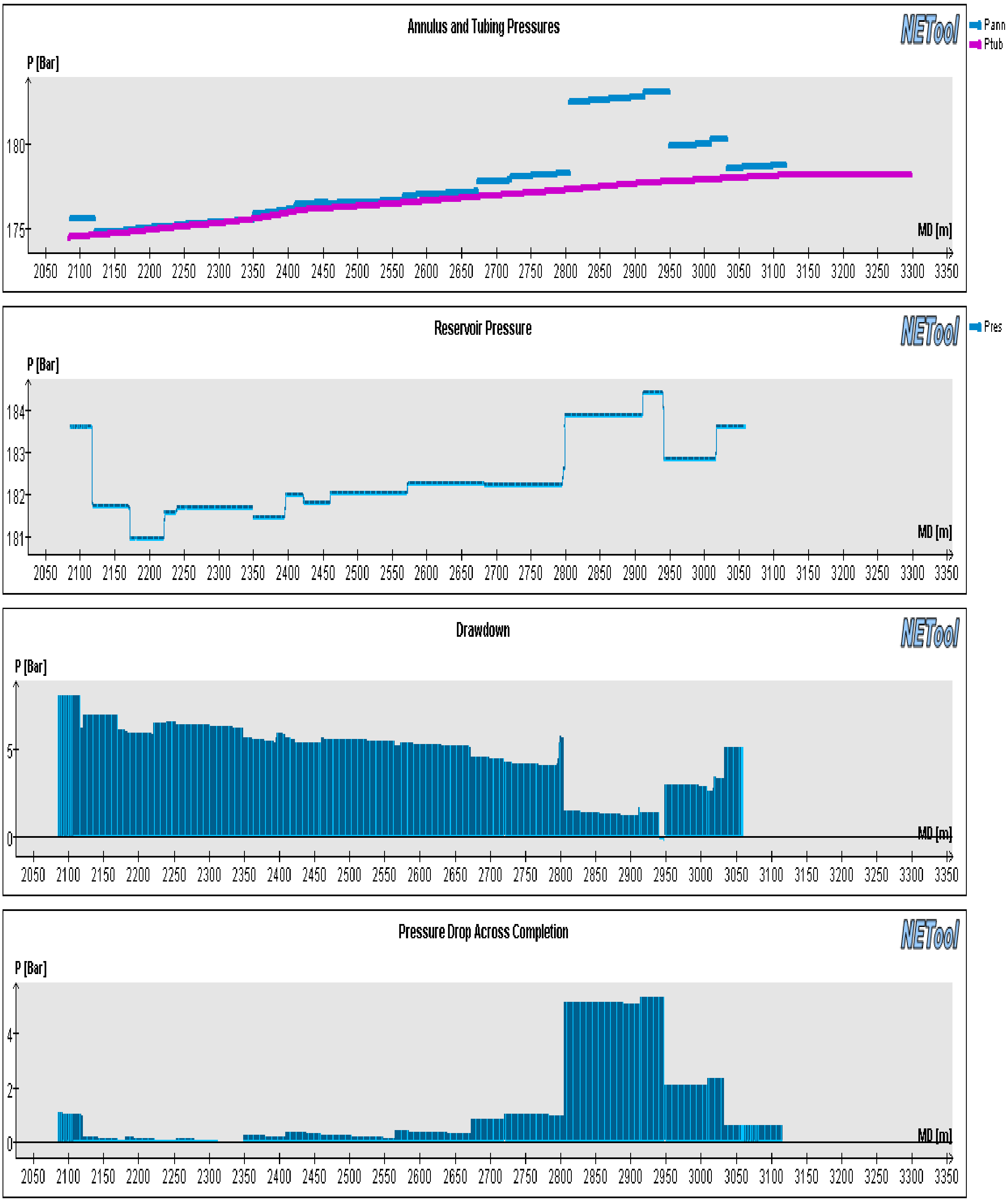
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



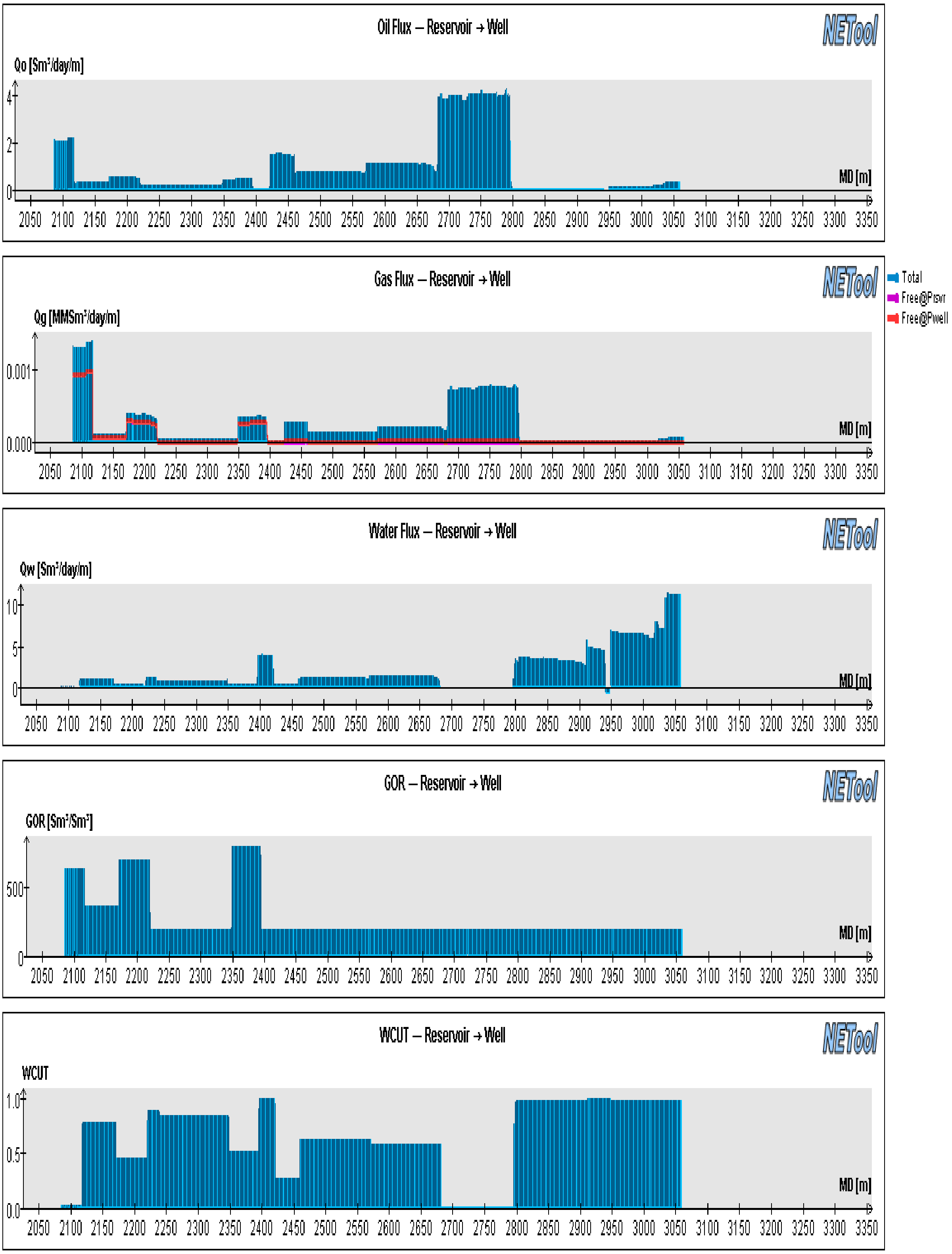
Skin factor plot for the well and given time step

A.29 Plots for well KP7, 7305 days, Recommended ICD 250m shorter wellbore.

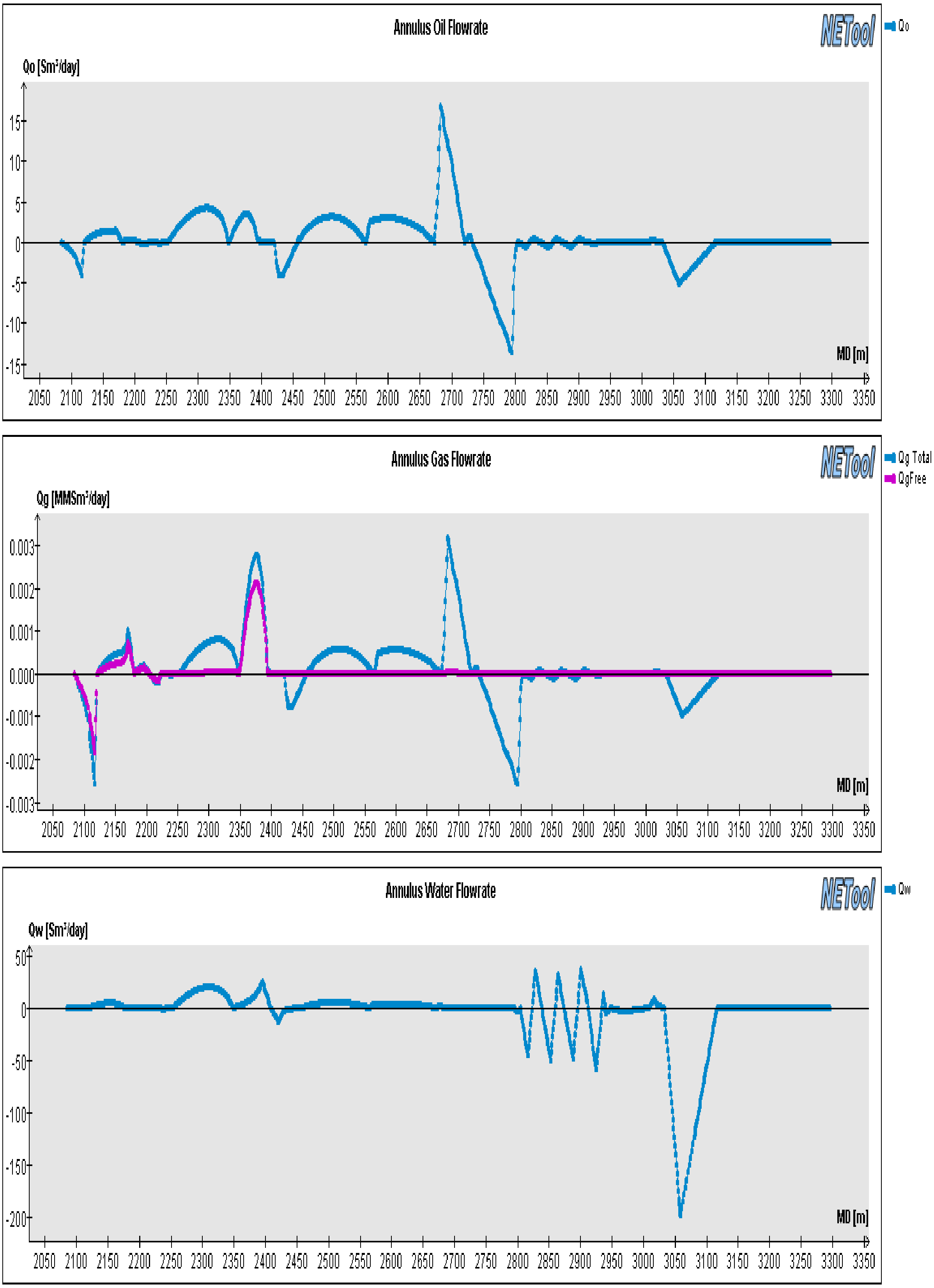
Completion overview for the case: see appendix A.18



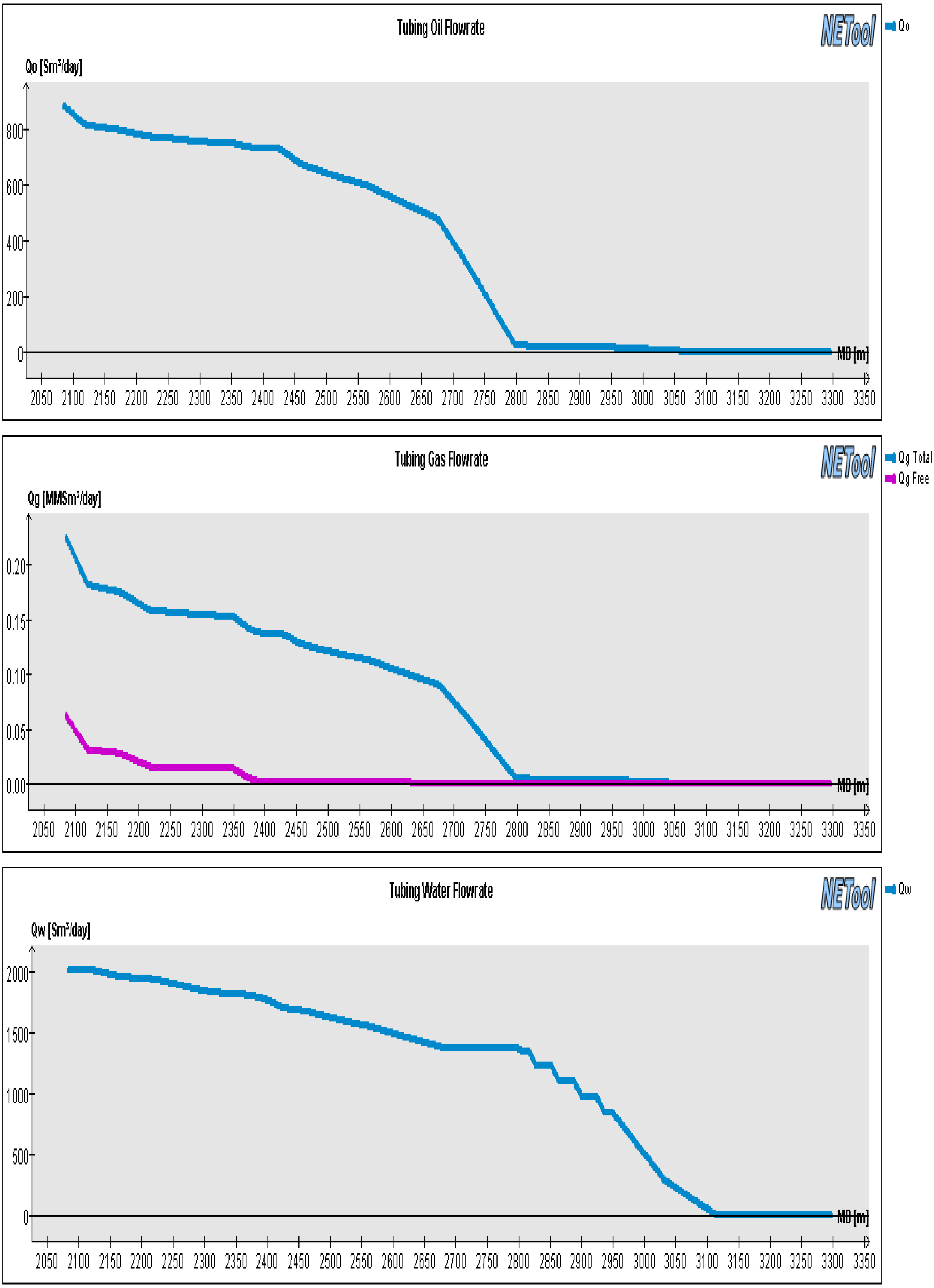
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



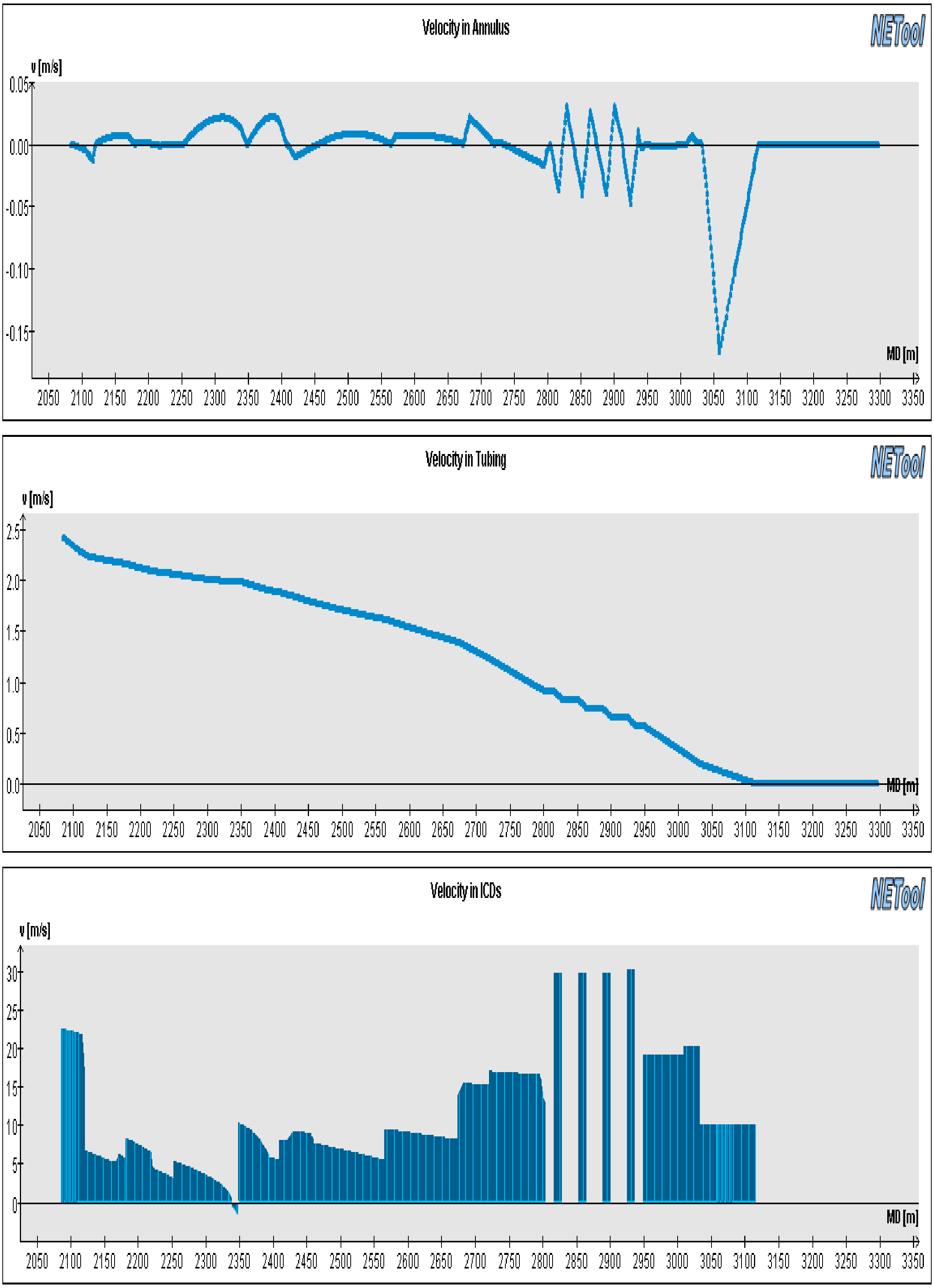
Influx of oil, gas and water from the reservoir and into the well along the wellbore



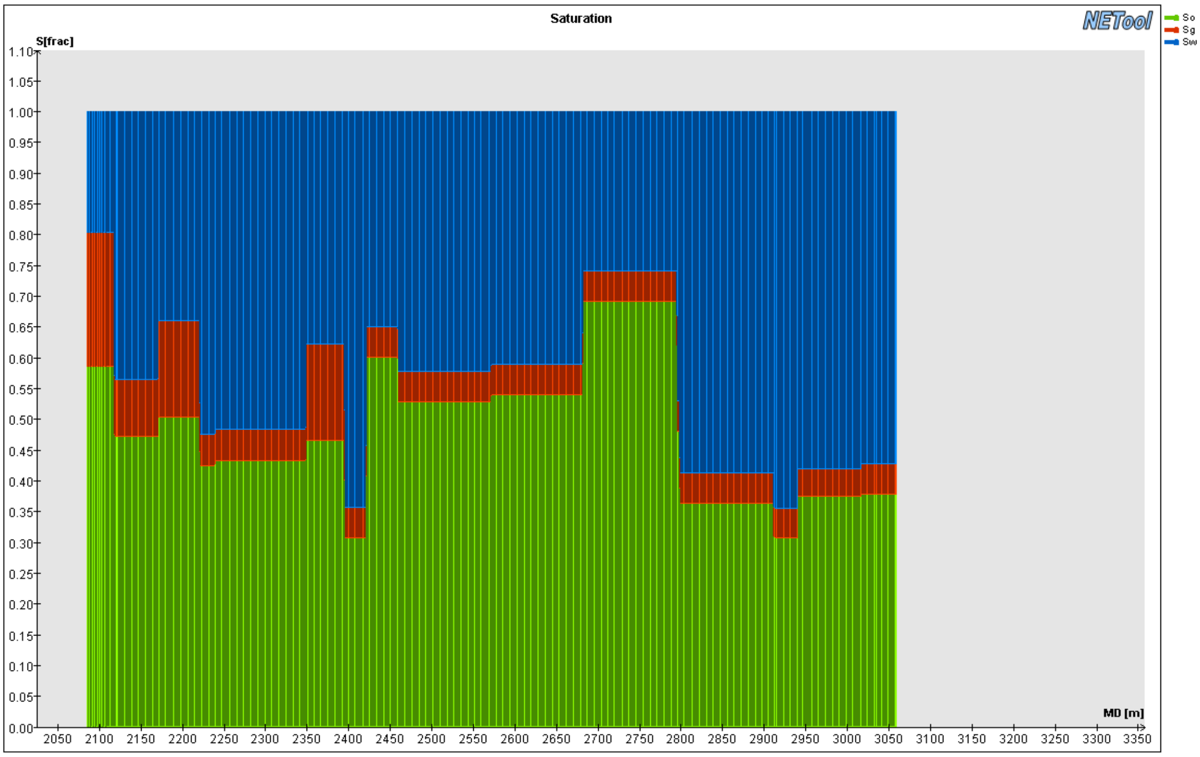
Annulus oil, gas and water flow rate along the wellbore



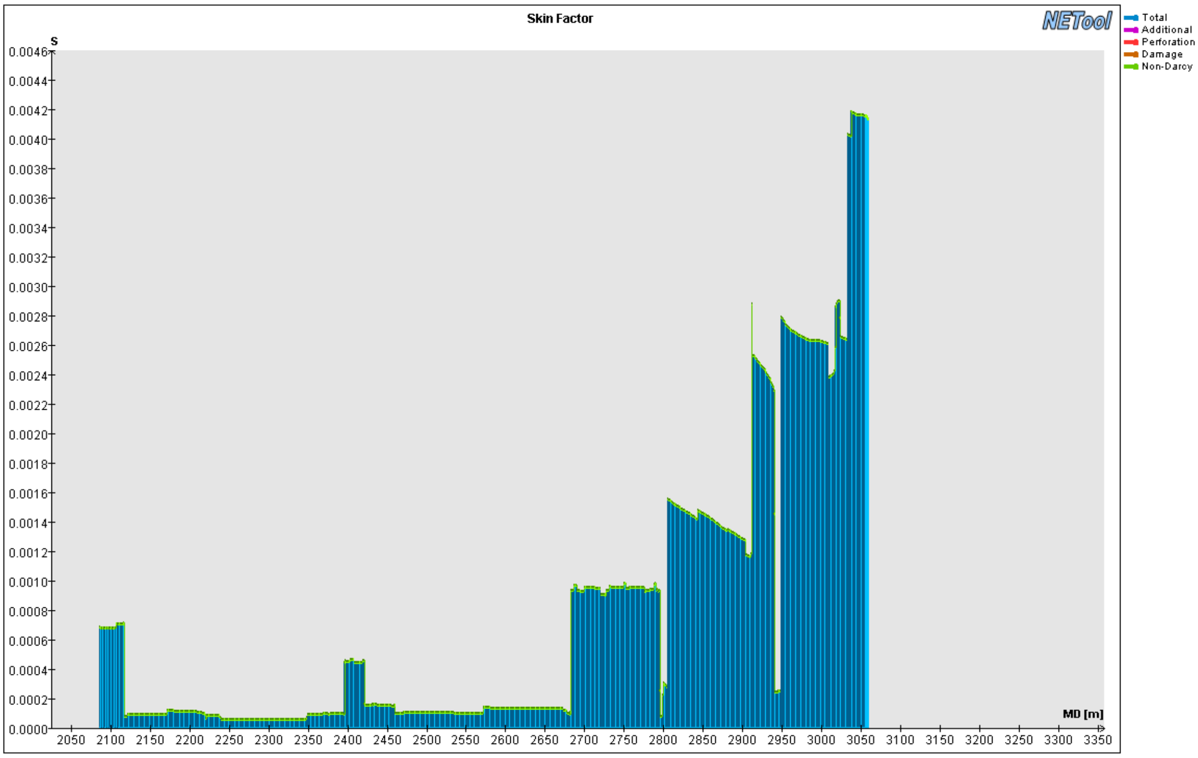
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



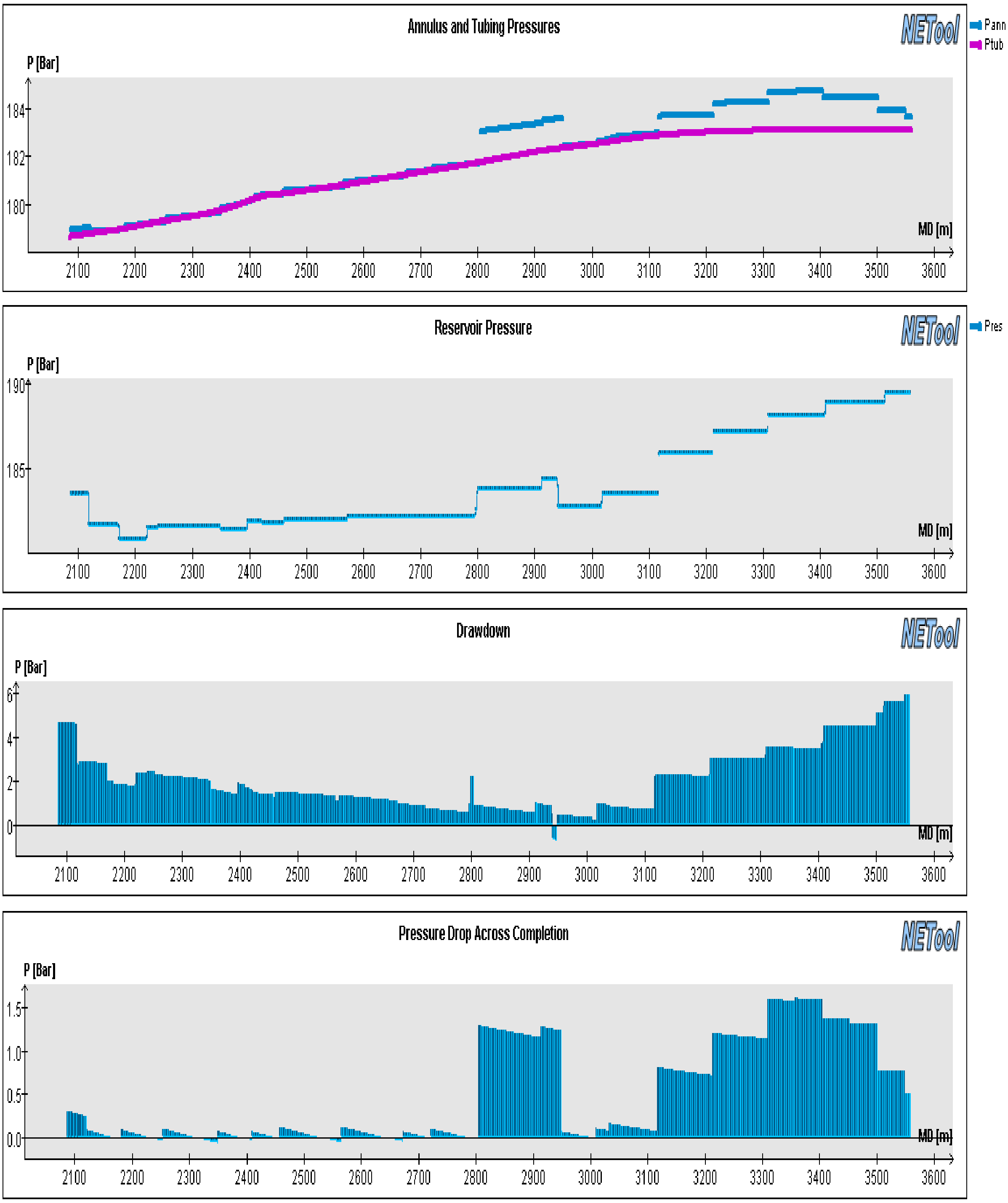
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



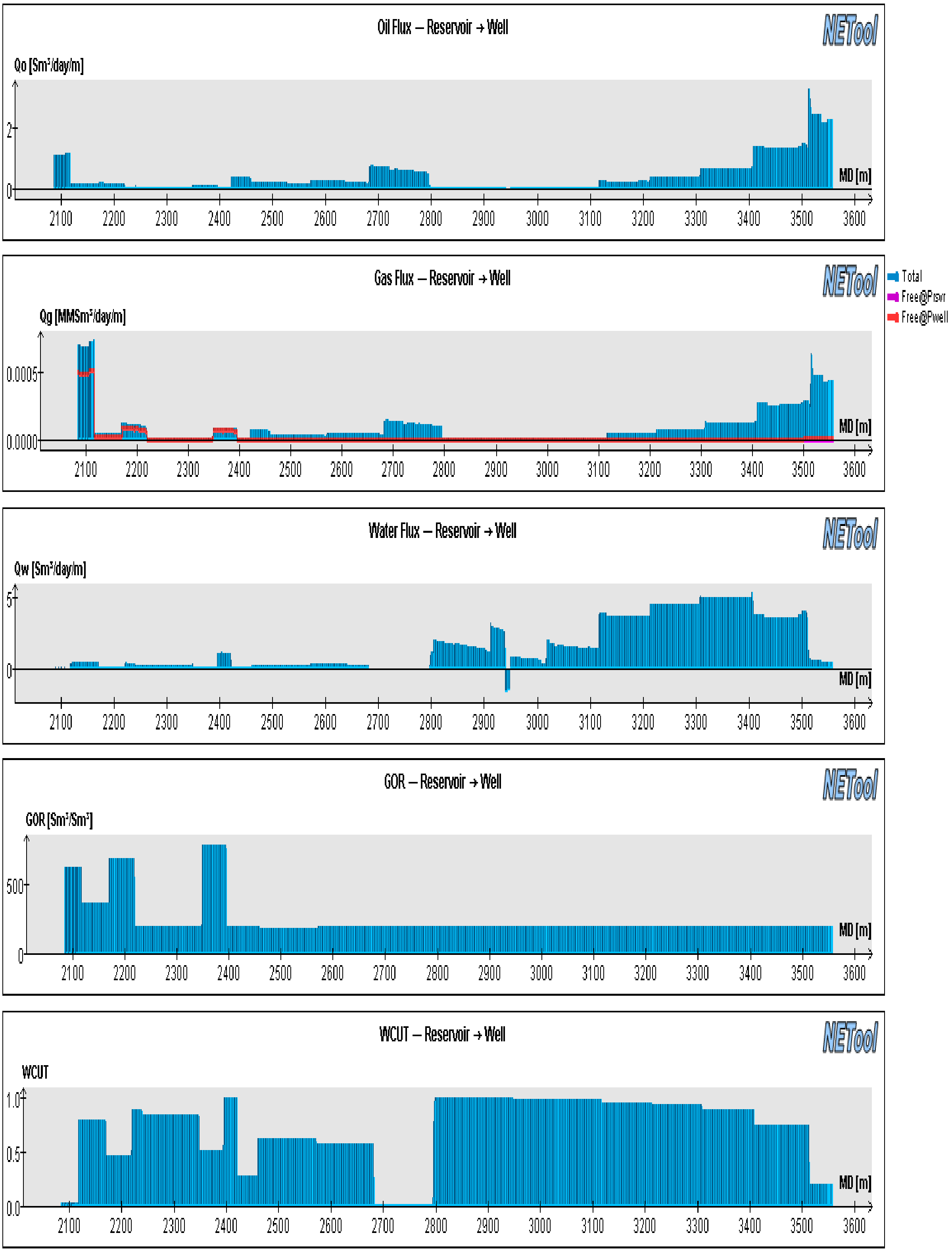
Skin factor plot for the well and given time step

A.30 Plots for well KP7, 7305 days, Recommended ICD 250m longer wellbore.

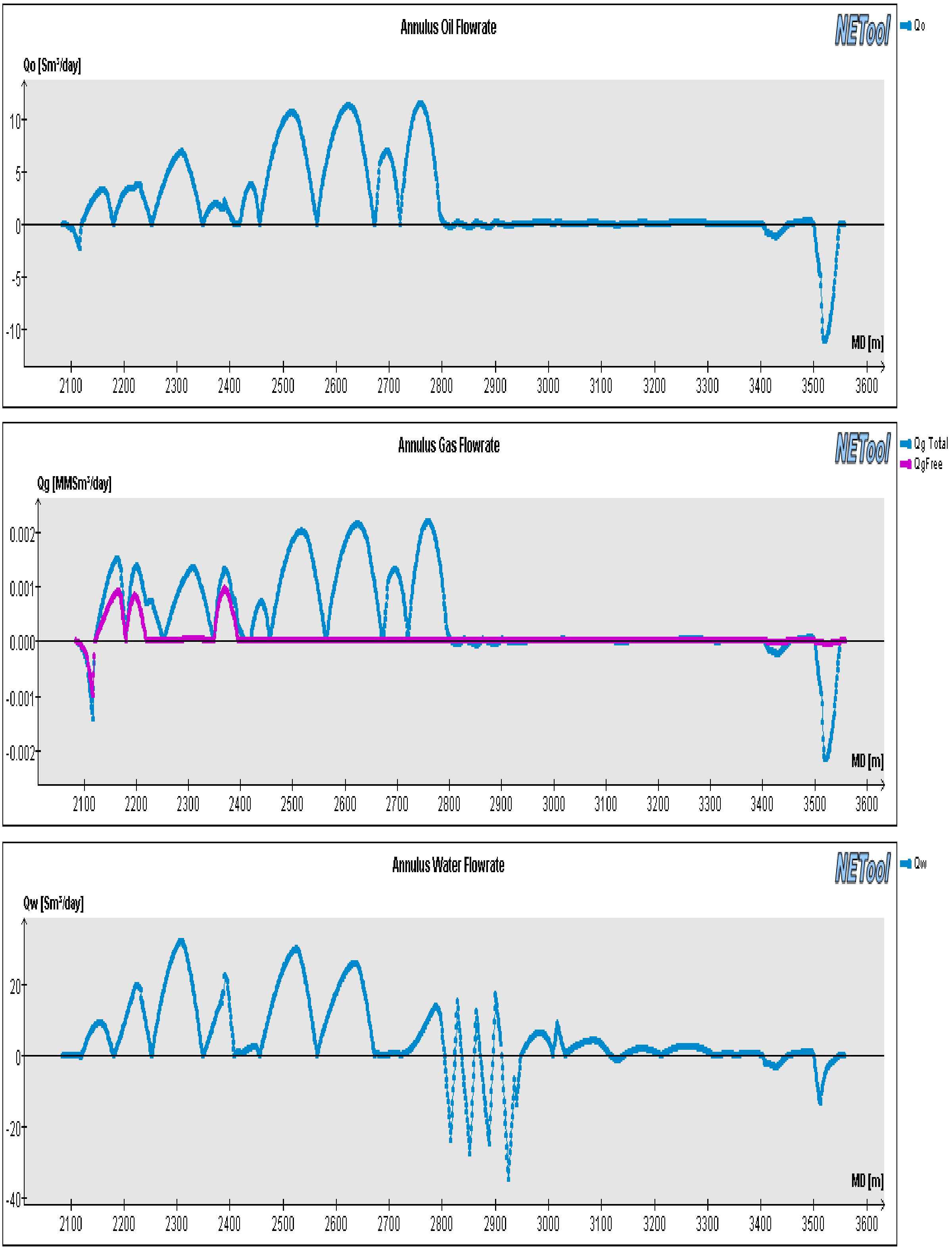
Completion overview for the case: see appendix A.19



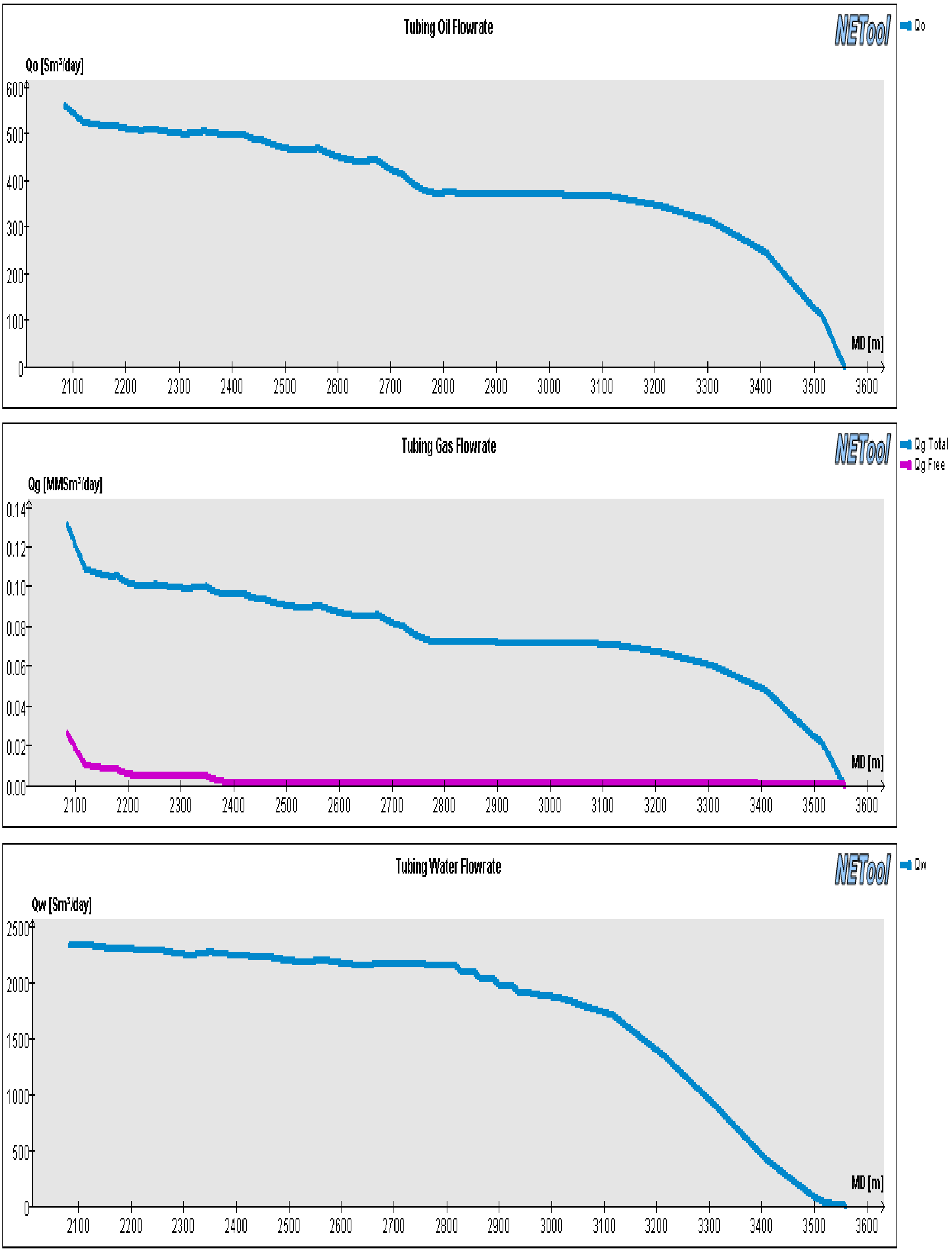
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



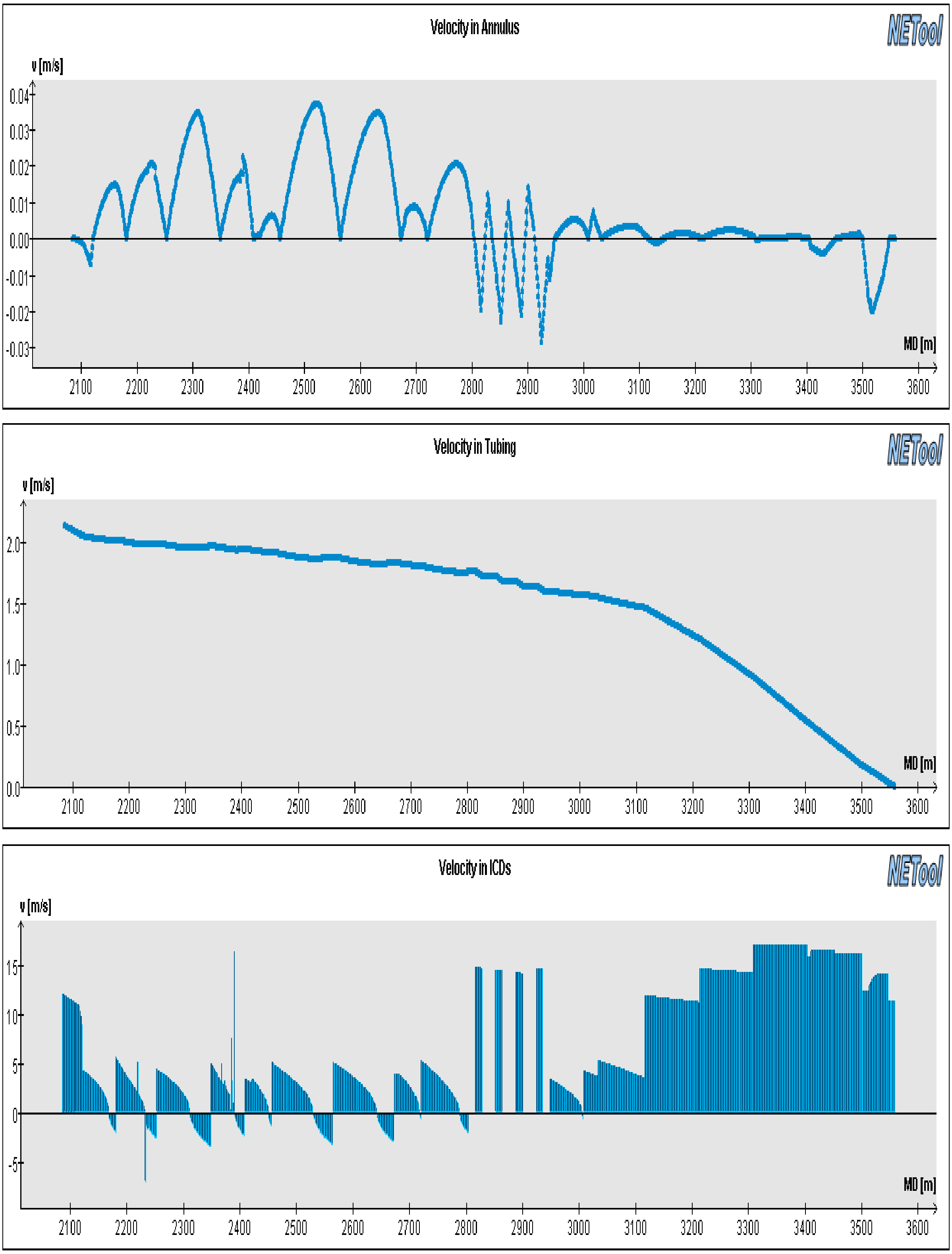
Influx of oil, gas and water from the reservoir and into the well along the wellbore



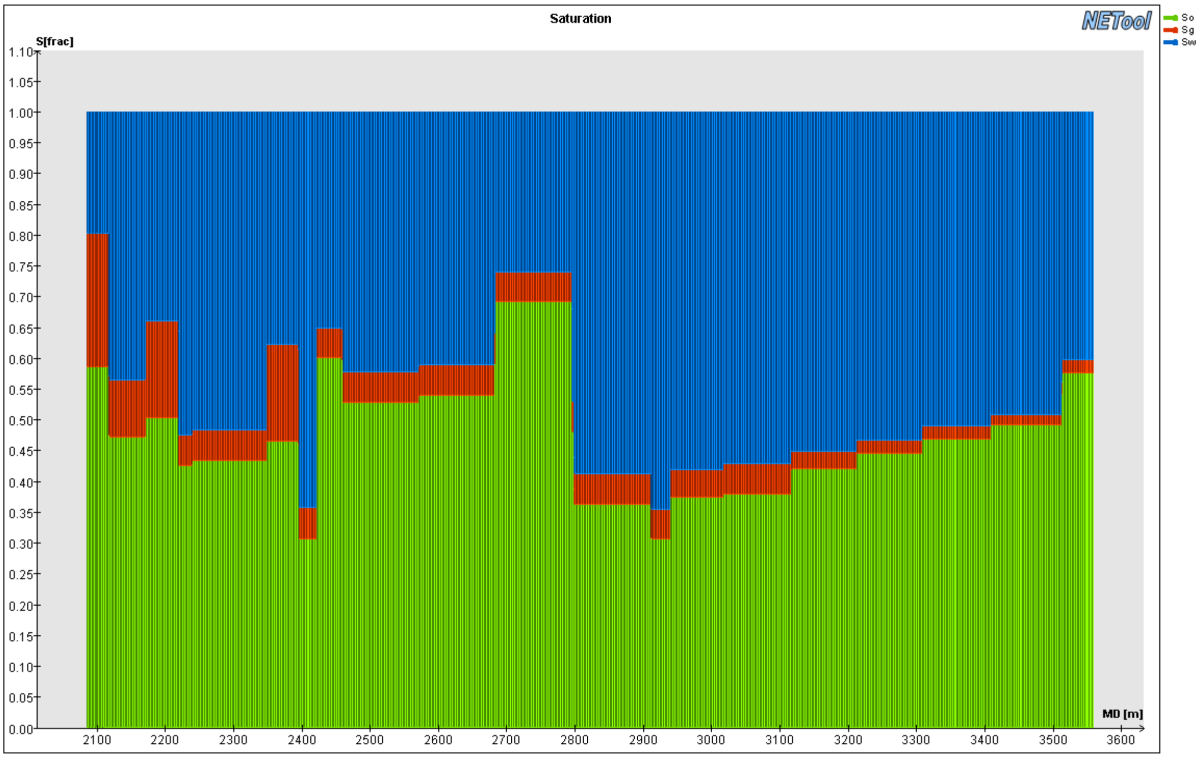
Annulus oil, gas and water flow rate along the wellbore



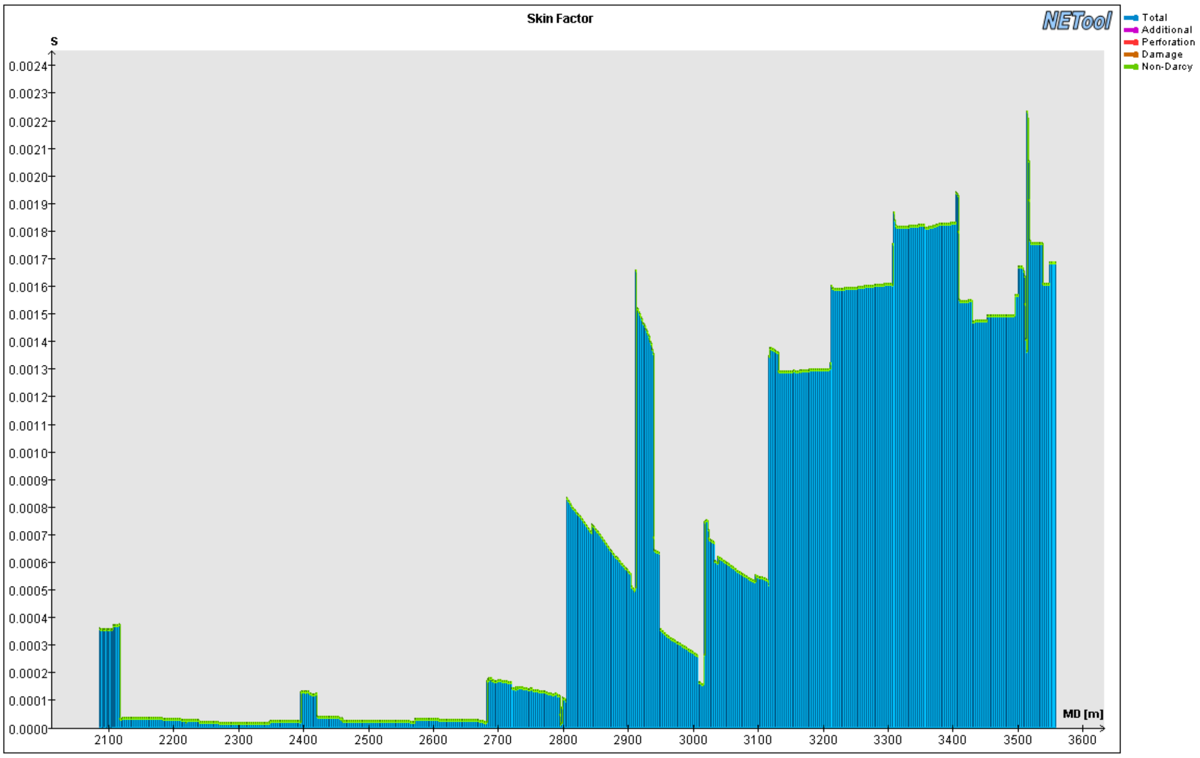
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



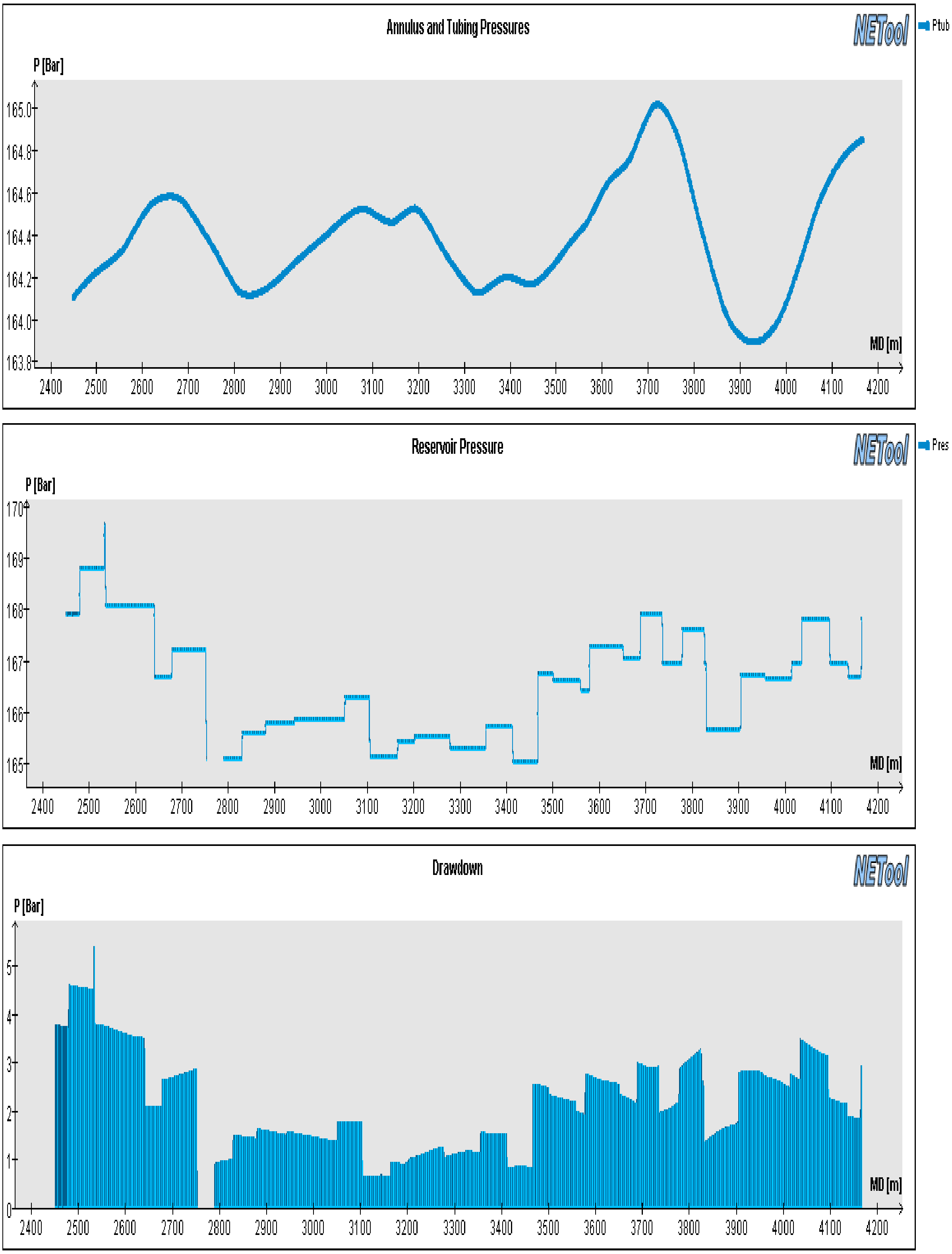
Skin factor plot for the well and given time step

A.30 Plots for well KP9, 730 days, initial case with Open Hole

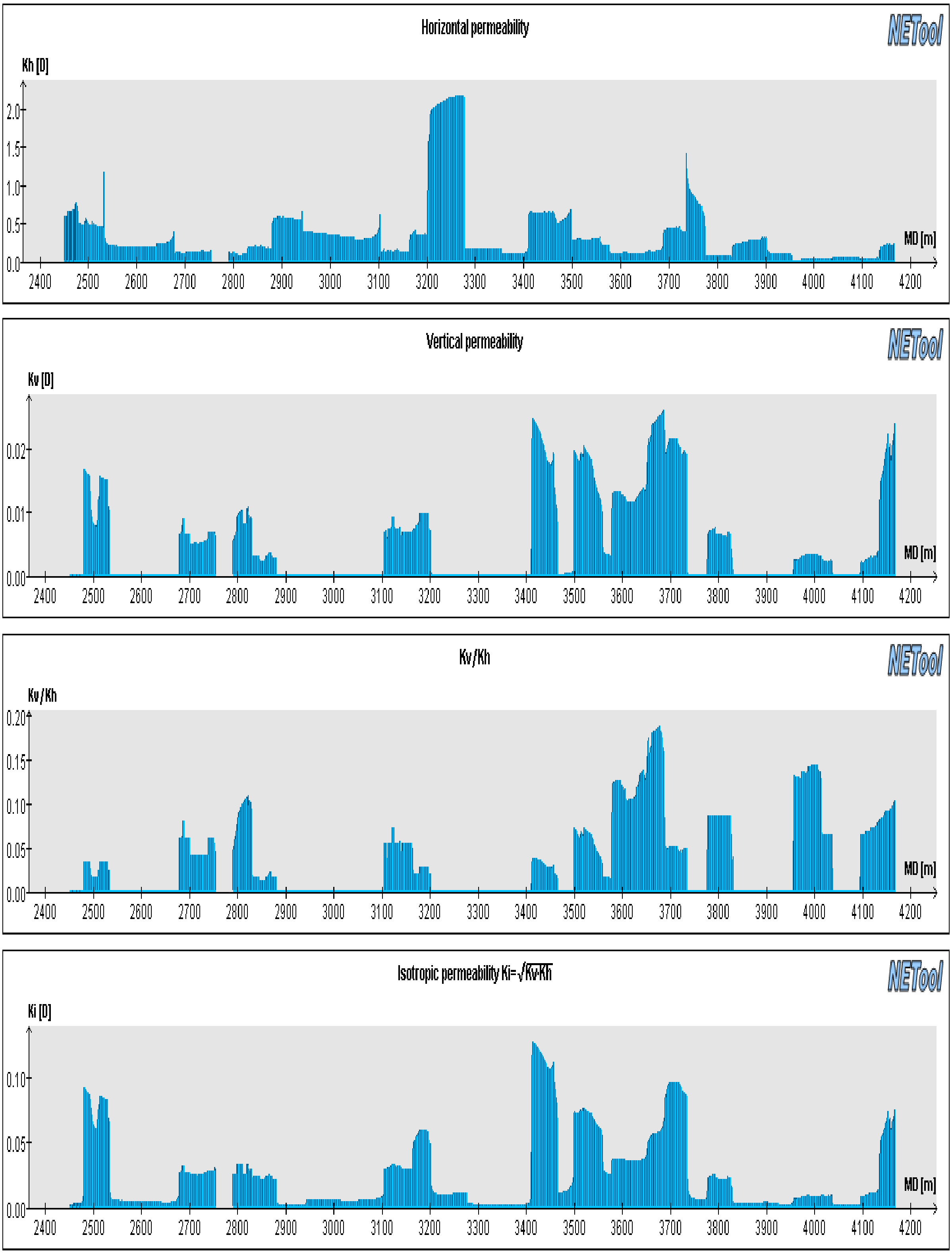
Completion overview: 8 ½” hole in the reservoir

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2870	12,0	**Open hole**	-	-	Yes	No	N/A
2	2450,3	23,7	**Open hole**	-	-	Yes	No	N/A	**37**	2882	12,0	**Open hole**	-	-	Yes	No	N/A
3	2474	12,0	**Open hole**	-	-	Yes	No	N/A	**38**	2894	12,0	**Open hole**	-	-	Yes	No	N/A
4	2486	12,0	**Open hole**	-	-	Yes	No	N/A	**39**	2906	12,0	**Open hole**	-	-	Yes	No	N/A
5	2498	12,0	**Open hole**	-	-	Yes	No	N/A	**40**	2918	12,0	**Open hole**	-	-	Yes	No	N/A
6	2510	12,0	**Open hole**	-	-	Yes	No	N/A	**41**	2930	12,0	**Open hole**	-	-	Yes	No	N/A
7	2522	12,0	**Open hole**	-	-	Yes	No	N/A	**42**	2942	12,0	**Open hole**	-	-	Yes	No	N/A
8	2534	12,0	**Open hole**	-	-	Yes	No	N/A	**43**	2954	12,0	**Open hole**	-	-	Yes	No	N/A
9	2546	12,0	**Open hole**	-	-	Yes	No	N/A	**44**	2966	12,0	**Open hole**	-	-	Yes	No	N/A
10	2558	12,0	**Open hole**	-	-	Yes	No	N/A	**45**	2978	12,0	**Open hole**	-	-	Yes	No	N/A
11	2570	12,0	**Open hole**	-	-	Yes	No	N/A	**46**	2990	12,0	**Open hole**	-	-	Yes	No	N/A
12	2582	12,0	**Open hole**	-	-	Yes	No	N/A	**47**	3002	12,0	**Open hole**	-	-	Yes	No	N/A
13	2594	12,0	**Open hole**	-	-	Yes	No	N/A	**48**	3014	12,0	**Open hole**	-	-	Yes	No	N/A
14	2606	12,0	**Open hole**	-	-	Yes	No	N/A	**49**	3026	12,0	**Open hole**	-	-	Yes	No	N/A
15	2618	12,0	**Open hole**	-	-	Yes	No	N/A	**50**	3038	12,0	**Open hole**	-	-	Yes	No	N/A
16	2630	12,0	**Open hole**	-	-	Yes	No	N/A	**51**	3050	12,0	**Open hole**	-	-	Yes	No	N/A
17	2642	12,0	**Open hole**	-	-	Yes	No	N/A	**52**	3062	12,0	**Open hole**	-	-	Yes	No	N/A
18	2654	12,0	**Open hole**	-	-	Yes	No	N/A	**53**	3074	12,0	**Open hole**	-	-	Yes	No	N/A
19	2666	12,0	**Open hole**	-	-	Yes	No	N/A	**54**	3086	12,0	**Open hole**	-	-	Yes	No	N/A
20	2678	12,0	**Open hole**	-	-	Yes	No	N/A	**55**	3098	12,0	**Open hole**	-	-	Yes	No	N/A
21	2690	12,0	**Open hole**	-	-	Yes	No	N/A	**56**	3110	12,0	**Open hole**	-	-	Yes	No	N/A
22	2702	12,0	**Open hole**	-	-	Yes	No	N/A	**57**	3122	12,0	**Open hole**	-	-	Yes	No	N/A
23	2714	12,0	**Open hole**	-	-	Yes	No	N/A	**58**	3134	12,0	**Open hole**	-	-	Yes	No	N/A
24	2726	12,0	**Open hole**	-	-	Yes	No	N/A	**59**	3146	12,0	**Open hole**	-	-	Yes	No	N/A
25	2738	12,0	**Open hole**	-	-	Yes	No	N/A	**60**	3158	12,0	**Open hole**	-	-	Yes	No	N/A
26	2750	12,0	**Open hole**	-	-	Yes	No	N/A	**61**	3170	12,0	**Open hole**	-	-	Yes	No	N/A
27	2762	12,0	**Open hole**	-	-	Yes	No	N/A	**62**	3182	12,0	**Open hole**	-	-	Yes	No	N/A
28	2774	12,0	**Open hole**	-	-	Yes	No	N/A	**63**	3194	12,0	**Open hole**	-	-	Yes	No	N/A
29	2786	12,0	**Open hole**	-	-	Yes	No	N/A	**64**	3206	12,0	**Open hole**	-	-	Yes	No	N/A
30	2798	12,0	**Open hole**	-	-	Yes	No	N/A	**65**	3218	12,0	**Open hole**	-	-	Yes	No	N/A
31	2810	12,0	**Open hole**	-	-	Yes	No	N/A	**66**	3230	12,0	**Open hole**	-	-	Yes	No	N/A
32	2822	12,0	**Open hole**	-	-	Yes	No	N/A	**67**	3242	12,0	**Open hole**	-	-	Yes	No	N/A
33	2834	12,0	**Open hole**	-	-	Yes	No	N/A	**68**	3254	12,0	**Open hole**	-	-	Yes	No	N/A
34	2846	12,0	**Open hole**	-	-	Yes	No	N/A	**69**	3266	12,0	**Open hole**	-	-	Yes	No	N/A
35	2858	12,0	**Open hole**	-	-	Yes	No	N/A	**70**	3278	12,0	**Open hole**	-	-	Yes	No	N/A

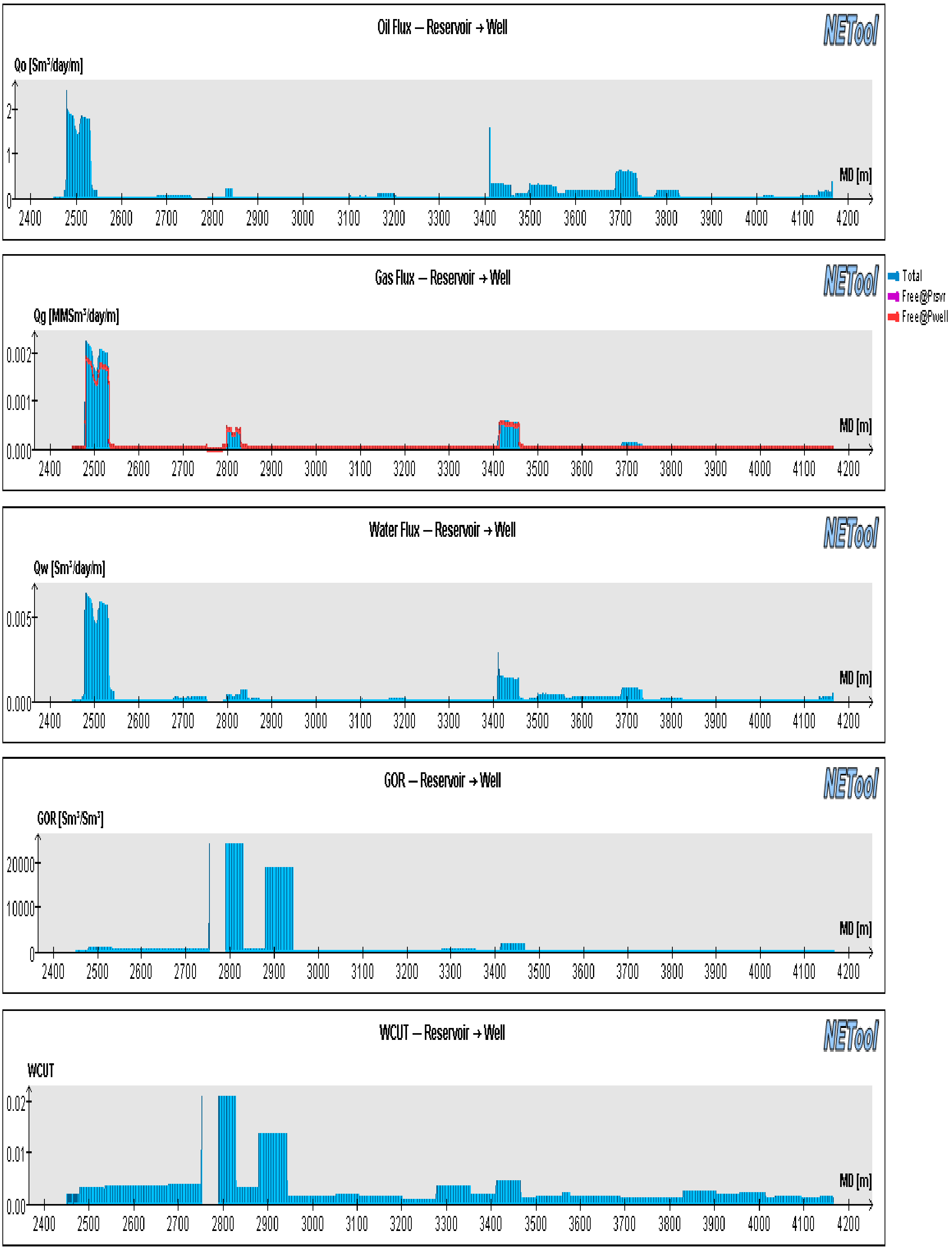
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3290	12,0	Open hole	-	-	Yes	No	N/A	111	3770,0	12,0	Open hole	-	-	Yes	No	N/A
72	3302	12,0	Open hole	-	-	Yes	No	N/A	112	3782,0	12,0	Open hole	-	-	Yes	No	N/A
73	3314	12,0	Open hole	-	-	Yes	No	N/A	113	3794,0	12,0	Open hole	-	-	Yes	No	N/A
74	3326	12,0	Open hole	-	-	Yes	No	N/A	114	3806,0	12,0	Open hole	-	-	Yes	No	N/A
75	3338	12,0	Open hole	-	-	Yes	No	N/A	115	3818,0	12,0	Open hole	-	-	Yes	No	N/A
76	3350	12,0	Open hole	-	-	Yes	No	N/A	116	3830,0	12,0	Open hole	-	-	Yes	No	N/A
77	3362	12,0	Open hole	-	-	Yes	No	N/A	117	3842,0	12,0	Open hole	-	-	Yes	No	N/A
78	3374	12,0	Open hole	-	-	Yes	No	N/A	118	3854,0	12,0	Open hole	-	-	Yes	No	N/A
79	3386	12,0	Open hole	-	-	Yes	No	N/A	119	3866,0	12,0	Open hole	-	-	Yes	No	N/A
80	3398	12,0	Open hole	-	-	Yes	No	N/A	120	3878,0	12,0	Open hole	-	-	Yes	No	N/A
81	3410	12,0	Open hole	-	-	Yes	No	N/A	121	3890,0	12,0	Open hole	-	-	Yes	No	N/A
82	3422	12,0	Open hole	-	-	Yes	No	N/A	122	3902,0	12,0	Open hole	-	-	Yes	No	N/A
83	3434	12,0	Open hole	-	-	Yes	No	N/A	123	3914,0	12,0	Open hole	-	-	Yes	No	N/A
84	3446	12,0	Open hole	-	-	Yes	No	N/A	124	3926,0	12,0	Open hole	-	-	Yes	No	N/A
85	3458	12,0	Open hole	-	-	Yes	No	N/A	125	3938,0	12,0	Open hole	-	-	Yes	No	N/A
86	3470	12,0	Open hole	-	-	Yes	No	N/A	126	3950,0	12,0	Open hole	-	-	Yes	No	N/A
87	3482	12,0	Open hole	-	-	Yes	No	N/A	127	3962,0	12,0	Open hole	-	-	Yes	No	N/A
88	3494	12,0	Open hole	-	-	Yes	No	N/A	128	3974,0	12,0	Open hole	-	-	Yes	No	N/A
89	3506	12,0	Open hole	-	-	Yes	No	N/A	129	3986,0	12,0	Open hole	-	-	Yes	No	N/A
90	3518	12,0	Open hole	-	-	Yes	No	N/A	130	3998,0	12,0	Open hole	-	-	Yes	No	N/A
91	3530	12,0	Open hole	-	-	Yes	No	N/A	131	4010,0	12,0	Open hole	-	-	Yes	No	N/A
92	3542	12,0	Open hole	-	-	Yes	No	N/A	132	4022,0	12,0	Open hole	-	-	Yes	No	N/A
93	3554	12,0	Open hole	-	-	Yes	No	N/A	133	4034,0	12,0	Open hole	-	-	Yes	No	N/A
94	3566	12,0	Open hole	-	-	Yes	No	N/A	134	4046,0	12,0	Open hole	-	-	Yes	No	N/A
95	3578	12,0	Open hole	-	-	Yes	No	N/A	135	4058,0	12,0	Open hole	-	-	Yes	No	N/A
96	3590	12,0	Open hole	-	-	Yes	No	N/A	136	4070,0	12,0	Open hole	-	-	Yes	No	N/A
97	3602	12,0	Open hole	-	-	Yes	No	N/A	137	4082,0	12,0	Open hole	-	-	Yes	No	N/A
98	3614	12,0	Open hole	-	-	Yes	No	N/A	138	4094,0	12,0	Open hole	-	-	Yes	No	N/A
99	3626	12,0	Open hole	-	-	Yes	No	N/A	139	4106,0	12,0	Open hole	-	-	Yes	No	N/A
100	3638	12,0	Open hole	-	-	Yes	No	N/A	140	4118,0	12,0	Open hole	-	-	Yes	No	N/A
101	3650	12,0	Open hole	-	-	Yes	No	N/A	141	4130,0	12,0	Open hole	-	-	Yes	No	N/A
102	3662,0	12,0	Open hole	-	-	Yes	No	N/A	142	4142,0	12,0	Open hole	-	-	Yes	No	N/A
103	3674,0	12,0	Open hole	-	-	Yes	No	N/A	143	4154,0	13,3	Open hole	-	-	Yes	No	N/A
104	3686,0	12,0	Open hole	-	-	Yes	No	N/A	TOE	4167,3		Open hole	-	-	Yes	No	N/A
105	3698,0	12,0	Open hole	-	-	Yes	No	N/A									
106	3710,0	12,0	Open hole	-	-	Yes	No	N/A									
107	3722,0	12,0	Open hole	-	-	Yes	No	N/A									
108	3734,0	12,0	Open hole	-	-	Yes	No	N/A									
109	3746,0	12,0	Open hole	-	-	Yes	No	N/A									
110	3758,0	12,0	Open hole	-	-	Yes	No	N/A									



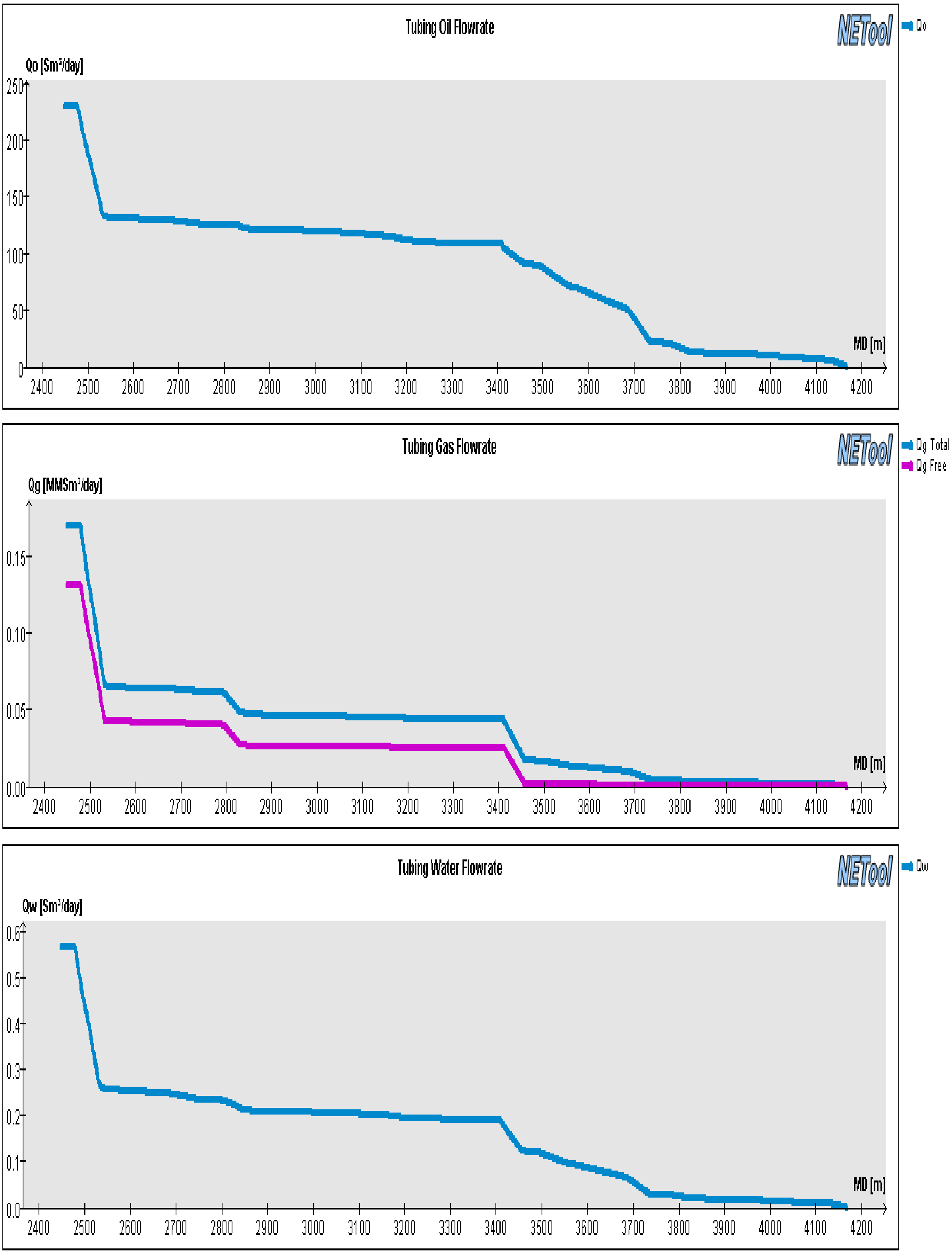
Annulus and tubing pressure, Reservoir pressure and Dradown along the wellbore.



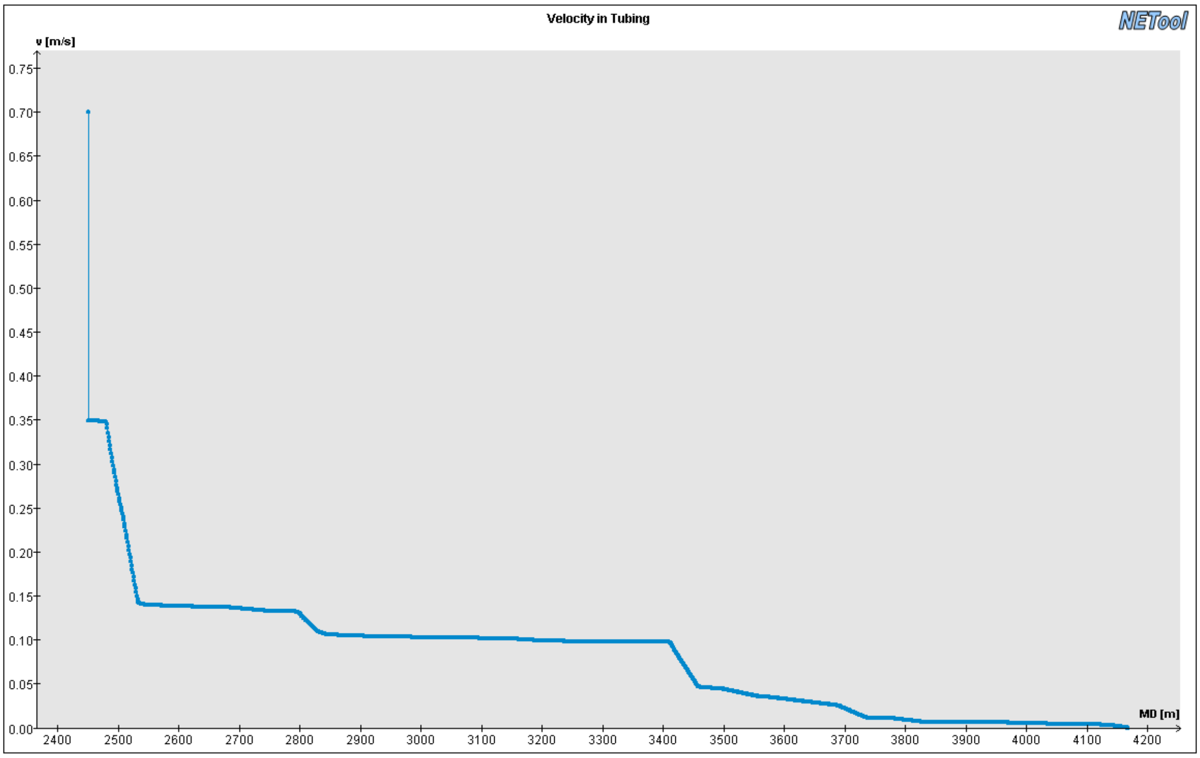
Permeability plot for KP9, valid for all time steps.



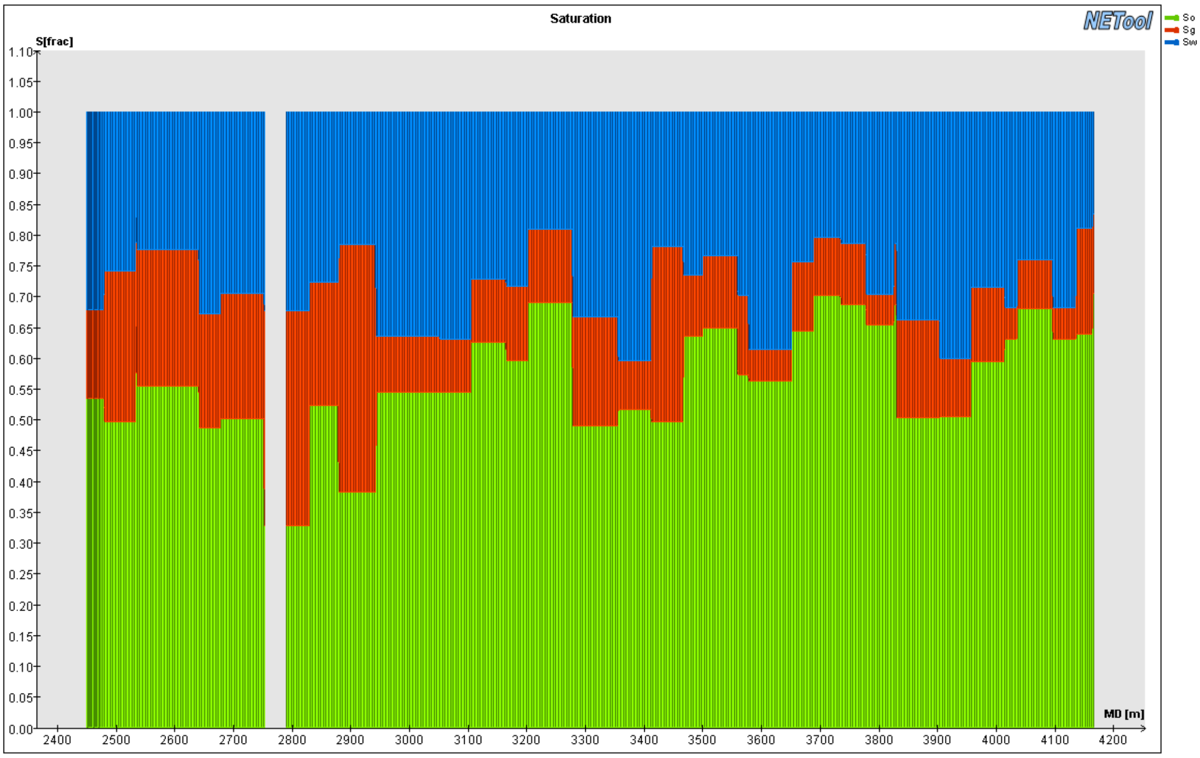
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



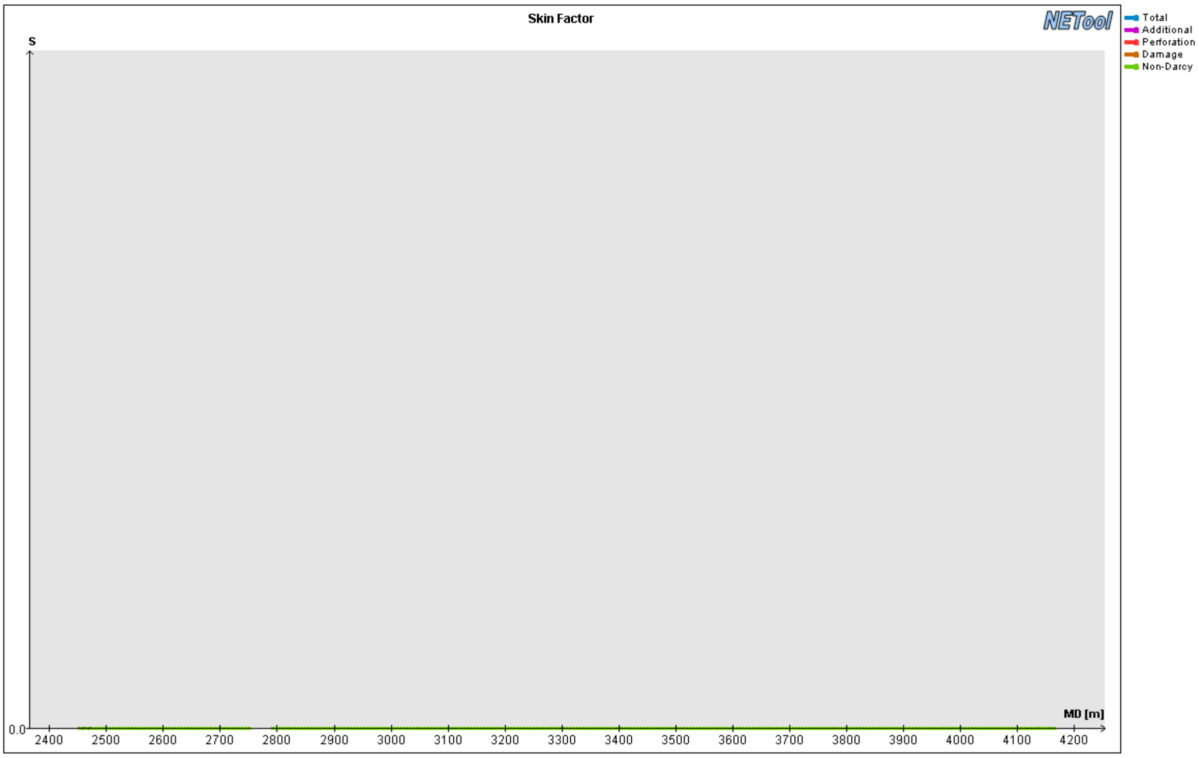
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the tubing along the wellbore.



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



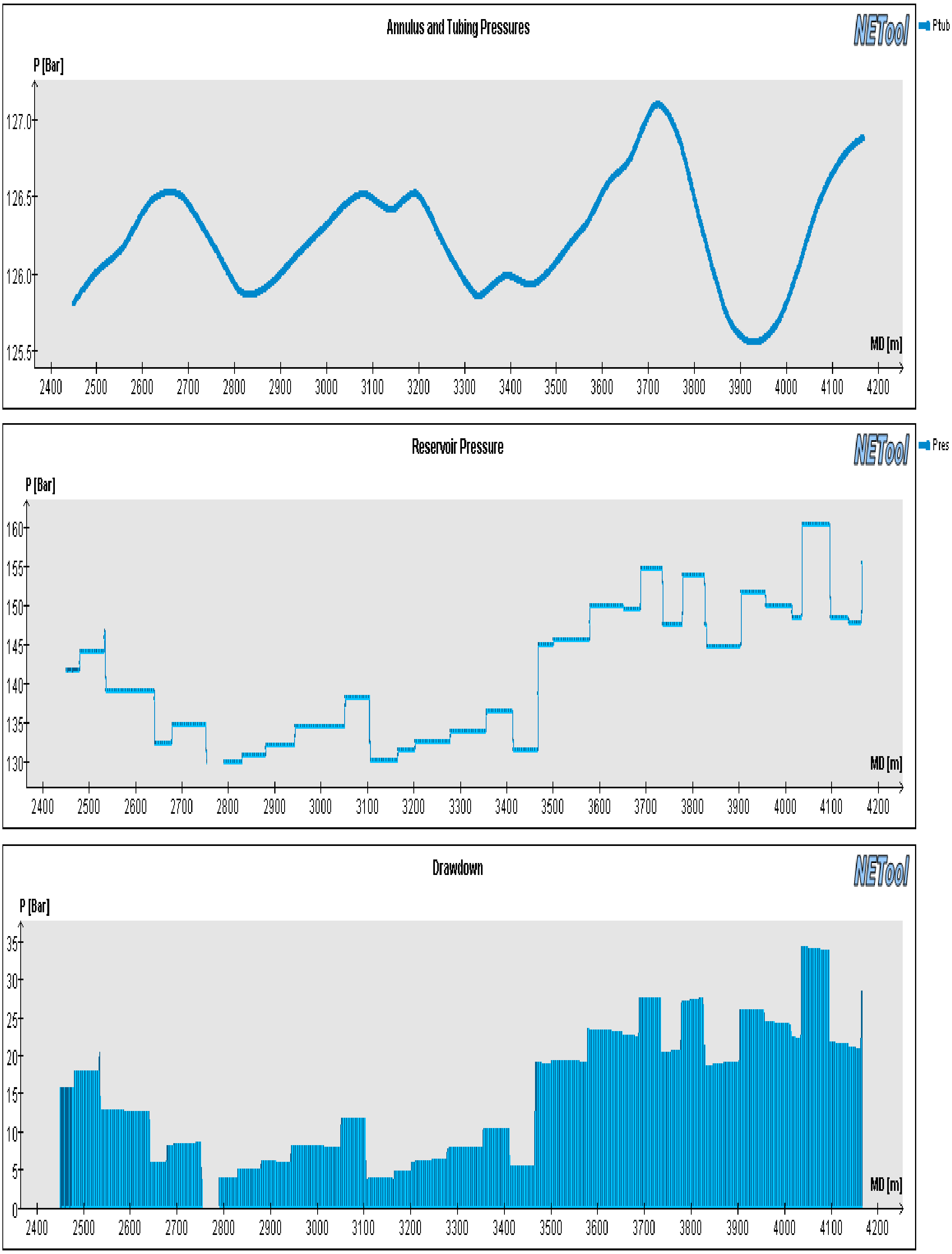
Skin factor plot for the well and given time step.

A.31 Plots for well KP7, 1826 days, reference case with Open Hole

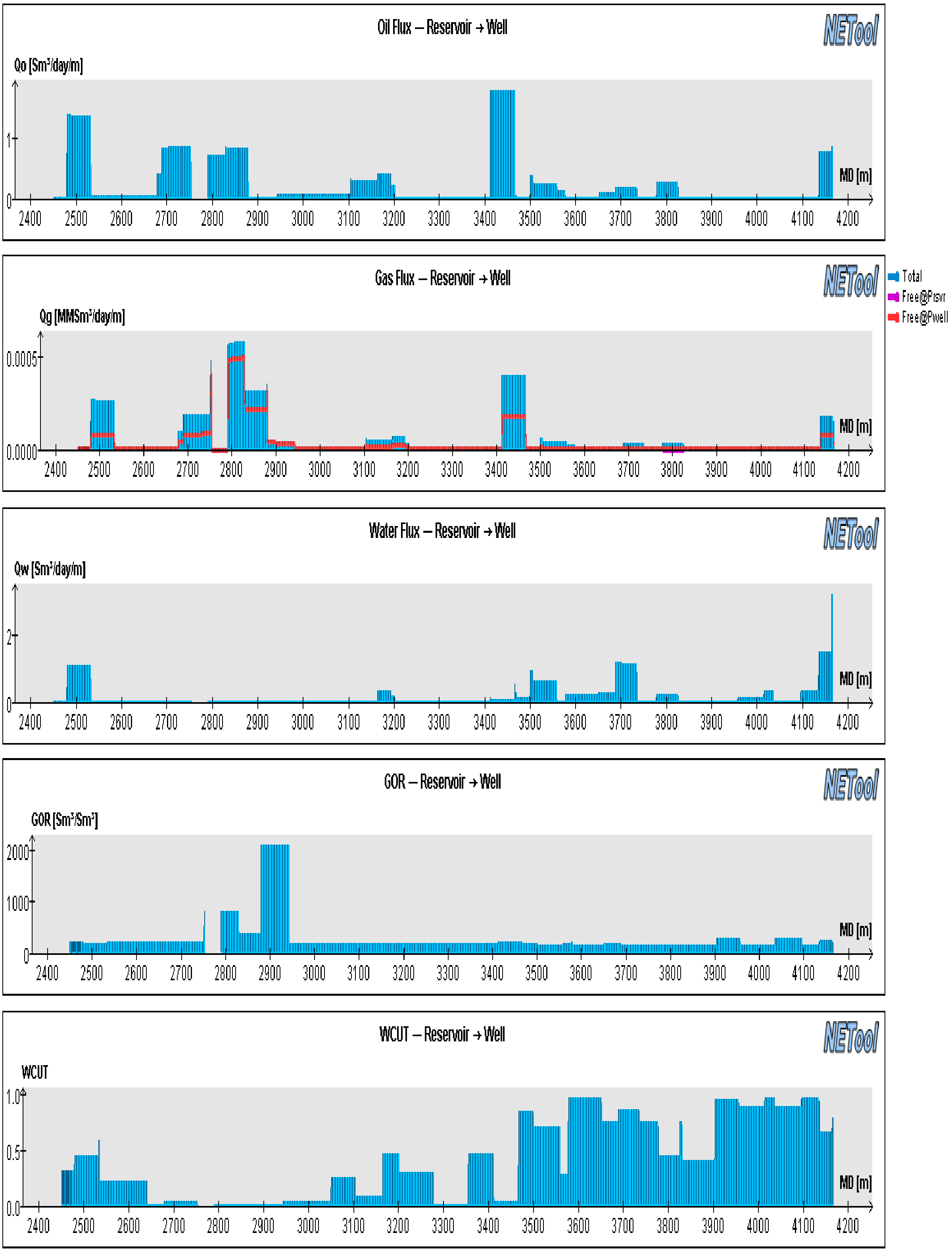
Completion overview: 8 ½” hole in the reservoir

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2870	12,0	**Open hole**	-	-	Yes	No	N/A
2	2450,3	23,7	**Open hole**	-	-	Yes	No	N/A	**37**	2882	12,0	**Open hole**	-	-	Yes	No	N/A
3	2474	12,0	**Open hole**	-	-	Yes	No	N/A	**38**	2894	12,0	**Open hole**	-	-	Yes	No	N/A
4	2486	12,0	**Open hole**	-	-	Yes	No	N/A	**39**	2906	12,0	**Open hole**	-	-	Yes	No	N/A
5	2498	12,0	**Open hole**	-	-	Yes	No	N/A	**40**	2918	12,0	**Open hole**	-	-	Yes	No	N/A
6	2510	12,0	**Open hole**	-	-	Yes	No	N/A	**41**	2930	12,0	**Open hole**	-	-	Yes	No	N/A
7	2522	12,0	**Open hole**	-	-	Yes	No	N/A	**42**	2942	12,0	**Open hole**	-	-	Yes	No	N/A
8	2534	12,0	**Open hole**	-	-	Yes	No	N/A	**43**	2954	12,0	**Open hole**	-	-	Yes	No	N/A
9	2546	12,0	**Open hole**	-	-	Yes	No	N/A	**44**	2966	12,0	**Open hole**	-	-	Yes	No	N/A
10	2558	12,0	**Open hole**	-	-	Yes	No	N/A	**45**	2978	12,0	**Open hole**	-	-	Yes	No	N/A
11	2570	12,0	**Open hole**	-	-	Yes	No	N/A	**46**	2990	12,0	**Open hole**	-	-	Yes	No	N/A
12	2582	12,0	**Open hole**	-	-	Yes	No	N/A	**47**	3002	12,0	**Open hole**	-	-	Yes	No	N/A
13	2594	12,0	**Open hole**	-	-	Yes	No	N/A	**48**	3014	12,0	**Open hole**	-	-	Yes	No	N/A
14	2606	12,0	**Open hole**	-	-	Yes	No	N/A	**49**	3026	12,0	**Open hole**	-	-	Yes	No	N/A
15	2618	12,0	**Open hole**	-	-	Yes	No	N/A	**50**	3038	12,0	**Open hole**	-	-	Yes	No	N/A
16	2630	12,0	**Open hole**	-	-	Yes	No	N/A	**51**	3050	12,0	**Open hole**	-	-	Yes	No	N/A
17	2642	12,0	**Open hole**	-	-	Yes	No	N/A	**52**	3062	12,0	**Open hole**	-	-	Yes	No	N/A
18	2654	12,0	**Open hole**	-	-	Yes	No	N/A	**53**	3074	12,0	**Open hole**	-	-	Yes	No	N/A
19	2666	12,0	**Open hole**	-	-	Yes	No	N/A	**54**	3086	12,0	**Open hole**	-	-	Yes	No	N/A
20	2678	12,0	**Open hole**	-	-	Yes	No	N/A	**55**	3098	12,0	**Open hole**	-	-	Yes	No	N/A
21	2690	12,0	**Open hole**	-	-	Yes	No	N/A	**56**	3110	12,0	**Open hole**	-	-	Yes	No	N/A
22	2702	12,0	**Open hole**	-	-	Yes	No	N/A	**57**	3122	12,0	**Open hole**	-	-	Yes	No	N/A
23	2714	12,0	**Open hole**	-	-	Yes	No	N/A	**58**	3134	12,0	**Open hole**	-	-	Yes	No	N/A
24	2726	12,0	**Open hole**	-	-	Yes	No	N/A	**59**	3146	12,0	**Open hole**	-	-	Yes	No	N/A
25	2738	12,0	**Open hole**	-	-	Yes	No	N/A	**60**	3158	12,0	**Open hole**	-	-	Yes	No	N/A
26	2750	12,0	**Open hole**	-	-	Yes	No	N/A	**61**	3170	12,0	**Open hole**	-	-	Yes	No	N/A
27	2762	12,0	**Open hole**	-	-	Yes	No	N/A	**62**	3182	12,0	**Open hole**	-	-	Yes	No	N/A
28	2774	12,0	**Open hole**	-	-	Yes	No	N/A	**63**	3194	12,0	**Open hole**	-	-	Yes	No	N/A
29	2786	12,0	**Open hole**	-	-	Yes	No	N/A	**64**	3206	12,0	**Open hole**	-	-	Yes	No	N/A
30	2798	12,0	**Open hole**	-	-	Yes	No	N/A	**65**	3218	12,0	**Open hole**	-	-	Yes	No	N/A
31	2810	12,0	**Open hole**	-	-	Yes	No	N/A	**66**	3230	12,0	**Open hole**	-	-	Yes	No	N/A
32	2822	12,0	**Open hole**	-	-	Yes	No	N/A	**67**	3242	12,0	**Open hole**	-	-	Yes	No	N/A
33	2834	12,0	**Open hole**	-	-	Yes	No	N/A	**68**	3254	12,0	**Open hole**	-	-	Yes	No	N/A
34	2846	12,0	**Open hole**	-	-	Yes	No	N/A	**69**	3266	12,0	**Open hole**	-	-	Yes	No	N/A
35	2858	12,0	**Open hole**	-	-	Yes	No	N/A	**70**	3278	12,0	**Open hole**	-	-	Yes	No	N/A

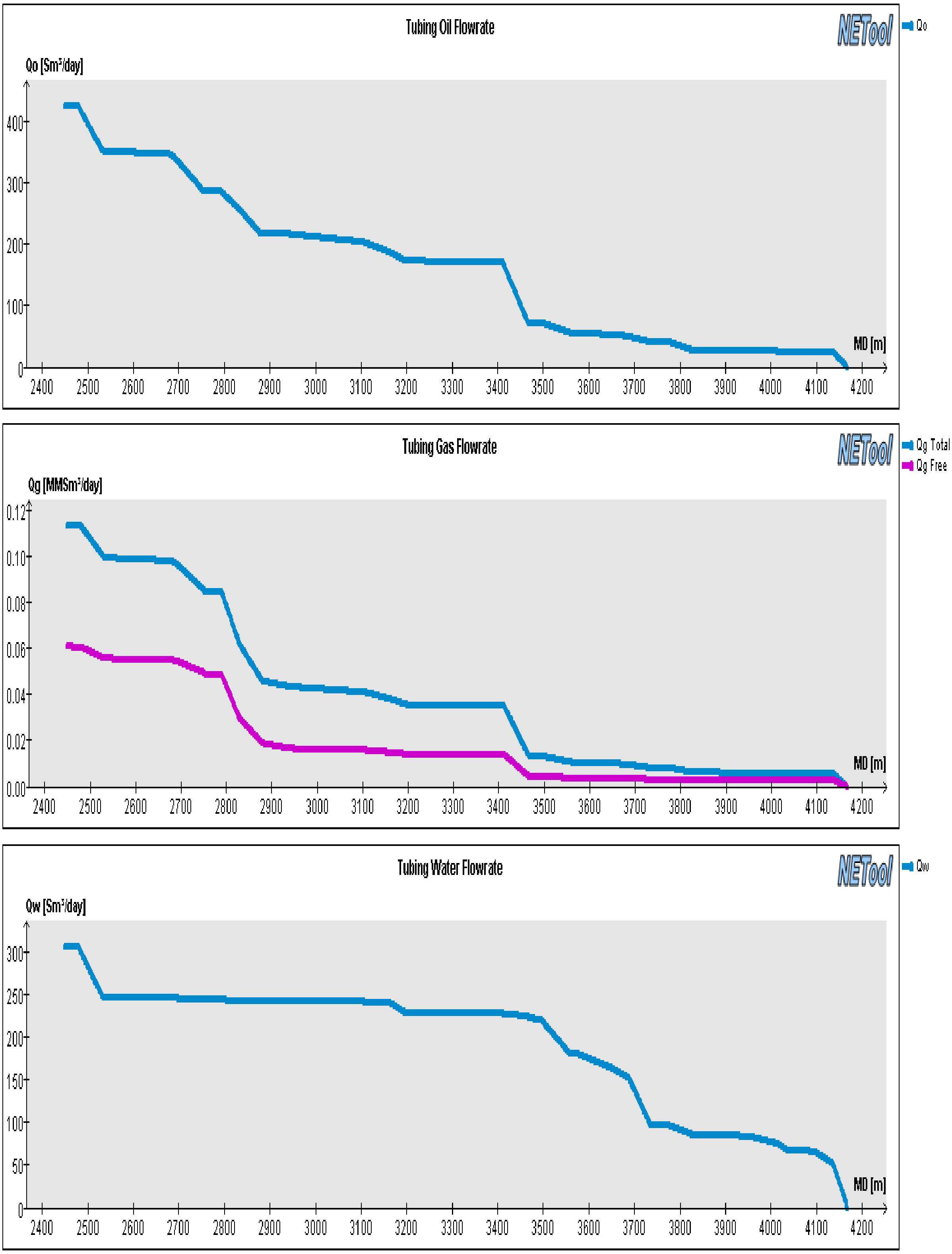
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3290	12,0	**Open hole**	-	-	Yes	No	N/A	**111**	3770,0	12,0	**Open hole**	-	-	Yes	No	N/A
72	3302	12,0	**Open hole**	-	-	Yes	No	N/A	**112**	3782,0	12,0	**Open hole**	-	-	Yes	No	N/A
73	3314	12,0	**Open hole**	-	-	Yes	No	N/A	**113**	3794,0	12,0	**Open hole**	-	-	Yes	No	N/A
74	3326	12,0	**Open hole**	-	-	Yes	No	N/A	**114**	3806,0	12,0	**Open hole**	-	-	Yes	No	N/A
75	3338	12,0	**Open hole**	-	-	Yes	No	N/A	**115**	3818,0	12,0	**Open hole**	-	-	Yes	No	N/A
76	3350	12,0	**Open hole**	-	-	Yes	No	N/A	**116**	3830,0	12,0	**Open hole**	-	-	Yes	No	N/A
77	3362	12,0	**Open hole**	-	-	Yes	No	N/A	**117**	3842,0	12,0	**Open hole**	-	-	Yes	No	N/A
78	3374	12,0	**Open hole**	-	-	Yes	No	N/A	**118**	3854,0	12,0	**Open hole**	-	-	Yes	No	N/A
79	3386	12,0	**Open hole**	-	-	Yes	No	N/A	**119**	3866,0	12,0	**Open hole**	-	-	Yes	No	N/A
80	3398	12,0	**Open hole**	-	-	Yes	No	N/A	**120**	3878,0	12,0	**Open hole**	-	-	Yes	No	N/A
81	3410	12,0	**Open hole**	-	-	Yes	No	N/A	**121**	3890,0	12,0	**Open hole**	-	-	Yes	No	N/A
82	3422	12,0	**Open hole**	-	-	Yes	No	N/A	**122**	3902,0	12,0	**Open hole**	-	-	Yes	No	N/A
83	3434	12,0	**Open hole**	-	-	Yes	No	N/A	**123**	3914,0	12,0	**Open hole**	-	-	Yes	No	N/A
84	3446	12,0	**Open hole**	-	-	Yes	No	N/A	**124**	3926,0	12,0	**Open hole**	-	-	Yes	No	N/A
85	3458	12,0	**Open hole**	-	-	Yes	No	N/A	**125**	3938,0	12,0	**Open hole**	-	-	Yes	No	N/A
86	3470	12,0	**Open hole**	-	-	Yes	No	N/A	**126**	3950,0	12,0	**Open hole**	-	-	Yes	No	N/A
87	3482	12,0	**Open hole**	-	-	Yes	No	N/A	**127**	3962,0	12,0	**Open hole**	-	-	Yes	No	N/A
88	3494	12,0	**Open hole**	-	-	Yes	No	N/A	**128**	3974,0	12,0	**Open hole**	-	-	Yes	No	N/A
89	3506	12,0	**Open hole**	-	-	Yes	No	N/A	**129**	3986,0	12,0	**Open hole**	-	-	Yes	No	N/A
90	3518	12,0	**Open hole**	-	-	Yes	No	N/A	**130**	3998,0	12,0	**Open hole**	-	-	Yes	No	N/A
91	3530	12,0	**Open hole**	-	-	Yes	No	N/A	**131**	4010,0	12,0	**Open hole**	-	-	Yes	No	N/A
92	3542	12,0	**Open hole**	-	-	Yes	No	N/A	**132**	4022,0	12,0	**Open hole**	-	-	Yes	No	N/A
93	3554	12,0	**Open hole**	-	-	Yes	No	N/A	**133**	4034,0	12,0	**Open hole**	-	-	Yes	No	N/A
94	3566	12,0	**Open hole**	-	-	Yes	No	N/A	**134**	4046,0	12,0	**Open hole**	-	-	Yes	No	N/A
95	3578	12,0	**Open hole**	-	-	Yes	No	N/A	**135**	4058,0	12,0	**Open hole**	-	-	Yes	No	N/A
96	3590	12,0	**Open hole**	-	-	Yes	No	N/A	**136**	4070,0	12,0	**Open hole**	-	-	Yes	No	N/A
97	3602	12,0	**Open hole**	-	-	Yes	No	N/A	**137**	4082,0	12,0	**Open hole**	-	-	Yes	No	N/A
98	3614	12,0	**Open hole**	-	-	Yes	No	N/A	**138**	4094,0	12,0	**Open hole**	-	-	Yes	No	N/A
99	3626	12,0	**Open hole**	-	-	Yes	No	N/A	**139**	4106,0	12,0	**Open hole**	-	-	Yes	No	N/A
100	3638	12,0	**Open hole**	-	-	Yes	No	N/A	**140**	4118,0	12,0	**Open hole**	-	-	Yes	No	N/A
101	3650	12,0	**Open hole**	-	-	Yes	No	N/A	**141**	4130,0	12,0	**Open hole**	-	-	Yes	No	N/A
102	3662,0	12,0	**Open hole**	-	-	Yes	No	N/A	**142**	4142,0	12,0	**Open hole**	-	-	Yes	No	N/A
103	3674,0	12,0	**Open hole**	-	-	Yes	No	N/A	**143**	4154,0	13,3	**Open hole**	-	-	Yes	No	N/A
104	3686,0	12,0	**Open hole**	-	-	Yes	No	N/A	**TOE**	4167,3		**Open hole**	-	-	Yes	No	N/A
105	3698,0	12,0	**Open hole**	-	-	Yes	No	N/A									
106	3710,0	12,0	**Open hole**	-	-	Yes	No	N/A									
107	3722,0	12,0	**Open hole**	-	-	Yes	No	N/A									
108	3734,0	12,0	**Open hole**	-	-	Yes	No	N/A									
109	3746,0	12,0	**Open hole**	-	-	Yes	No	N/A									
110	3758,0	12,0	**Open hole**	-	-	Yes	No	N/A									



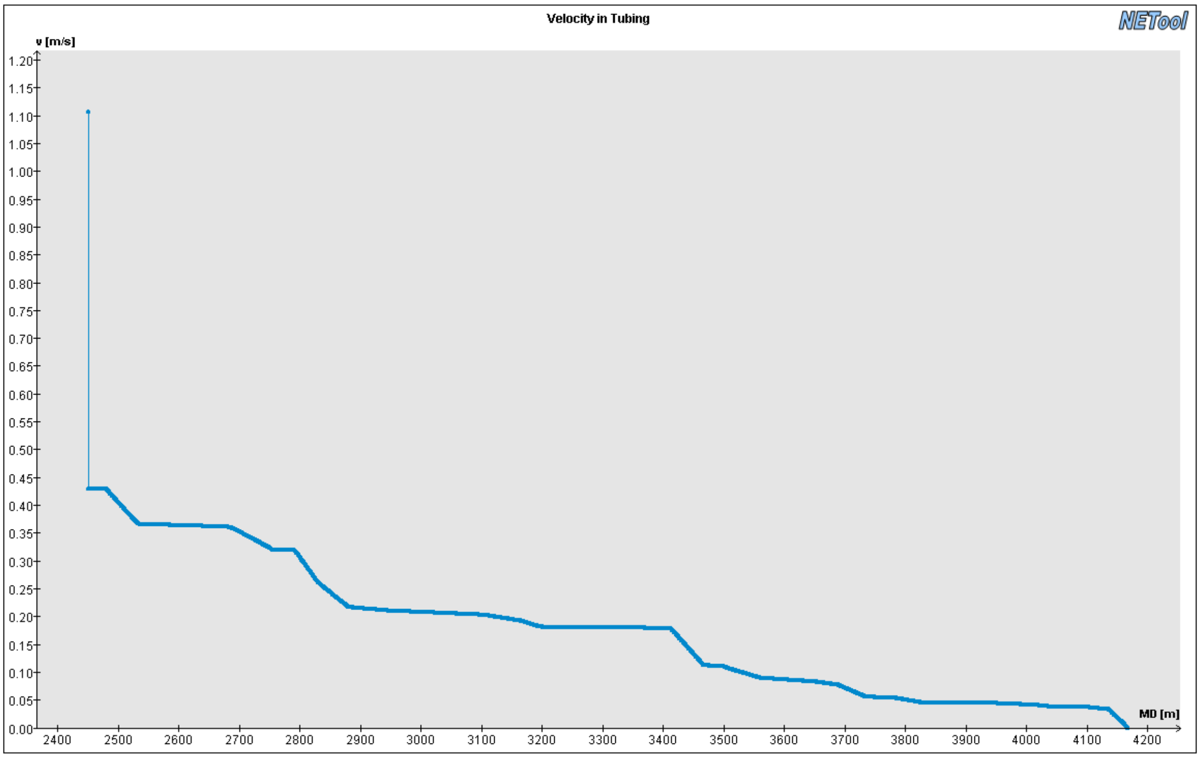
Annulus and tubing pressure, Reservoir pressure and Dradown along the wellbore.



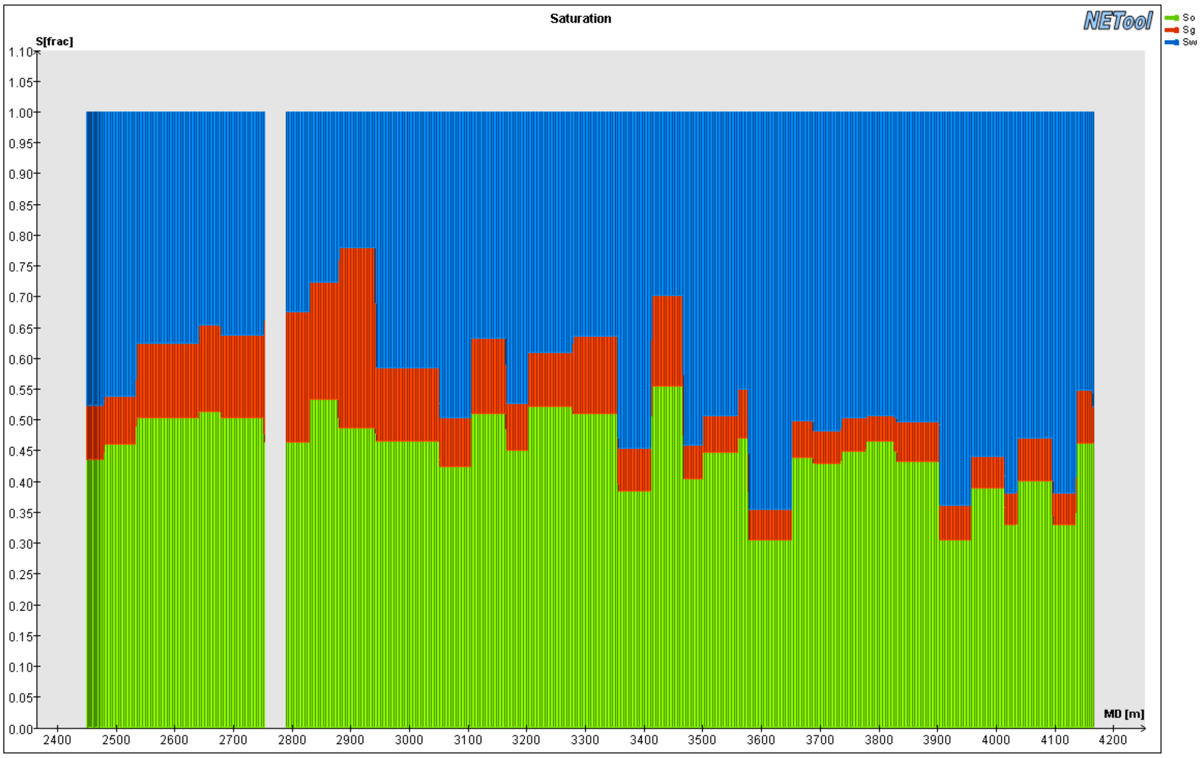
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



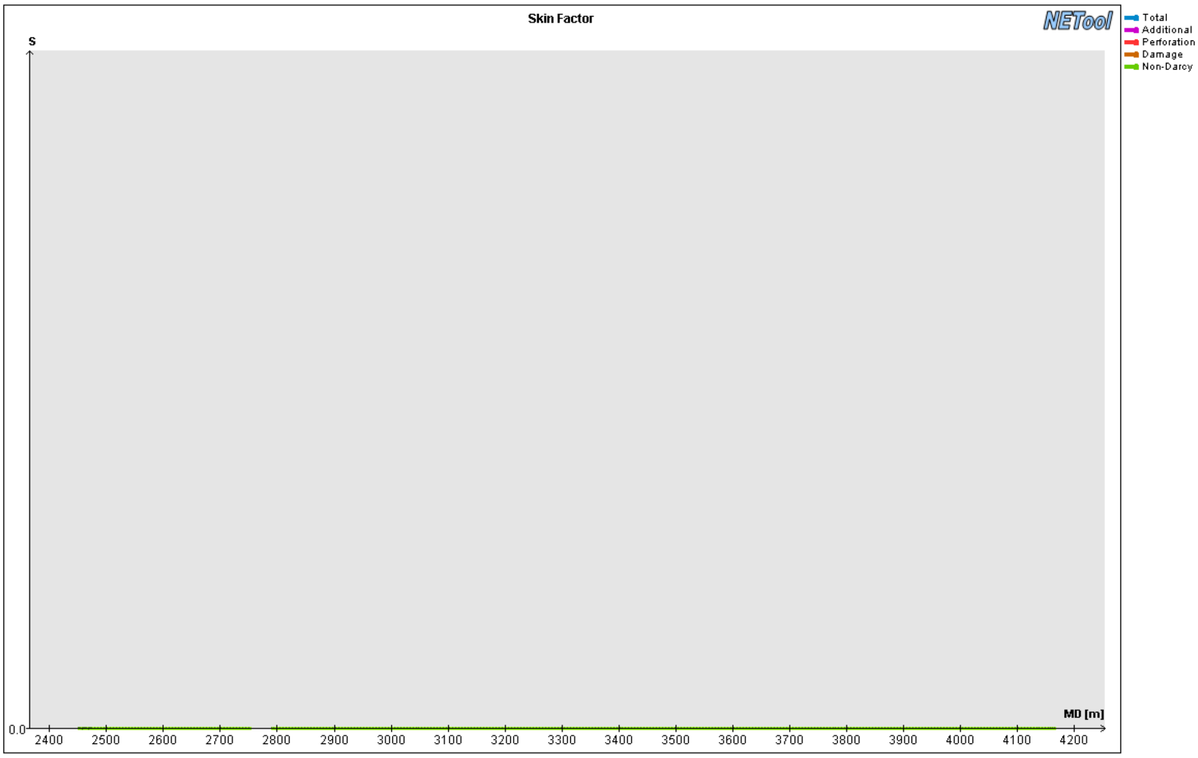
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the tubing along the wellbore.



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



Skin factor plot for the well and given time step.

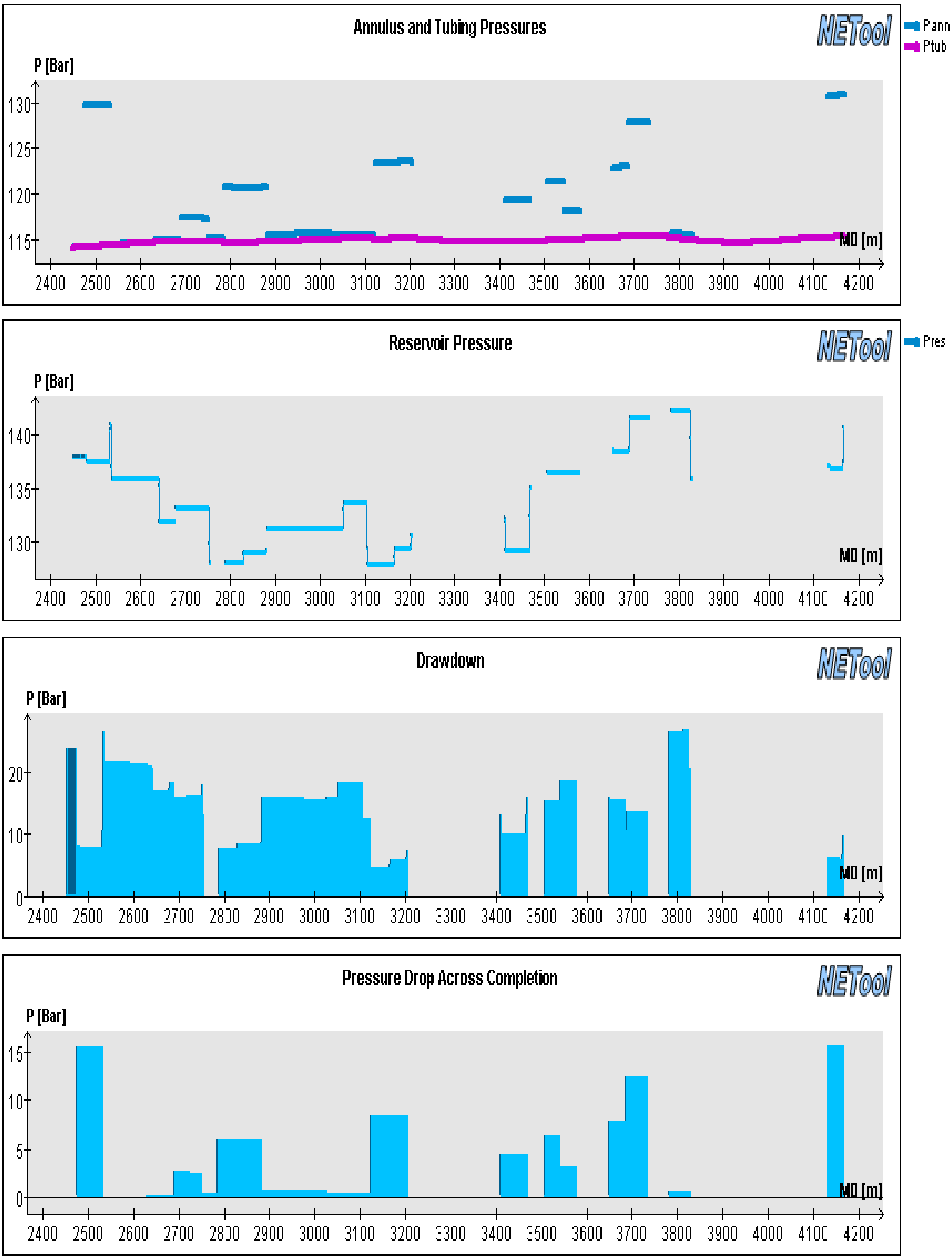
A.32 Plots for well KP9, 1826 days, Recommended ICD

Completion overview for the case:

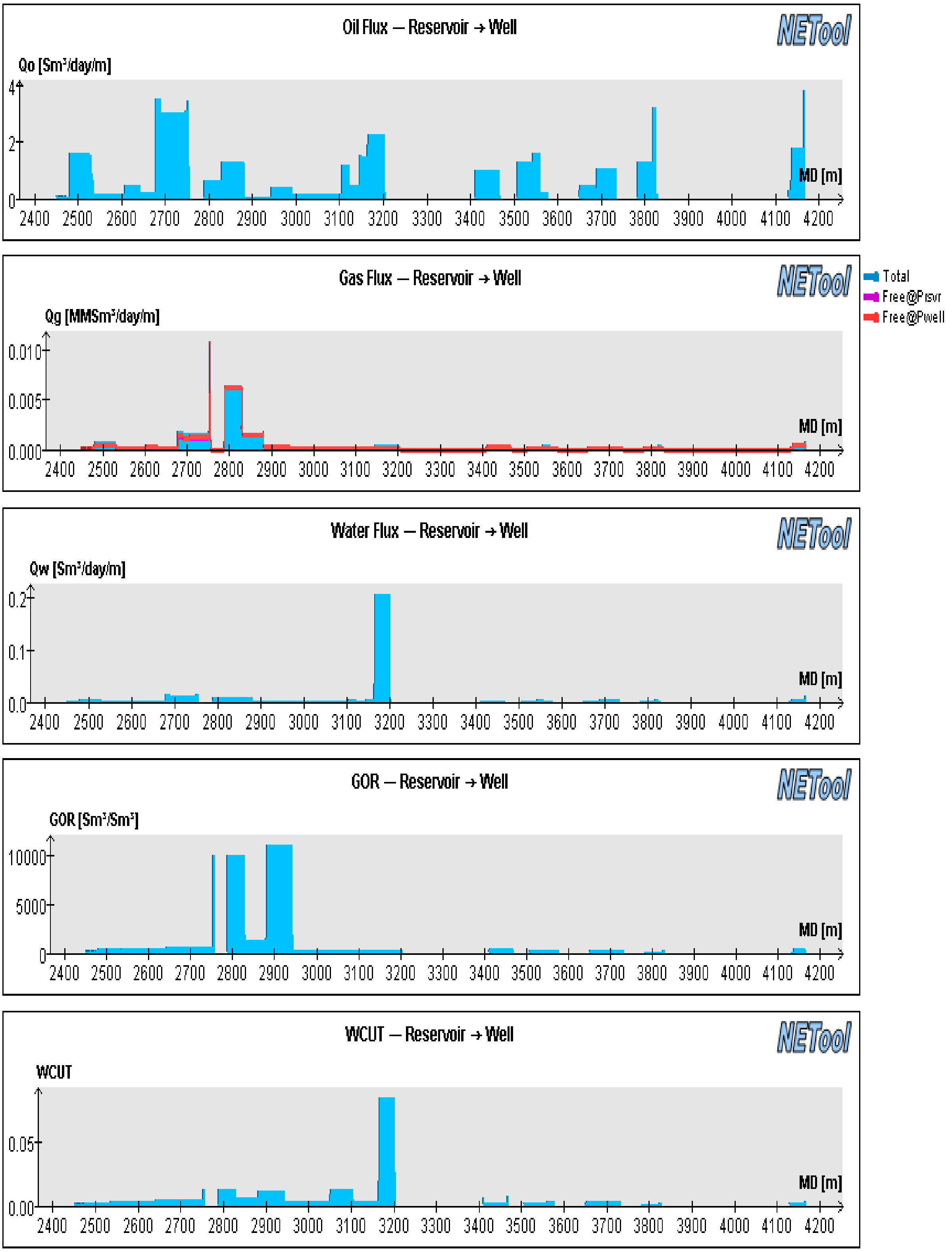
Reservoir section OD	8 ½"
Completion OD	6 5/8"
Completion ID	5,927"
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	-	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

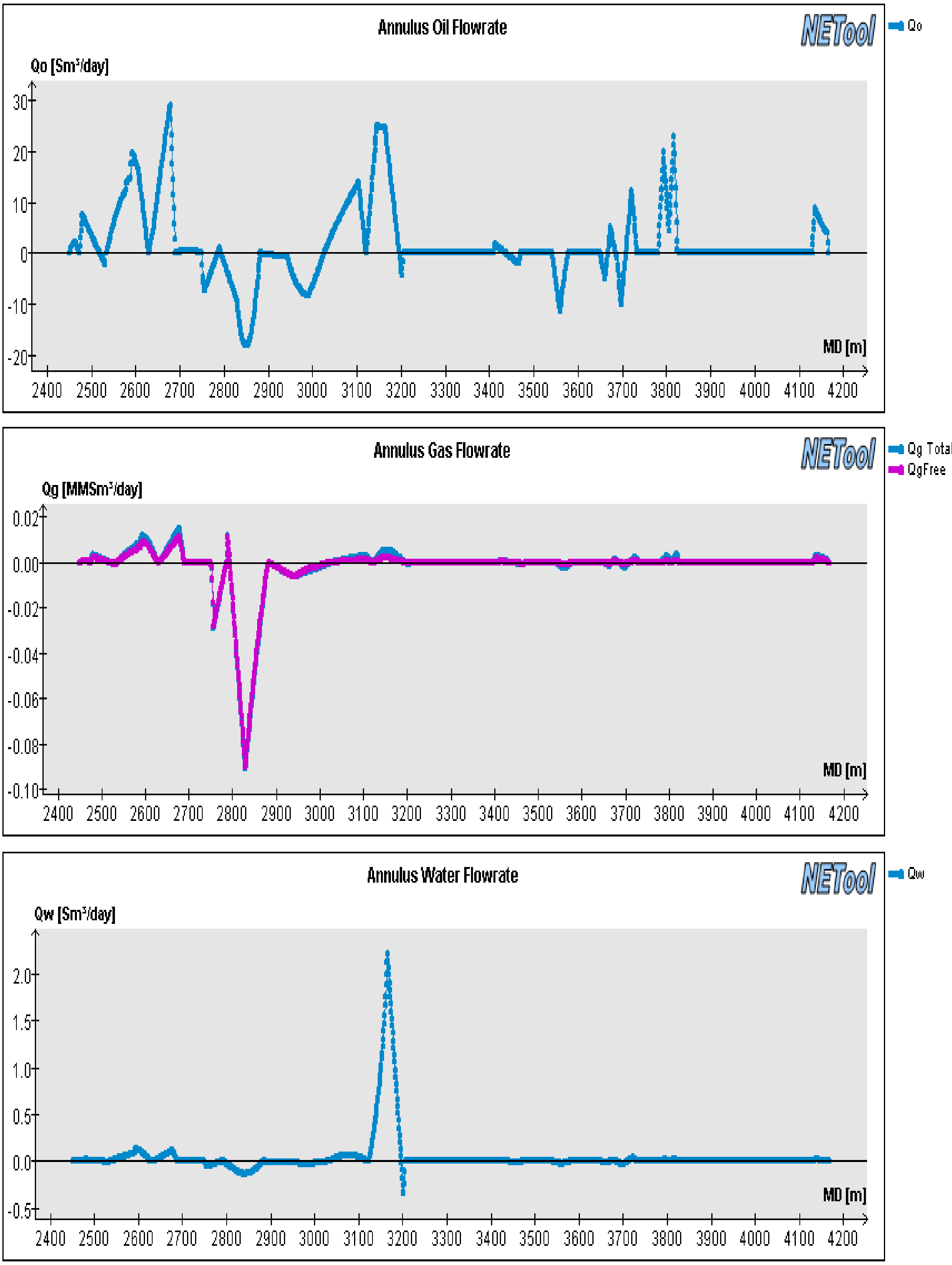
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	2	2,5	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	4	1,6	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	1,6	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A									



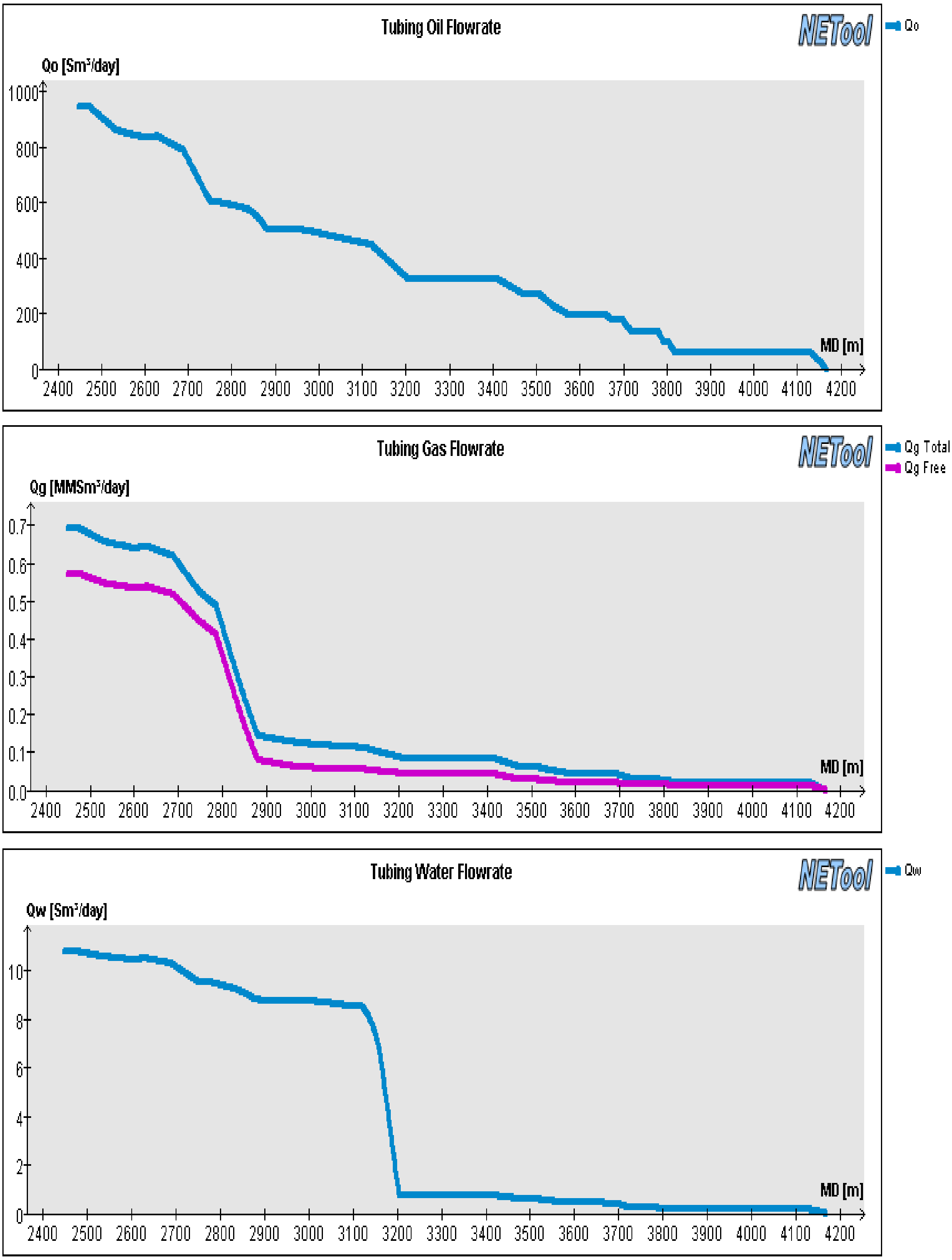
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



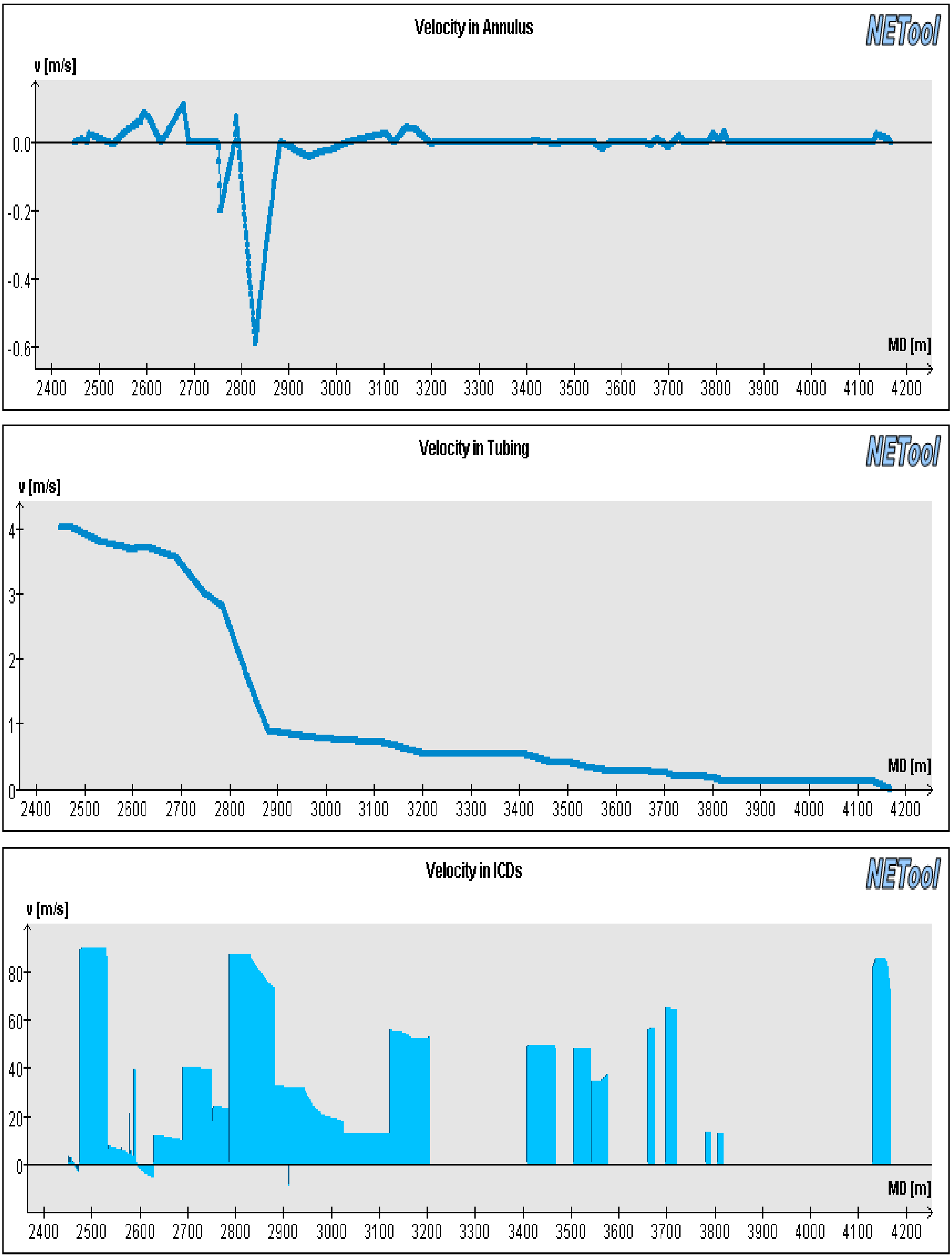
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



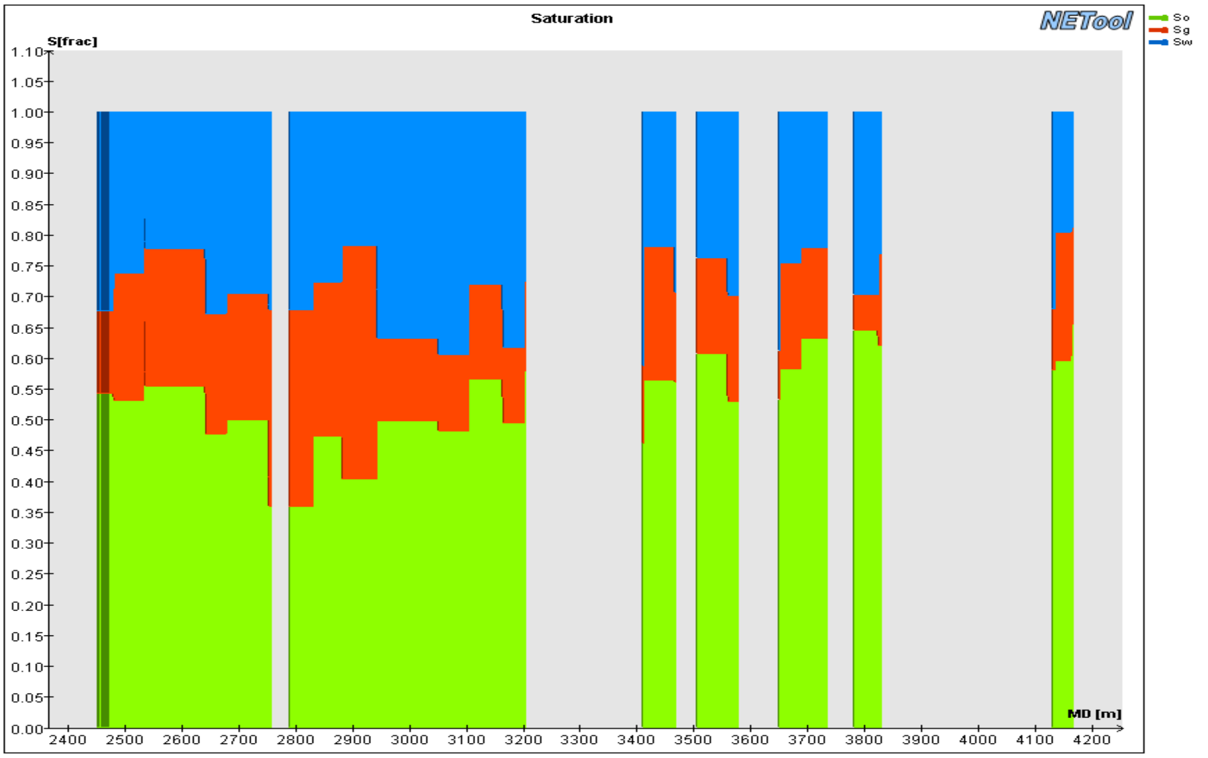
Annulus oil, gas and water flow rate along the wellbore.



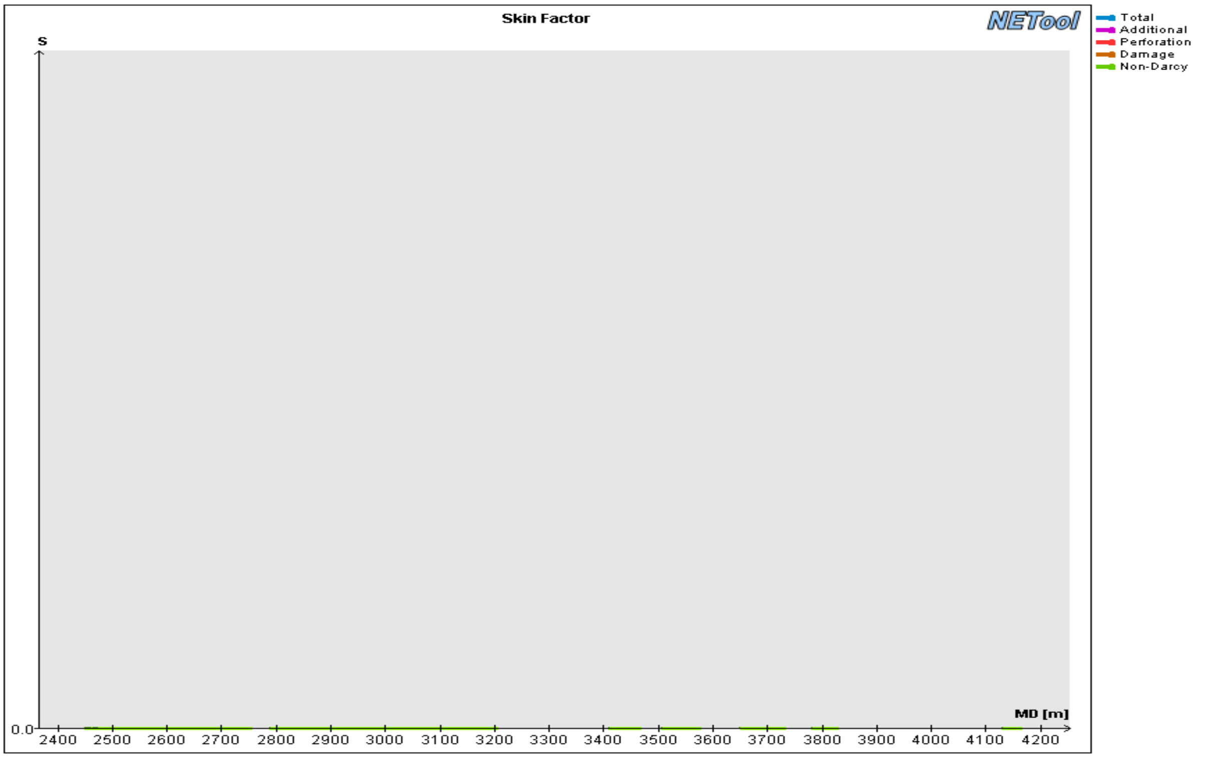
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



Skin factor plot for the well and given time step.

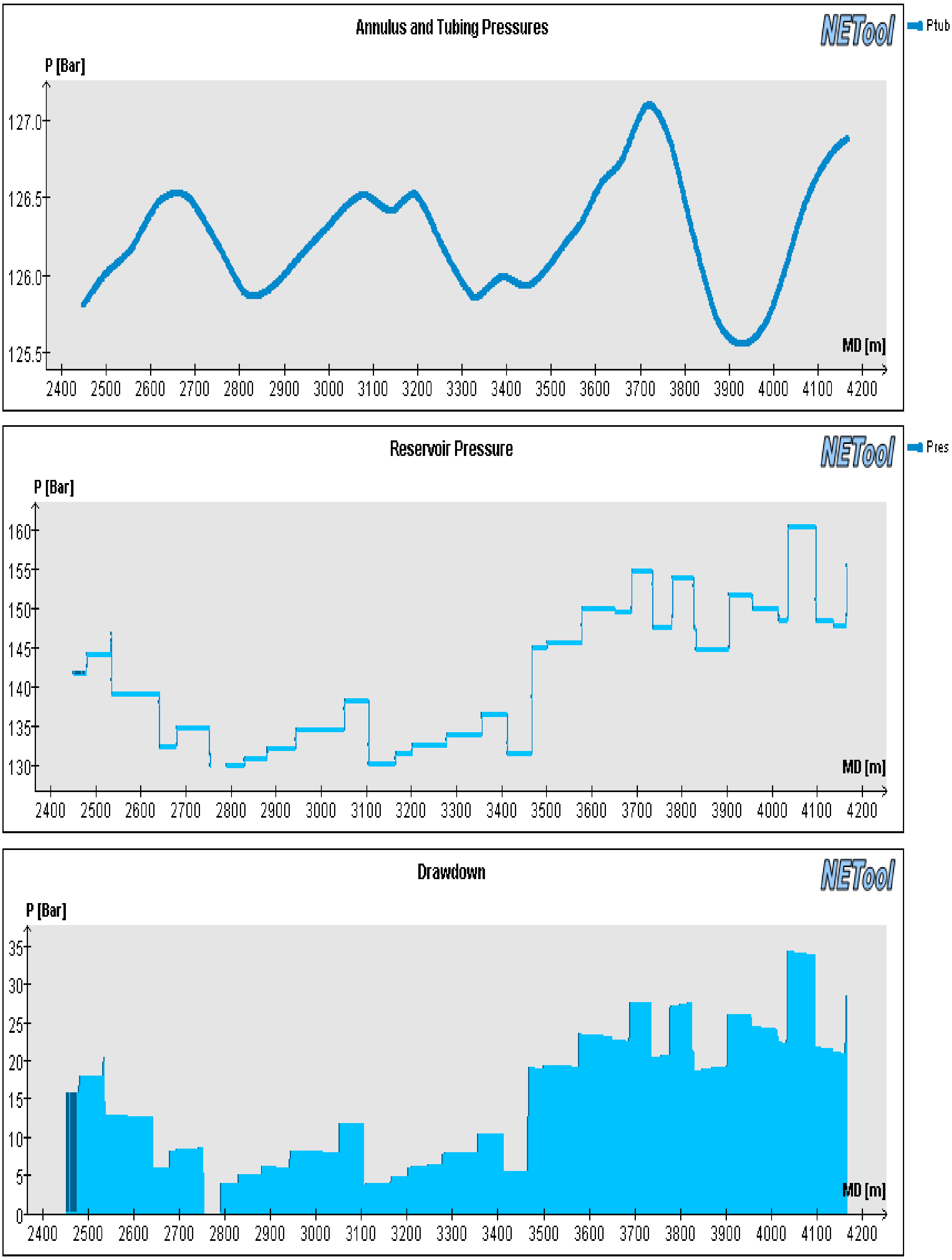
A.33 Plots for well KP9, 2556 days, reference case

Completion overview: 8 ½” hole in the reservoir

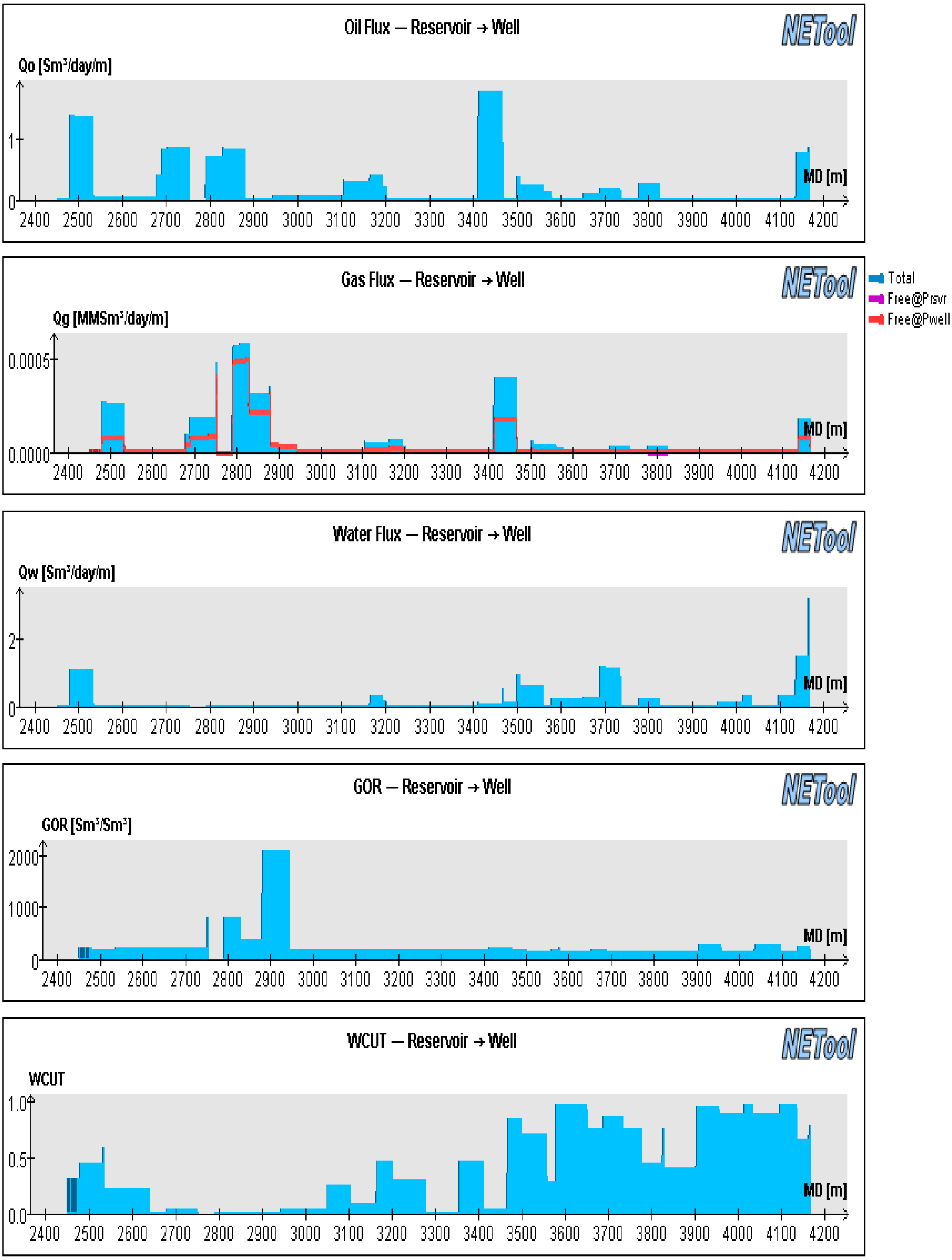
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2870	12,0	Open hole	-	-	Yes	No	N/A
2	2450,3	23,7	Open hole	-	-	Yes	No	N/A	37	2882	12,0	Open hole	-	-	Yes	No	N/A
3	2474	12,0	Open hole	-	-	Yes	No	N/A	38	2894	12,0	Open hole	-	-	Yes	No	N/A
4	2486	12,0	Open hole	-	-	Yes	No	N/A	39	2906	12,0	Open hole	-	-	Yes	No	N/A
5	2498	12,0	Open hole	-	-	Yes	No	N/A	40	2918	12,0	Open hole	-	-	Yes	No	N/A
6	2510	12,0	Open hole	-	-	Yes	No	N/A	41	2930	12,0	Open hole	-	-	Yes	No	N/A
7	2522	12,0	Open hole	-	-	Yes	No	N/A	42	2942	12,0	Open hole	-	-	Yes	No	N/A
8	2534	12,0	Open hole	-	-	Yes	No	N/A	43	2954	12,0	Open hole	-	-	Yes	No	N/A
9	2546	12,0	Open hole	-	-	Yes	No	N/A	44	2966	12,0	Open hole	-	-	Yes	No	N/A
10	2558	12,0	Open hole	-	-	Yes	No	N/A	45	2978	12,0	Open hole	-	-	Yes	No	N/A
11	2570	12,0	Open hole	-	-	Yes	No	N/A	46	2990	12,0	Open hole	-	-	Yes	No	N/A
12	2582	12,0	Open hole	-	-	Yes	No	N/A	47	3002	12,0	Open hole	-	-	Yes	No	N/A
13	2594	12,0	Open hole	-	-	Yes	No	N/A	48	3014	12,0	Open hole	-	-	Yes	No	N/A
14	2606	12,0	Open hole	-	-	Yes	No	N/A	49	3026	12,0	Open hole	-	-	Yes	No	N/A
15	2618	12,0	Open hole	-	-	Yes	No	N/A	50	3038	12,0	Open hole	-	-	Yes	No	N/A
16	2630	12,0	Open hole	-	-	Yes	No	N/A	51	3050	12,0	Open hole	-	-	Yes	No	N/A
17	2642	12,0	Open hole	-	-	Yes	No	N/A	52	3062	12,0	Open hole	-	-	Yes	No	N/A
18	2654	12,0	Open hole	-	-	Yes	No	N/A	53	3074	12,0	Open hole	-	-	Yes	No	N/A
19	2666	12,0	Open hole	-	-	Yes	No	N/A	54	3086	12,0	Open hole	-	-	Yes	No	N/A
20	2678	12,0	Open hole	-	-	Yes	No	N/A	55	3098	12,0	Open hole	-	-	Yes	No	N/A
21	2690	12,0	Open hole	-	-	Yes	No	N/A	56	3110	12,0	Open hole	-	-	Yes	No	N/A
22	2702	12,0	Open hole	-	-	Yes	No	N/A	57	3122	12,0	Open hole	-	-	Yes	No	N/A
23	2714	12,0	Open hole	-	-	Yes	No	N/A	58	3134	12,0	Open hole	-	-	Yes	No	N/A
24	2726	12,0	Open hole	-	-	Yes	No	N/A	59	3146	12,0	Open hole	-	-	Yes	No	N/A
25	2738	12,0	Open hole	-	-	Yes	No	N/A	60	3158	12,0	Open hole	-	-	Yes	No	N/A
26	2750	12,0	Open hole	-	-	Yes	No	N/A	61	3170	12,0	Open hole	-	-	Yes	No	N/A
27	2762	12,0	Open hole	-	-	Yes	No	N/A	62	3182	12,0	Open hole	-	-	Yes	No	N/A
28	2774	12,0	Open hole	-	-	Yes	No	N/A	63	3194	12,0	Open hole	-	-	Yes	No	N/A
29	2786	12,0	Open hole	-	-	Yes	No	N/A	64	3206	12,0	Open hole	-	-	Yes	No	N/A
30	2798	12,0	Open hole	-	-	Yes	No	N/A	65	3218	12,0	Open hole	-	-	Yes	No	N/A
31	2810	12,0	Open hole	-	-	Yes	No	N/A	66	3230	12,0	Open hole	-	-	Yes	No	N/A
32	2822	12,0	Open hole	-	-	Yes	No	N/A	67	3242	12,0	Open hole	-	-	Yes	No	N/A
33	2834	12,0	Open hole	-	-	Yes	No	N/A	68	3254	12,0	Open hole	-	-	Yes	No	N/A
34	2846	12,0	Open hole	-	-	Yes	No	N/A	69	3266	12,0	Open hole	-	-	Yes	No	N/A
35	2858	12,0	Open hole	-	-	Yes	No	N/A	70	3278	12,0	Open hole	-	-	Yes	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	3290	12,0	Open hole	-	-	Yes	No	N/A
72	3302	12,0	Open hole	-	-	Yes	No	N/A
73	3314	12,0	Open hole	-	-	Yes	No	N/A
74	3326	12,0	Open hole	-	-	Yes	No	N/A
75	3338	12,0	Open hole	-	-	Yes	No	N/A
76	3350	12,0	Open hole	-	-	Yes	No	N/A
77	3362	12,0	Open hole	-	-	Yes	No	N/A
78	3374	12,0	Open hole	-	-	Yes	No	N/A
79	3386	12,0	Open hole	-	-	Yes	No	N/A
80	3398	12,0	Open hole	-	-	Yes	No	N/A
81	3410	12,0	Open hole	-	-	Yes	No	N/A
82	3422	12,0	Open hole	-	-	Yes	No	N/A
83	3434	12,0	Open hole	-	-	Yes	No	N/A
84	3446	12,0	Open hole	-	-	Yes	No	N/A
85	3458	12,0	Open hole	-	-	Yes	No	N/A
86	3470	12,0	Open hole	-	-	Yes	No	N/A
87	3482	12,0	Open hole	-	-	Yes	No	N/A
88	3494	12,0	Open hole	-	-	Yes	No	N/A
89	3506	12,0	Open hole	-	-	Yes	No	N/A
90	3518	12,0	Open hole	-	-	Yes	No	N/A
91	3530	12,0	Open hole	-	-	Yes	No	N/A
92	3542	12,0	Open hole	-	-	Yes	No	N/A
93	3554	12,0	Open hole	-	-	Yes	No	N/A
94	3566	12,0	Open hole	-	-	Yes	No	N/A
95	3578	12,0	Open hole	-	-	Yes	No	N/A
96	3590	12,0	Open hole	-	-	Yes	No	N/A
97	3602	12,0	Open hole	-	-	Yes	No	N/A
98	3614	12,0	Open hole	-	-	Yes	No	N/A
99	3626	12,0	Open hole	-	-	Yes	No	N/A
100	3638	12,0	Open hole	-	-	Yes	No	N/A
101	3650	12,0	Open hole	-	-	Yes	No	N/A
102	3662,0	12,0	Open hole	-	-	Yes	No	N/A
103	3674,0	12,0	Open hole	-	-	Yes	No	N/A
104	3686,0	12,0	Open hole	-	-	Yes	No	N/A
105	3698,0	12,0	Open hole	-	-	Yes	No	N/A
106	3710,0	12,0	Open hole	-	-	Yes	No	N/A
107	3722,0	12,0	Open hole	-	-	Yes	No	N/A
108	3734,0	12,0	Open hole	-	-	Yes	No	N/A
109	3746,0	12,0	Open hole	-	-	Yes	No	N/A
110	3758,0	12,0	Open hole	-	-	Yes	No	N/A

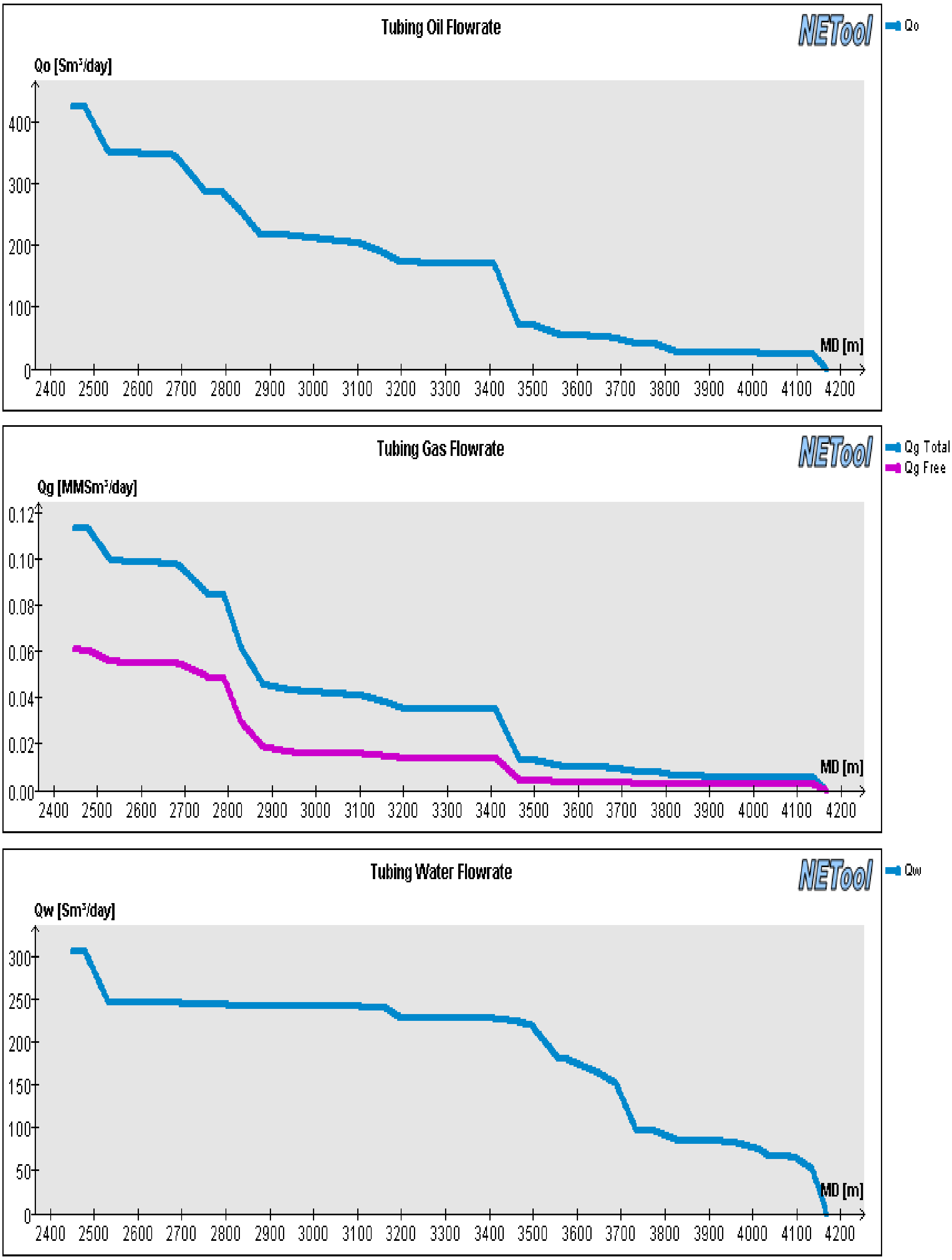
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
111	3770,0	12,0	Open hole	-	-	Yes	No	N/A
112	3782,0	12,0	Open hole	-	-	Yes	No	N/A
113	3794,0	12,0	Open hole	-	-	Yes	No	N/A
114	3806,0	12,0	Open hole	-	-	Yes	No	N/A
115	3818,0	12,0	Open hole	-	-	Yes	No	N/A
116	3830,0	12,0	Open hole	-	-	Yes	No	N/A
117	3842,0	12,0	Open hole	-	-	Yes	No	N/A
118	3854,0	12,0	Open hole	-	-	Yes	No	N/A
119	3866,0	12,0	Open hole	-	-	Yes	No	N/A
120	3878,0	12,0	Open hole	-	-	Yes	No	N/A
121	3890,0	12,0	Open hole	-	-	Yes	No	N/A
122	3902,0	12,0	Open hole	-	-	Yes	No	N/A
123	3914,0	12,0	Open hole	-	-	Yes	No	N/A
124	3926,0	12,0	Open hole	-	-	Yes	No	N/A
125	3938,0	12,0	Open hole	-	-	Yes	No	N/A
126	3950,0	12,0	Open hole	-	-	Yes	No	N/A
127	3962,0	12,0	Open hole	-	-	Yes	No	N/A
128	3974,0	12,0	Open hole	-	-	Yes	No	N/A
129	3986,0	12,0	Open hole	-	-	Yes	No	N/A
130	3998,0	12,0	Open hole	-	-	Yes	No	N/A
131	4010,0	12,0	Open hole	-	-	Yes	No	N/A
132	4022,0	12,0	Open hole	-	-	Yes	No	N/A
133	4034,0	12,0	Open hole	-	-	Yes	No	N/A
134	4046,0	12,0	Open hole	-	-	Yes	No	N/A
135	4058,0	12,0	Open hole	-	-	Yes	No	N/A
136	4070,0	12,0	Open hole	-	-	Yes	No	N/A
137	4082,0	12,0	Open hole	-	-	Yes	No	N/A
138	4094,0	12,0	Open hole	-	-	Yes	No	N/A
139	4106,0	12,0	Open hole	-	-	Yes	No	N/A
140	4118,0	12,0	Open hole	-	-	Yes	No	N/A
141	4130,0	12,0	Open hole	-	-	Yes	No	N/A
142	4142,0	12,0	Open hole	-	-	Yes	No	N/A
143	4154,0	13,3	Open hole	-	-	Yes	No	N/A
TOE	4167,3		Open hole	-	-	Yes	No	N/A



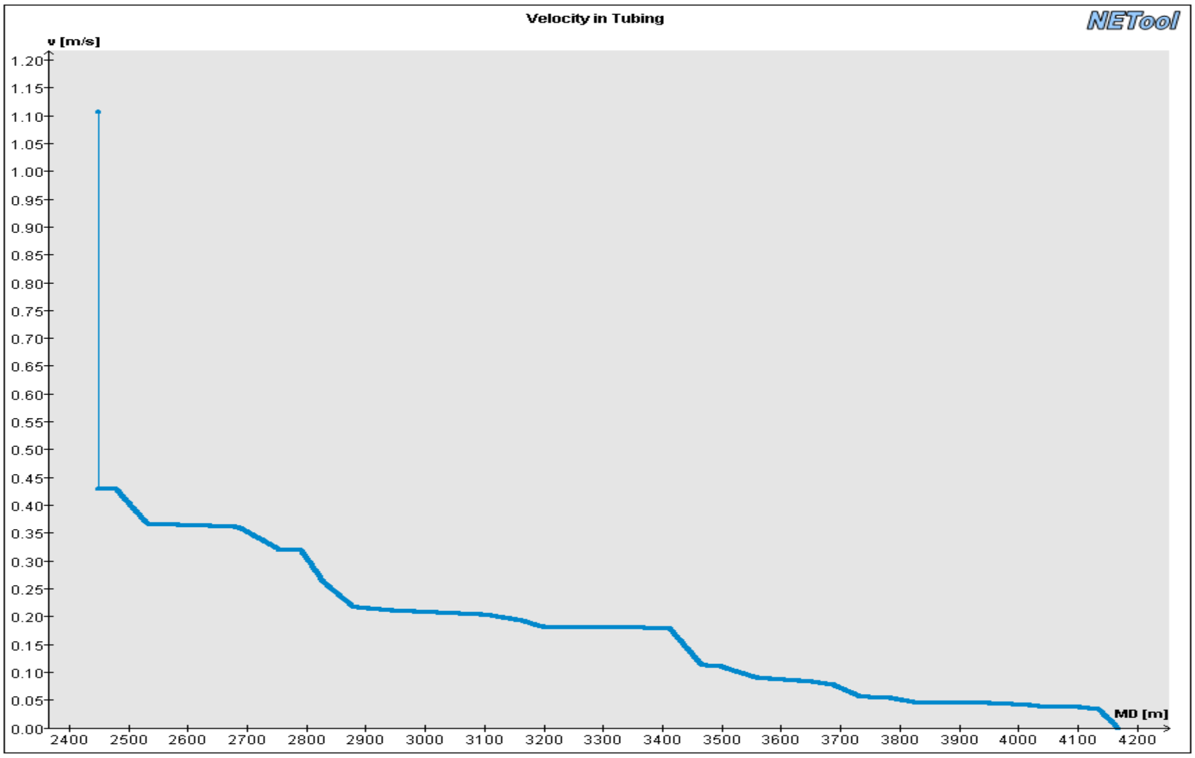
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



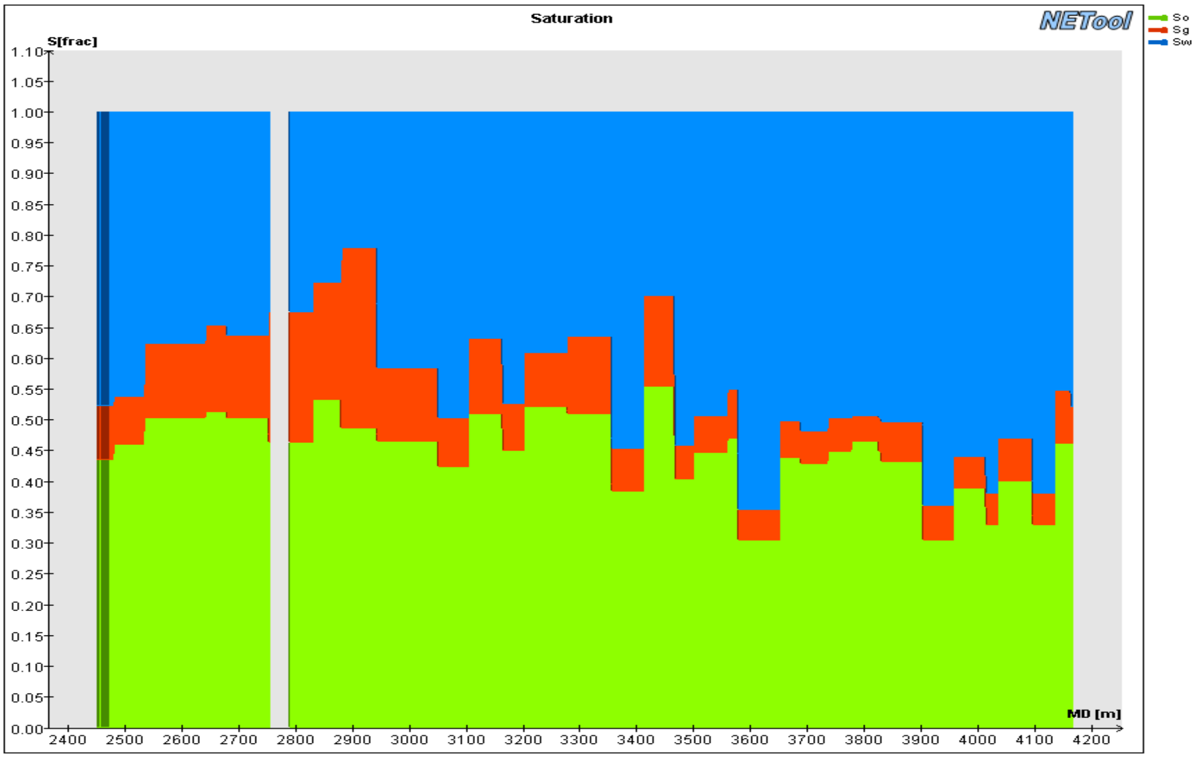
Influx of oil, gas and water from the reservoir and into the well along the wellbore



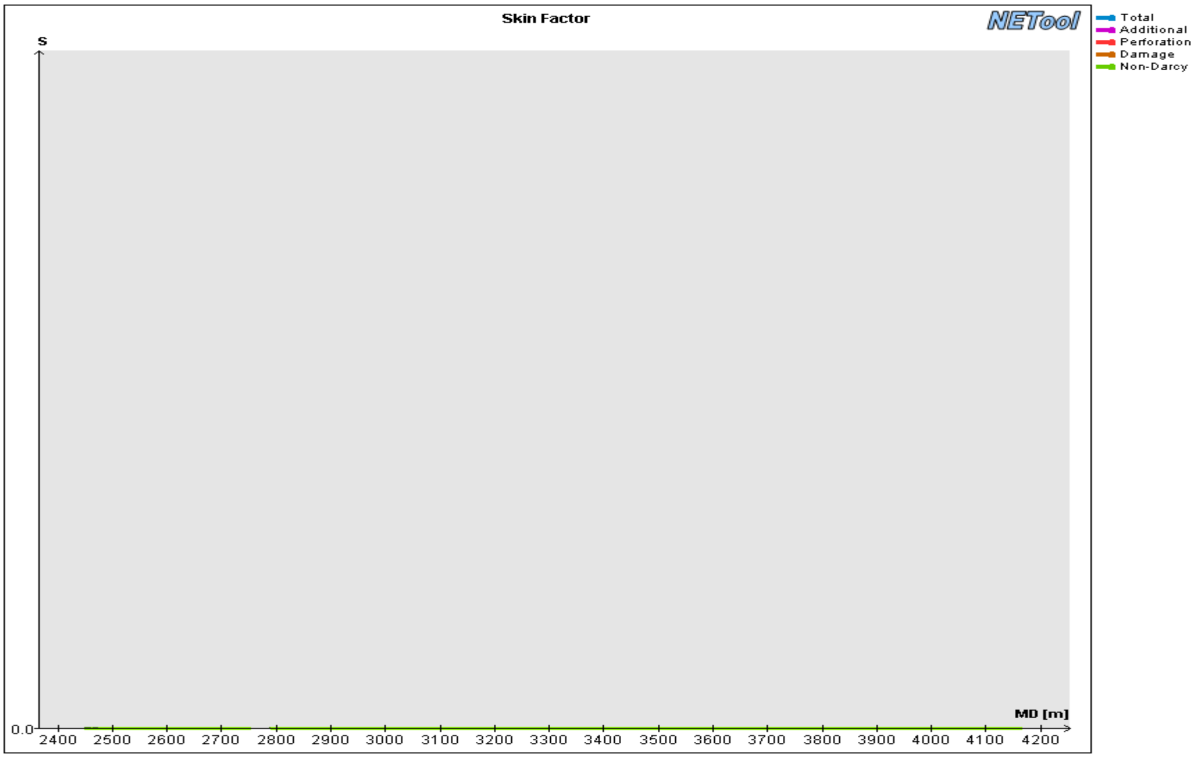
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.34 Plots for well KP9, 2556 days, 2x1,6mm ICD and BP

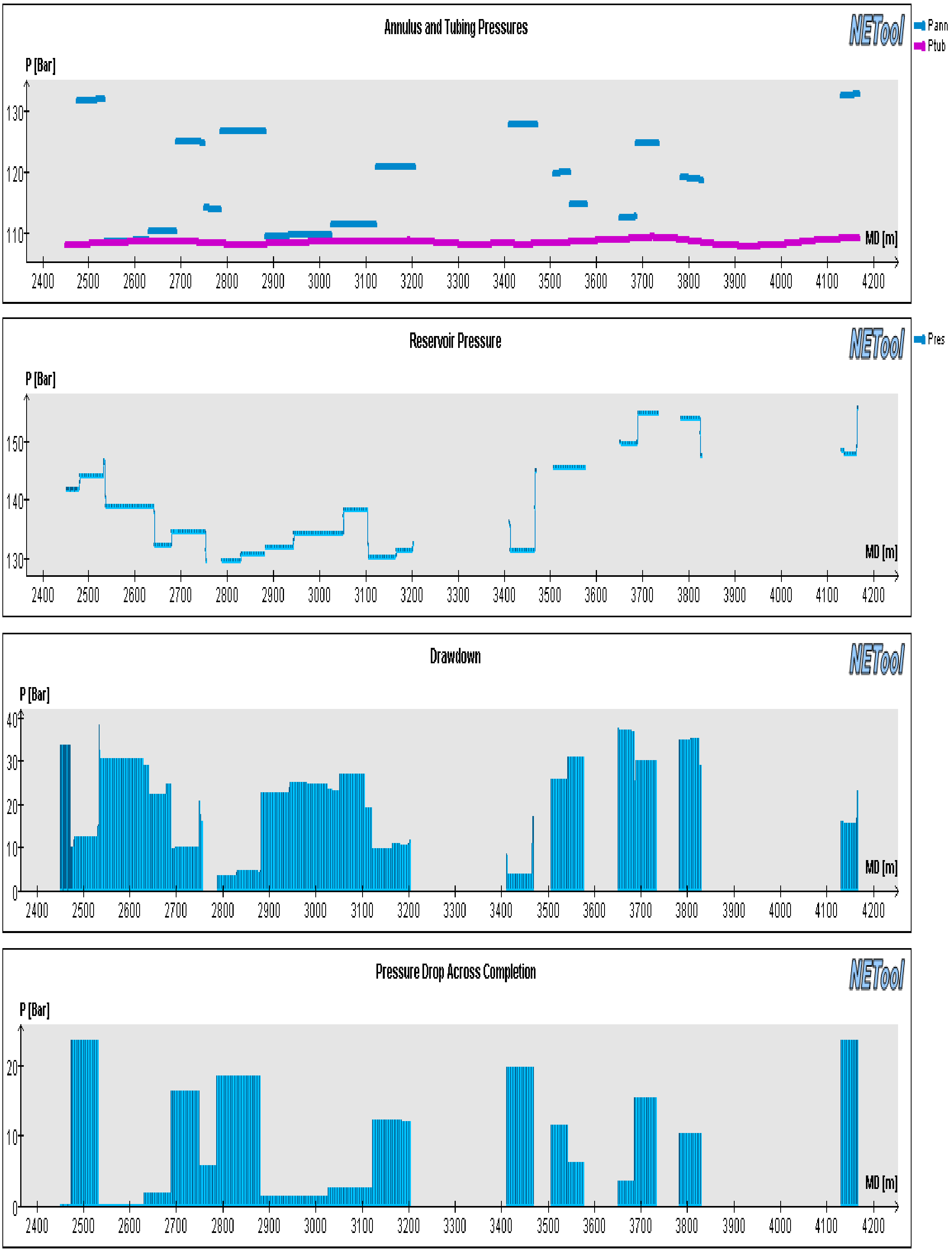
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

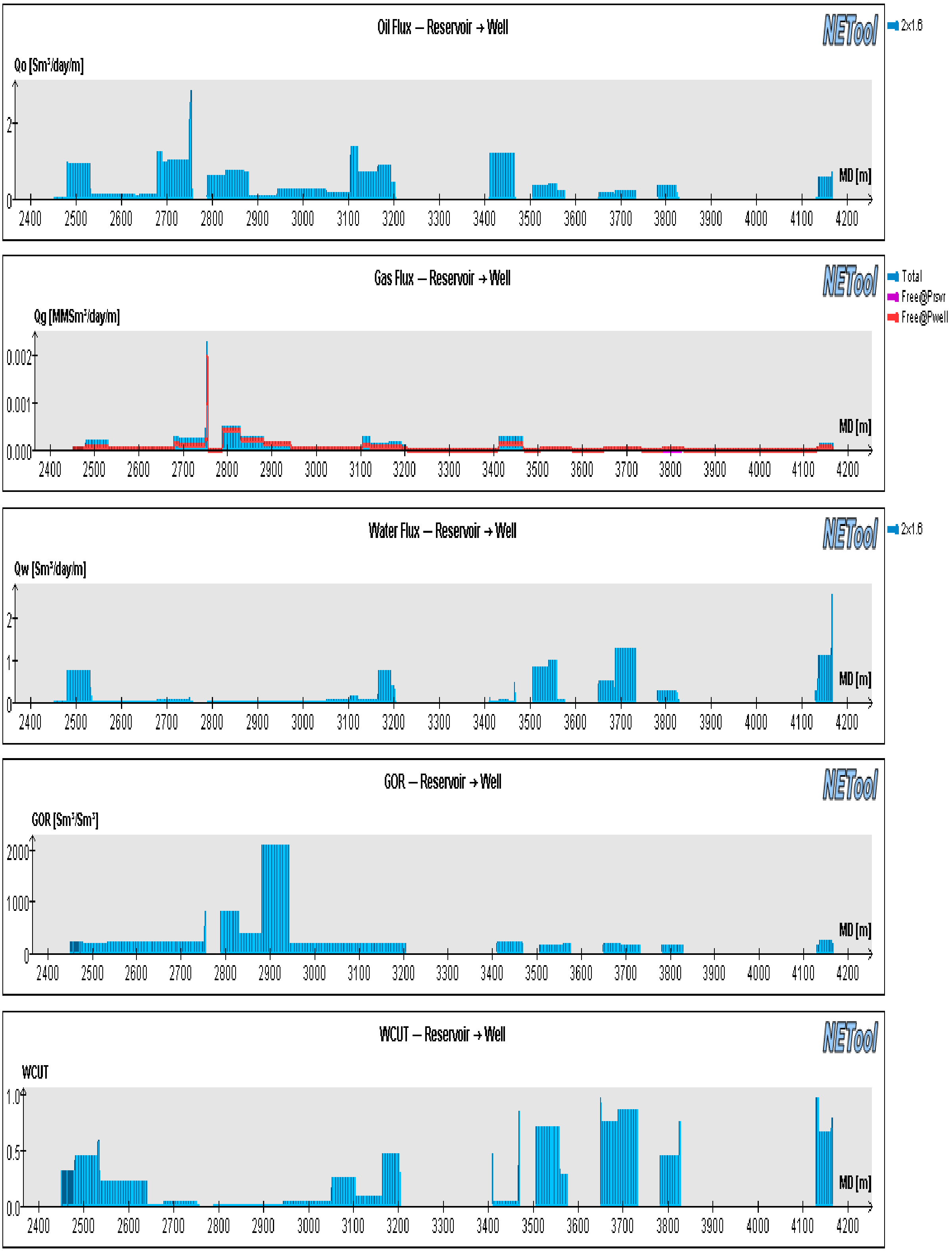
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2798	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
2	2450,3	23,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**37**	2810	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
3	2474	0,3	**Packer**	-	-	No	No	N/A	**38**	2822,0	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
4	2474,3	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**39**	2834	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
5	2486	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**40**	2846	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
6	2498	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**41**	2858	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
7	2510	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**42**	2870	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No
8	2522	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**43**	2881,7	0,3	**Packer**	-	-	No	No	N/A
9	2533,7	0,3	**Packer**	-	-	No	No	N/A	**44**	2882	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
10	2534	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**45**	2894	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
11	2546	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**46**	2906	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
12	2558	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**47**	2918	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
13	2570	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**48**	2930	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
14	2582	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**49**	2942	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
15	2594	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**50**	2954	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
16	2606	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**51**	2966	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
17	2618	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**52**	2978	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
18	2629,7	0,3	**Packer**	-	-	No	No	N/A	**53**	2990	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
19	2630	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**54**	3002	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
20	2642	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**55**	3014	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No
21	2654	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**56**	3025,7	0,3	**Packer**	-	-	No	No	N/A
22	2666	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**57**	3026	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
23	2678	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**58**	3038	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
24	2689,7	0,3	**Packer**	-	-	No	No	N/A	**59**	3050	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
25	2690	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**60**	3062	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
26	2702	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**61**	3074	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
27	2714	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**62**	3086	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
28	2726	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**63**	3098	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
29	2738	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**64**	3110	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No
30	2749,7	0,3	**Packer**	-	-	No	No	N/A	**65**	3121,7	0,3	**Packer**	-	-	No	No	N/A
31	2750	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**66**	3122	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
32	2762	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**67**	3134	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
33	2774	11,7	**Nozzle ICD**	2	1,6	Yes	Yes	No	**68**	3146	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
34	2785,7	0,3	**Packer**	-	-	No	No	N/A	**69**	3158	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No
35	2786	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No	**70**	3170	12,0	**Nozzle ICD**	2	1,6	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	3182,0	12,0	Nozzle ICD	2	1,6	Yes	Yes	No
72	3194	11,7	Nozzle ICD	2	1,6	Yes	Yes	No
73	3205,7	0,3	Packer	-	-	No	No	N/A
74	3206	12,0	Blank pipe	-	-	Yes	No	No
75	3218	12,0	Blank pipe	-	-	Yes	No	No
76	3230	12,0	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No
78	3254	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No
83	3314	12,0	Blank pipe	-	-	Yes	No	No
84	3326	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No
86	3350	12,0	Blank pipe	-	-	Yes	No	No
87	3362	12,0	Blank pipe	-	-	Yes	No	No
88	3374	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A
92	3410	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
93	3422	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
94	3434	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
95	3446	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
96	3458	11,7	Nozzle ICD	2	1,6	Yes	No	N/A
97	3469,7	0,3	Packer	-	-	No	No	N/A
98	3470	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A
105	3541,7	0,3	Packer	-	-	No	No	N/A
106	3542,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
107	3554,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
108	3566,0	11,7	Nozzle ICD	2	1,6	Yes	No	N/A
109	3577,7	0,3	Packer	-	-	No	No	N/A
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No
116	3649,7	0,3	Packer	-	-	No	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No
118	3662,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
120	3685,7	0,3	Packer	-	-	No	No	N/A
121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
122	3698,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
123	3710,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
125	3733,7	0,3	Packer	-	-	No	No	N/A
126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
130	3781,7	0,3	Packer	-	-	No	No	N/A
131	3782,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
133	3806,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
135	3829,7	0,3	Packer	-	-	No	No	N/A
136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
161	4129,7	0,3	Packer	-	-	No	No	N/A
162	4130,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
163	4142,0	12,0	Nozzle ICD	2	1,6	Yes	No	N/A
164	4154,0	13,3	Nozzle ICD	2	1,6	Yes	No	N/A
TOE	4167,3	-	-	-	-	-	-	-

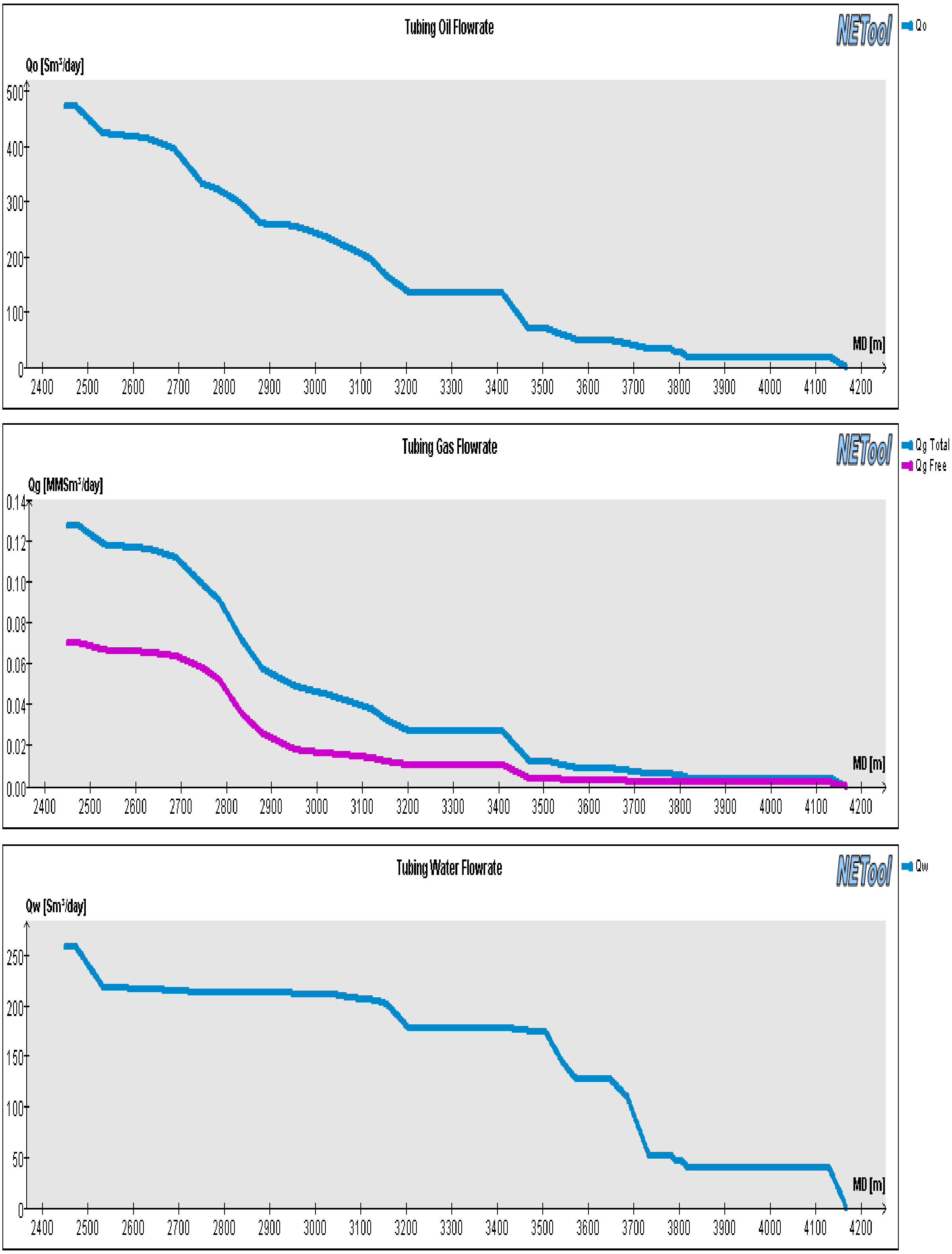


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



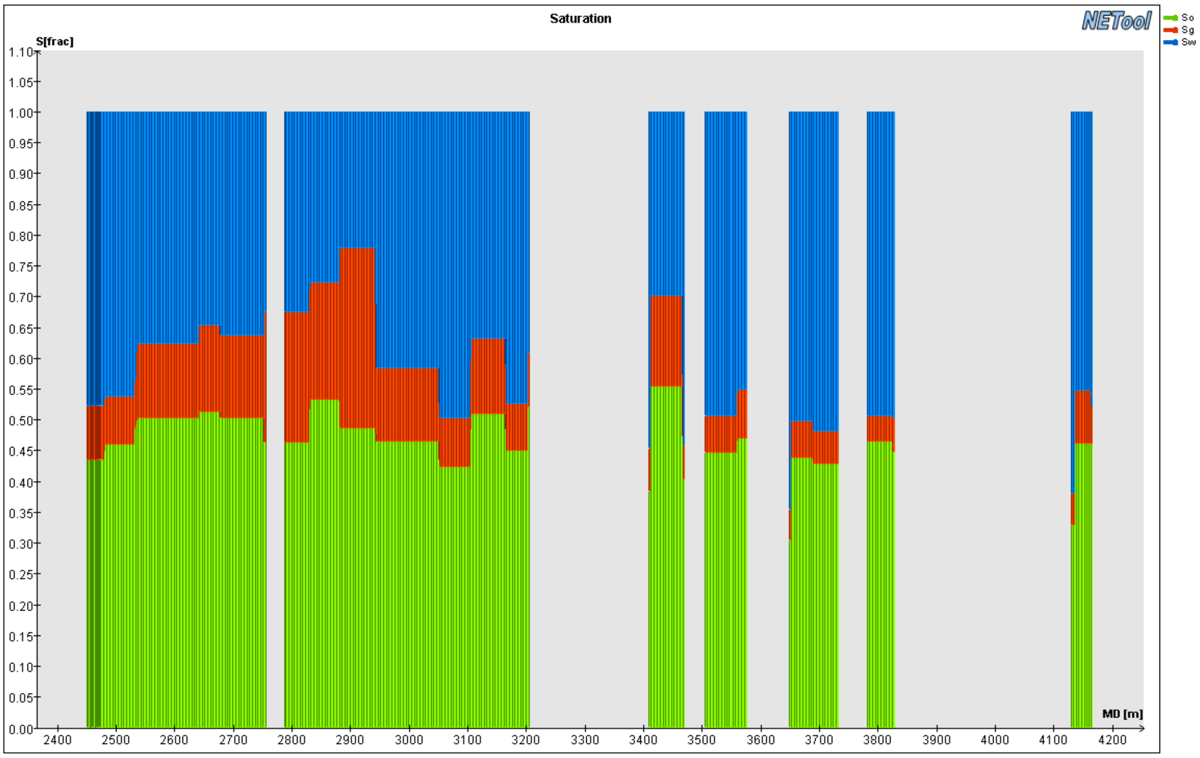
Influx of oil, gas and water from the reservoir and into the well along the wellbore

Annulus oil, gas and water flow rate along the wellbore.



Tubing flow of oil, gas and water along the wellbore

Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

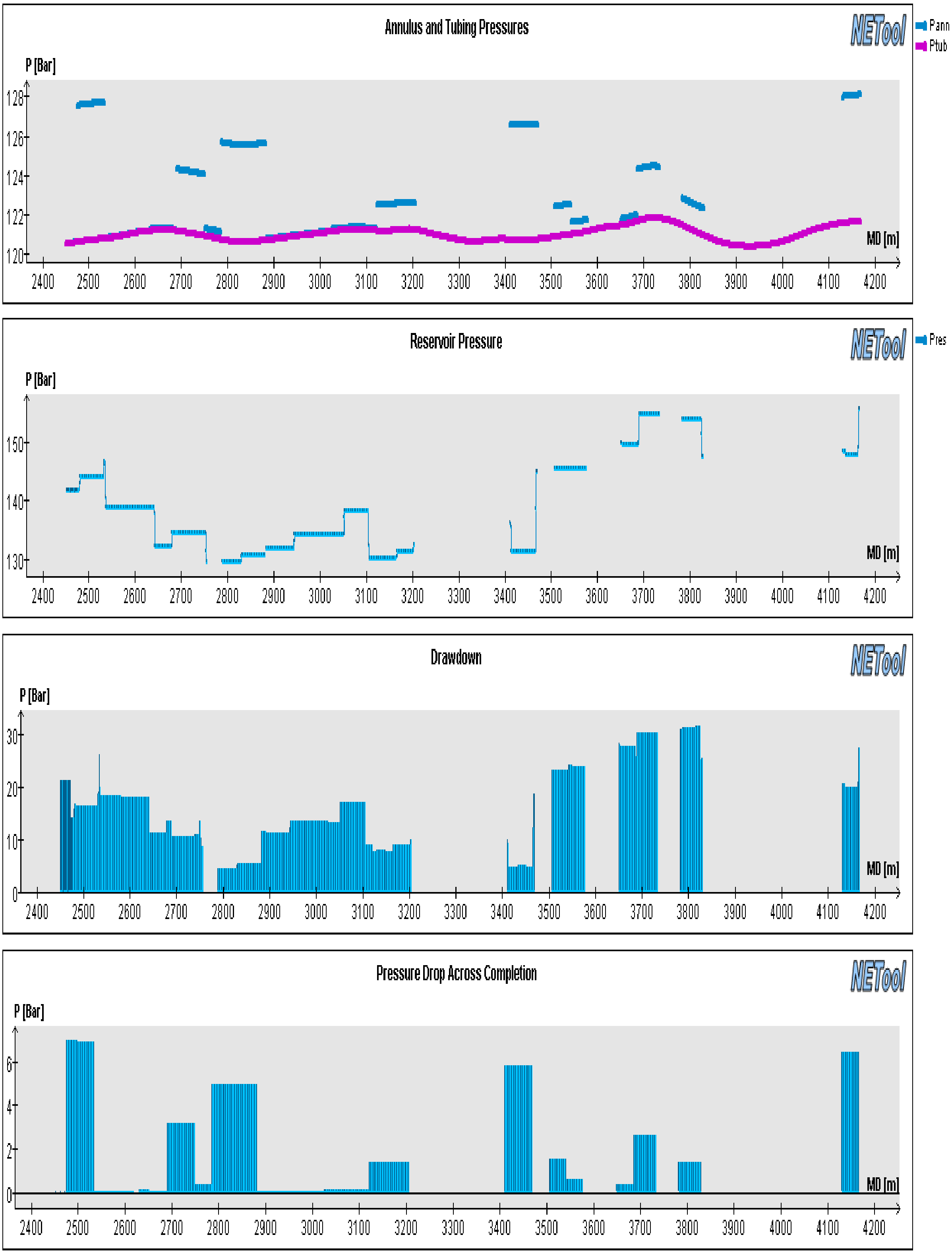
A.35 Plots for well KP9, 2556 days, 2x2,5mm ICD and BP

Completion overview for the case:

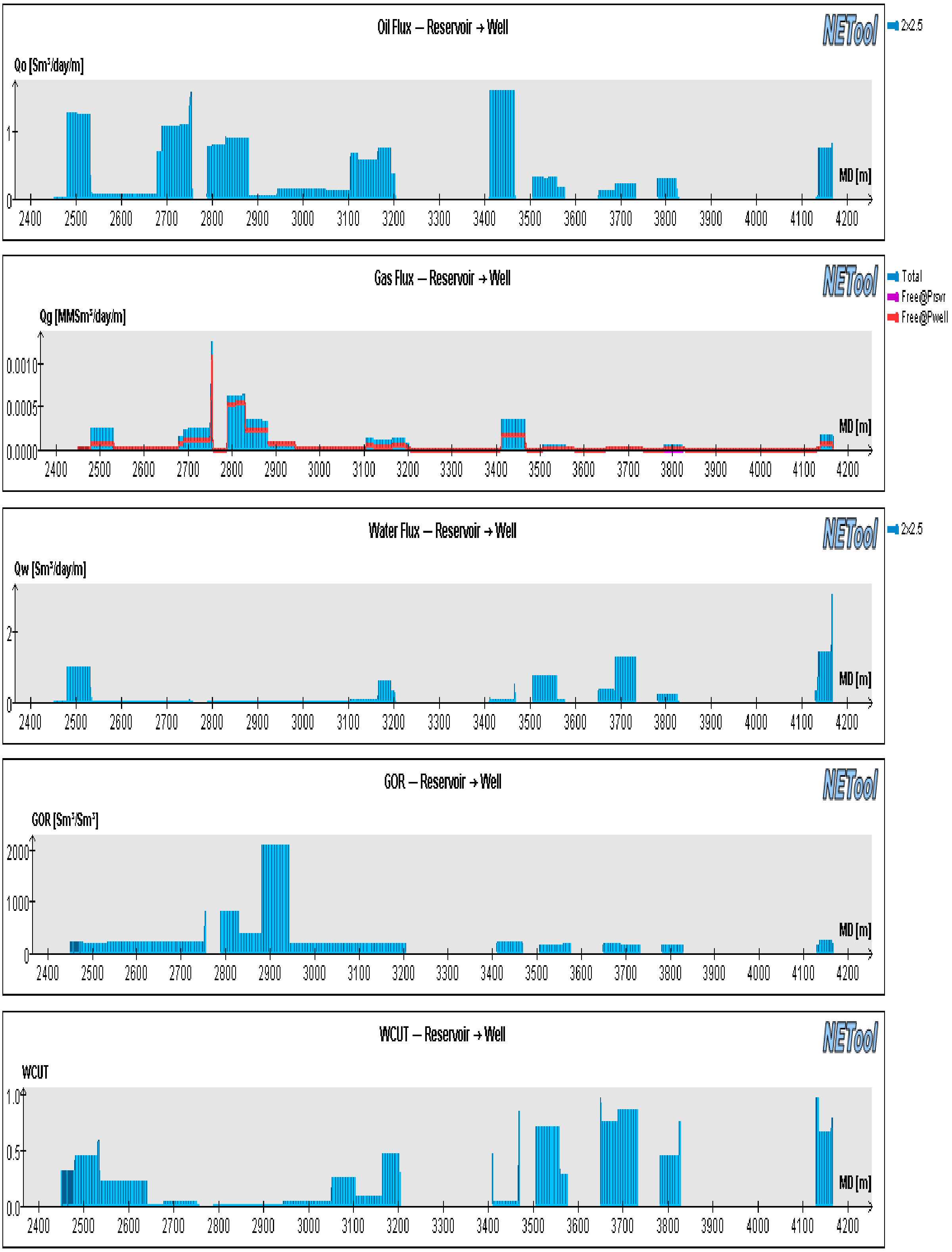
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	2	2,5	Yes	Yes	No	37	2810	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	39	2834	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
5	2486	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	40	2846	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
6	2498	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	41	2858	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
7	2510	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	42	2870	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
8	2522	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
10	2534	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	45	2894	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
11	2546	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	46	2906	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
12	2558	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	47	2918	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
13	2570	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	48	2930	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
14	2582	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	49	2942	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
15	2594	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	50	2954	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
16	2606	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	51	2966	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
17	2618	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	52	2978	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
19	2630	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	54	3002	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
20	2642	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	55	3014	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
21	2654	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	57	3026	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
23	2678	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	58	3038	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
25	2690	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	60	3062	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
26	2702	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	61	3074	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
27	2714	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	62	3086	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
28	2726	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	63	3098	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
29	2738	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	64	3110	11,7	Nozzle ICD	2	2,5	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	66	3122	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
32	2762	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	67	3134	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
33	2774	11,7	Nozzle ICD	2	2,5	Yes	Yes	No	68	3146	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	2	2,5	Yes	Yes	No
35	2786	12,0	Nozzle ICD	2	2,5	Yes	Yes	No	70	3170	12,0	Nozzle ICD	2	2,5	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	**Nozzle ICD**	2	2,5	Yes	Yes	No	**119**	3674,0	11,7	**Blank pipe**	-	-	Yes	No	No
72	3194	11,7	**Nozzle ICD**	2	2,5	Yes	Yes	No	**120**	3685,7	0,3	**Packer**	-	-	No	No	N/A
73	3205,7	0,3	**Packer**	-	-	No	No	N/A	**121**	3686,0	12,0	**Blank pipe**	-	-	Yes	No	No
74	3206	12,0	**Blank pipe**	-	-	Yes	No	No	**122**	3698,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
75	3218	12,0	**Blank pipe**	-	-	Yes	No	No	**123**	3710,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
76	3230	12,0	**Blank pipe**	-	-	Yes	No	No	**124**	3722,0	11,7	**Blank pipe**	-	-	Yes	No	No
77	3242	12,0	**Blank pipe**	-	-	Yes	No	No	**125**	3733,7	0,3	**Packer**	-	-	No	No	N/A
78	3254	12,0	**Blank pipe**	-	-	Yes	No	No	**126**	3734,0	12,0	**Blank pipe**	-	-	Yes	No	No
79	3266	12,0	**Blank pipe**	-	-	Yes	No	No	**127**	3746,0	12,0	**Blank pipe**	-	-	Yes	No	No
80	3278	12,0	**Blank pipe**	-	-	Yes	No	No	**128**	3758,0	12,0	**Blank pipe**	-	-	Yes	No	No
81	3290	12,0	**Blank pipe**	-	-	Yes	No	No	**129**	3770,0	11,7	**Blank pipe**	-	-	Yes	No	No
82	3302	12,0	**Blank pipe**	-	-	Yes	No	No	**130**	3781,7	0,3	**Packer**	-	-	No	No	N/A
83	3314	12,0	**Blank pipe**	-	-	Yes	No	No	**131**	3782,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
84	3326	12,0	**Blank pipe**	-	-	Yes	No	No	**132**	3794,0	12,0	**Blank pipe**	-	-	Yes	No	No
85	3338	12,0	**Blank pipe**	-	-	Yes	No	No	**133**	3806,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
86	3350	12,0	**Blank pipe**	-	-	Yes	No	No	**134**	3818,0	11,7	**Blank pipe**	-	-	Yes	No	N/A
87	3362	12,0	**Blank pipe**	-	-	Yes	No	No	**135**	3829,7	0,3	**Packer**	-	-	No	No	N/A
88	3374	12,0	**Blank pipe**	-	-	Yes	No	No	**136**	3830,0	12,0	**Blank pipe**	-	-	Yes	No	No
89	3386	12,0	**Blank pipe**	-	-	Yes	No	No	**137**	3842,0	12,0	**Blank pipe**	-	-	Yes	No	No
90	3398	11,7	**Blank pipe**	-	-	Yes	No	No	**138**	3854,0	12,0	**Blank pipe**	-	-	Yes	No	No
91	3409,7	0,3	**Packer**	-	-	No	No	N/A	**139**	3866,0	12,0	**Blank pipe**	-	-	Yes	No	No
92	3410	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**140**	3878,0	12,0	**Blank pipe**	-	-	Yes	No	No
93	3422	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**141**	3890,0	12,0	**Blank pipe**	-	-	Yes	No	No
94	3434	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**142**	3902,0	12,0	**Blank pipe**	-	-	Yes	No	No
95	3446	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**143**	3914,0	12,0	**Blank pipe**	-	-	Yes	No	No
96	3458	11,7	**Nozzle ICD**	2	2,5	Yes	No	N/A	**144**	3926,0	12,0	**Blank pipe**	-	-	Yes	No	No
97	3469,7	0,3	**Packer**	-	-	No	No	N/A	**145**	3938,0	12,0	**Blank pipe**	-	-	Yes	No	No
98	3470	12,0	**Blank pipe**	-	-	Yes	No	No	**146**	3950,0	12,0	**Blank pipe**	-	-	Yes	No	No
99	3482	12,0	**Blank pipe**	-	-	Yes	No	No	**147**	3962,0	12,0	**Blank pipe**	-	-	Yes	No	No
100	3494	11,7	**Blank pipe**	-	-	Yes	No	No	**148**	3974,0	12,0	**Blank pipe**	-	-	Yes	No	No
101	3505,7	0,3	**Packer**	-	-	No	No	N/A	**149**	3986,0	12,0	**Blank pipe**	-	-	Yes	No	No
102	3506,0	12,0	**Nozzle ICD**	-	-	Yes	No	N/A	**150**	3998,0	12,0	**Blank pipe**	-	-	Yes	No	No
103	3518,0	12,0	**Nozzle ICD**	-	-	Yes	No	N/A	**151**	4010,0	12,0	**Blank pipe**	-	-	Yes	No	No
104	3530,0	11,7	**Nozzle ICD**	-	-	Yes	No	N/A	**152**	4022,0	12,0	**Blank pipe**	-	-	Yes	No	No
105	3541,7	0,3	**Packer**	-	-	No	No	N/A	**153**	4034,0	12,0	**Blank pipe**	-	-	Yes	No	No
106	3542,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**154**	4046,0	12,0	**Blank pipe**	-	-	Yes	No	No
107	3554,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A	**155**	4058,0	12,0	**Blank pipe**	-	-	Yes	No	No
108	3566,0	11,7	**Nozzle ICD**	2	2,5	Yes	No	N/A	**156**	4070,0	12,0	**Blank pipe**	-	-	Yes	No	No
109	3577,7	0,3	**Packer**	-	-	No	No	N/A	**157**	4082,0	12,0	**Blank pipe**	-	-	Yes	No	No
110	3578,0	12,0	**Blank pipe**	-	-	Yes	No	No	**158**	4094,0	12,0	**Blank pipe**	-	-	Yes	No	No
111	3590,0	12,0	**Blank pipe**	-	-	Yes	No	No	**159**	4106,0	12,0	**Blank pipe**	-	-	Yes	No	No
112	3602,0	12,0	**Blank pipe**	-	-	Yes	No	No	**160**	4118,0	11,7	**Blank pipe**	-	-	Yes	No	No
113	3614,0	12,0	**Blank pipe**	-	-	Yes	No	No	**161**	4129,7	0,3	**Packer**	-	-	No	No	N/A
114	3626,0	12,0	**Blank pipe**	-	-	Yes	No	No	**162**	4130,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
115	3638,0	11,7	**Blank pipe**	-	-	Yes	No	No	**163**	4142,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A
116	3649,7	0,3	**Packer**	-	-	No	No	N/A	**164**	4154,0	13,3	**Nozzle ICD**	2	2,5	Yes	No	N/A
117	3650,0	12,0	**Blank pipe**	-	-	Yes	No	No	**TOE**	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	**Nozzle ICD**	2	2,5	Yes	No	N/A									

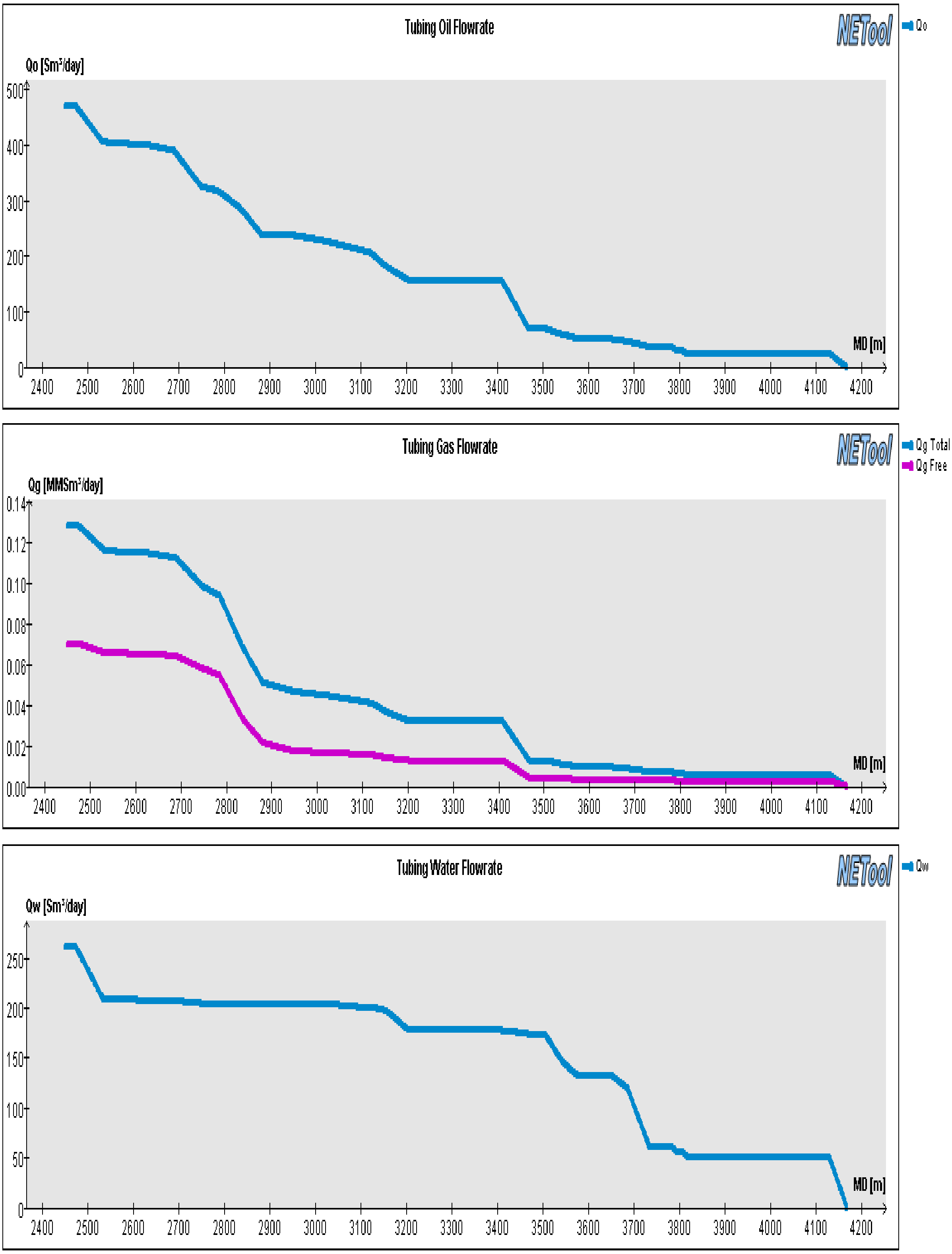


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

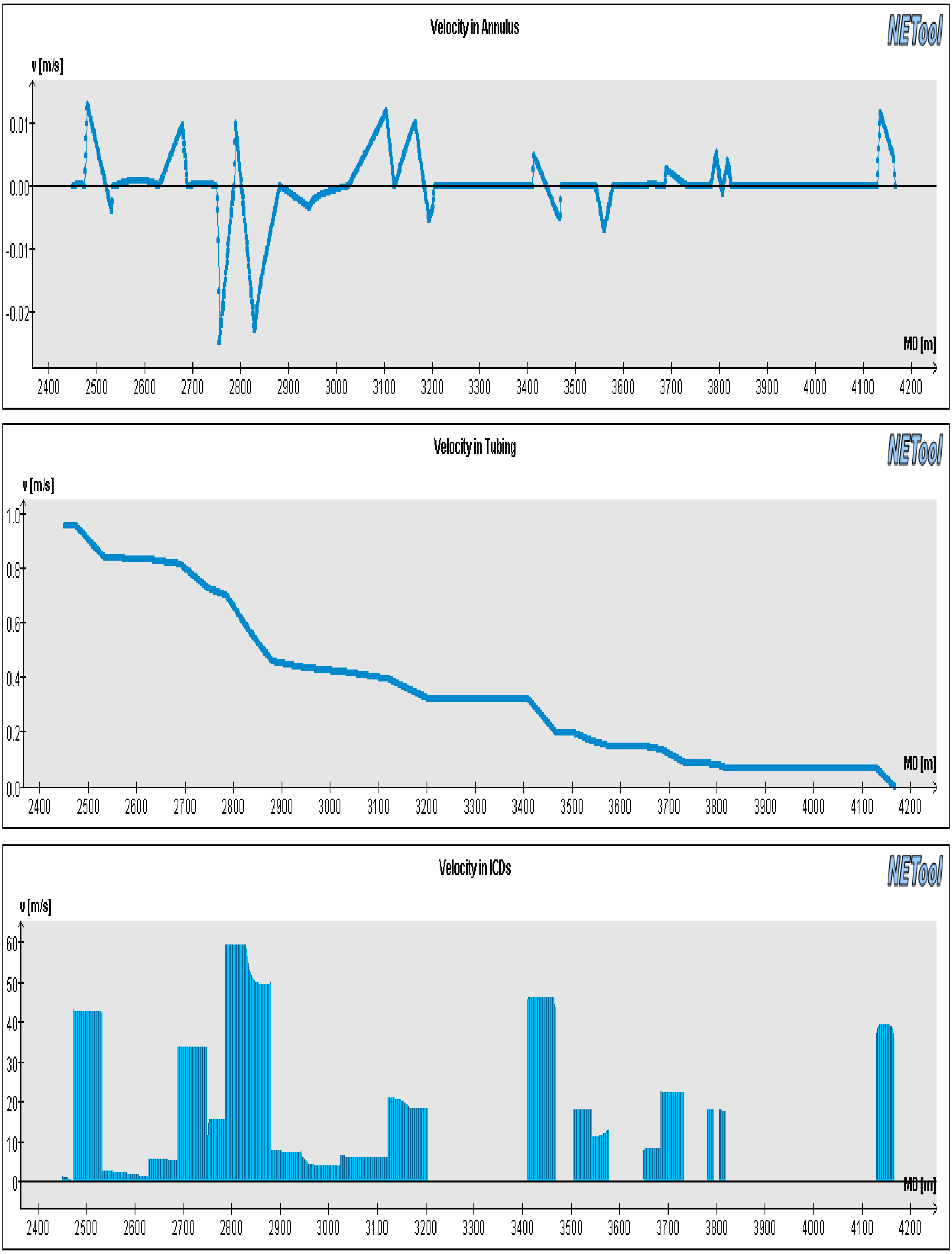


Influx of oil, gas and water from the reservoir and into the well along the wellbore

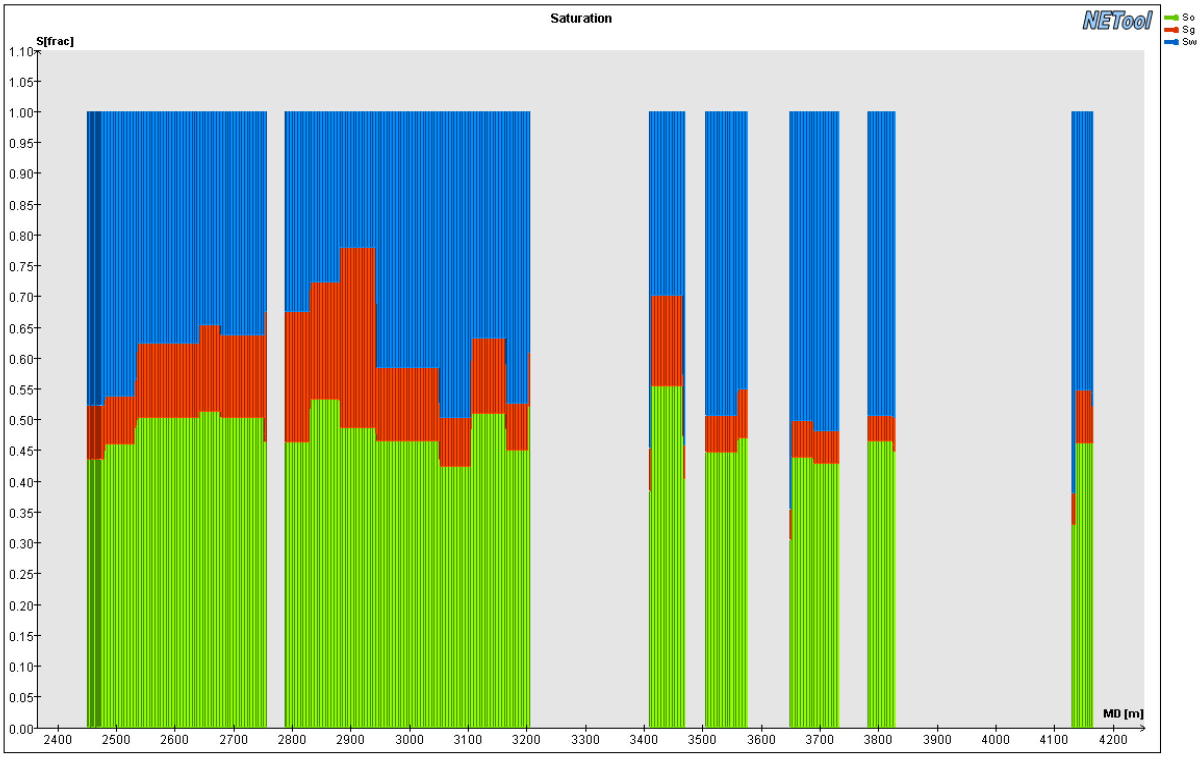
Annulus oil, gas and water flow rate along the wellbore.



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

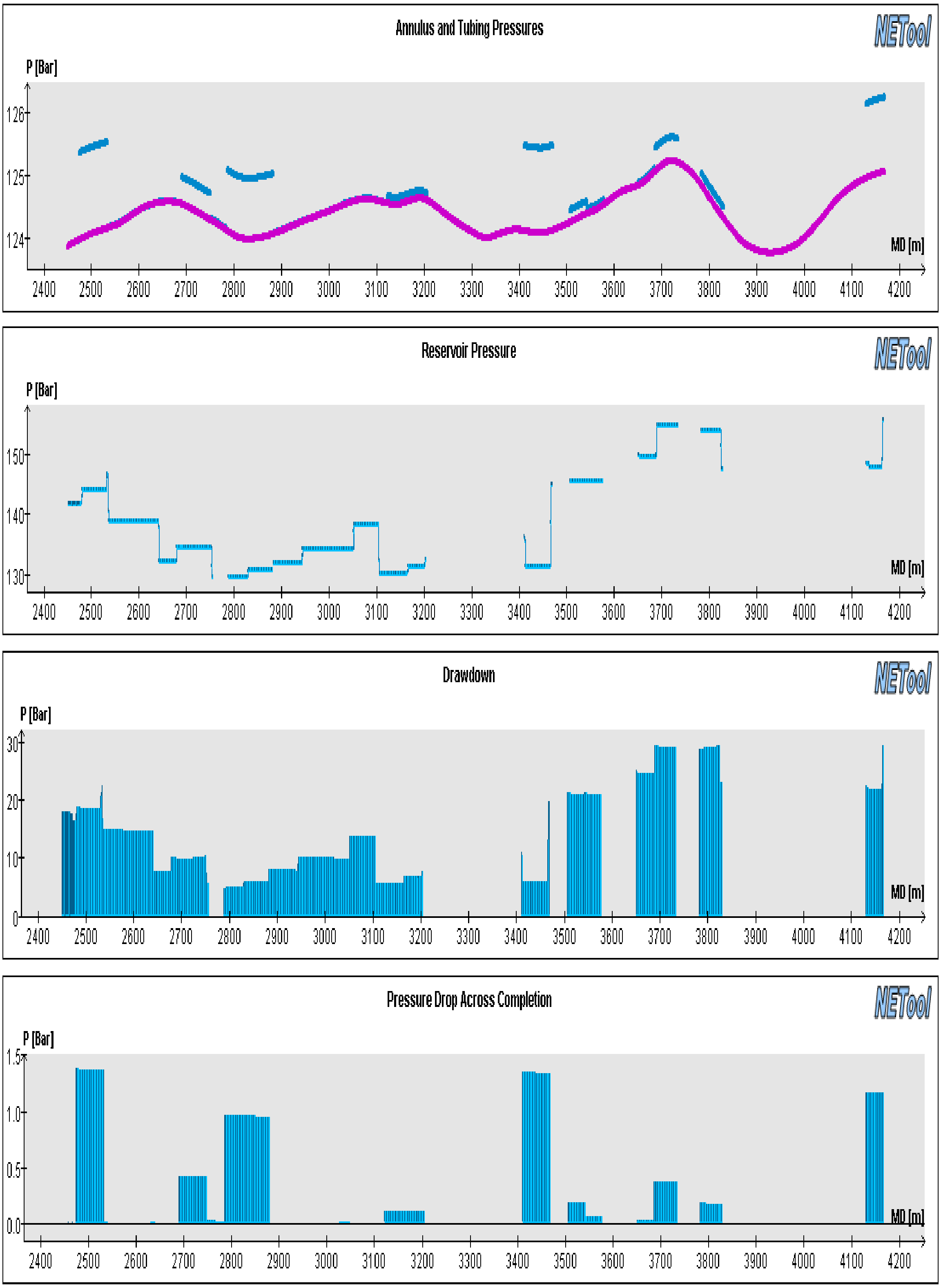
A.36 Plots for well KP9, 2556 days, 2x4mm ICD and BP

Completion overview for the case:

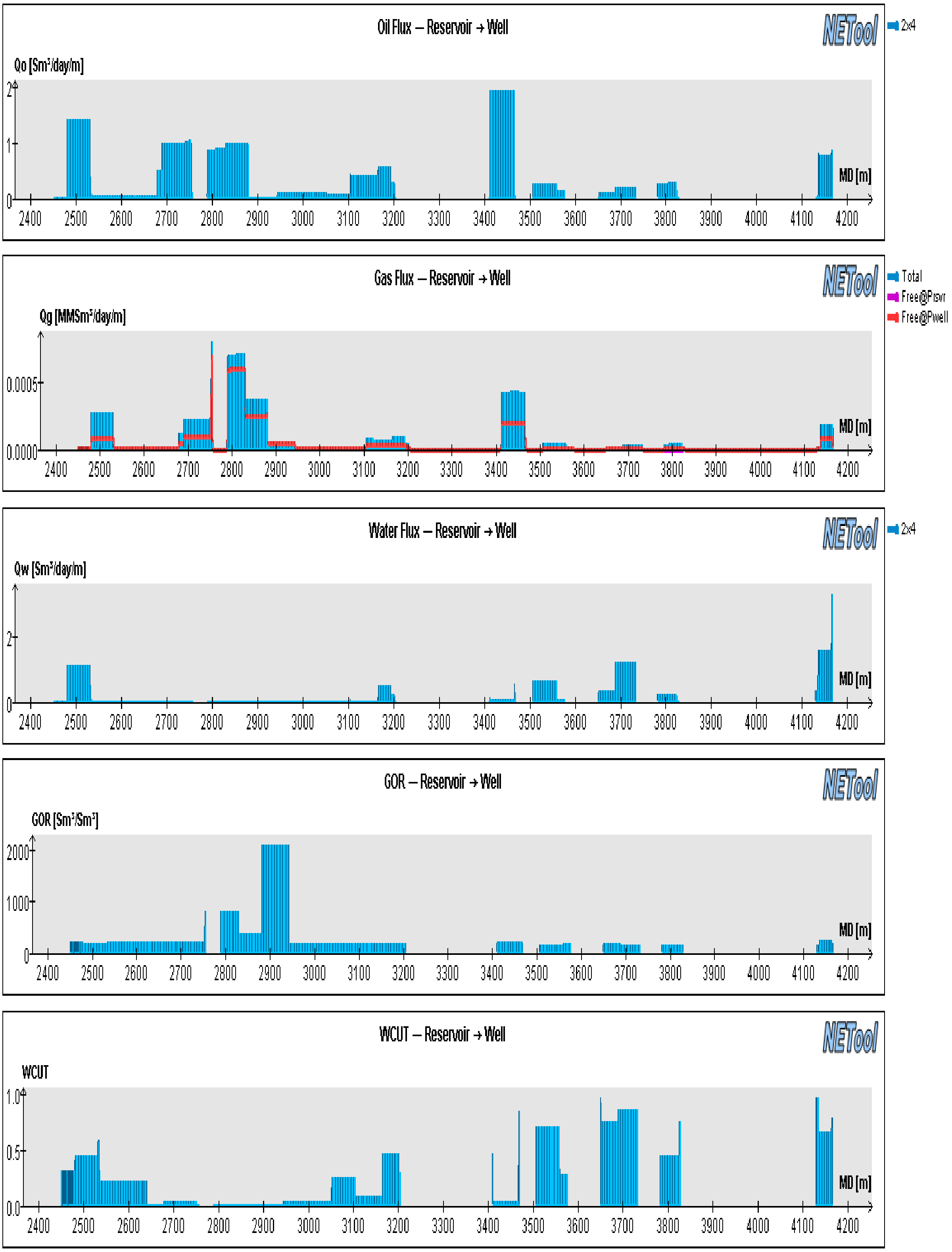
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	2	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	2	4	Yes	Yes	No	37	2810	12,0	Nozzle ICD	2	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	2	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	2	4	Yes	Yes	No	39	2834	12,0	Nozzle ICD	2	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	2	4	Yes	Yes	No	40	2846	12,0	Nozzle ICD	2	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	2	4	Yes	Yes	No	41	2858	12,0	Nozzle ICD	2	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	2	4	Yes	Yes	No	42	2870	11,7	Nozzle ICD	2	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	2	4	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	2	4	Yes	Yes	No
10	2534	12,0	Nozzle ICD	2	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	2	4	Yes	Yes	No
11	2546	12,0	Nozzle ICD	2	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	2	4	Yes	Yes	No
12	2558	12,0	Nozzle ICD	2	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	2	4	Yes	Yes	No
13	2570	12,0	Nozzle ICD	2	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	2	4	Yes	Yes	No
14	2582	12,0	Nozzle ICD	2	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	2	4	Yes	Yes	No
15	2594	12,0	Nozzle ICD	2	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	2	4	Yes	Yes	No
16	2606	12,0	Nozzle ICD	2	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	2	4	Yes	Yes	No
17	2618	11,7	Nozzle ICD	2	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	2	4	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	2	4	Yes	Yes	No
19	2630	12,0	Nozzle ICD	2	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	2	4	Yes	Yes	No
20	2642	12,0	Nozzle ICD	2	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	2	4	Yes	Yes	No
21	2654	12,0	Nozzle ICD	2	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	2	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	2	4	Yes	Yes	No
23	2678	11,7	Nozzle ICD	2	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	2	4	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	2	4	Yes	Yes	No
25	2690	12,0	Nozzle ICD	2	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	2	4	Yes	Yes	No
26	2702	12,0	Nozzle ICD	2	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	2	4	Yes	Yes	No
27	2714	12,0	Nozzle ICD	2	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	2	4	Yes	Yes	No
28	2726	12,0	Nozzle ICD	2	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	2	4	Yes	Yes	No
29	2738	11,7	Nozzle ICD	2	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	2	4	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	2	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	2	4	Yes	Yes	No
32	2762	12,0	Nozzle ICD	2	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	2	4	Yes	Yes	No
33	2774	11,7	Nozzle ICD	2	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	2	4	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	2	4	Yes	Yes	No
35	2786	12,0	Nozzle ICD	2	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	2	4	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	2	4	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	2	4	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	2	4	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	2	4	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	2	4	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	2	4	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	2	4	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	2	4	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	2	4	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	2	4	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	2	4	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	2	4	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	2	4	Yes	No	N/A									

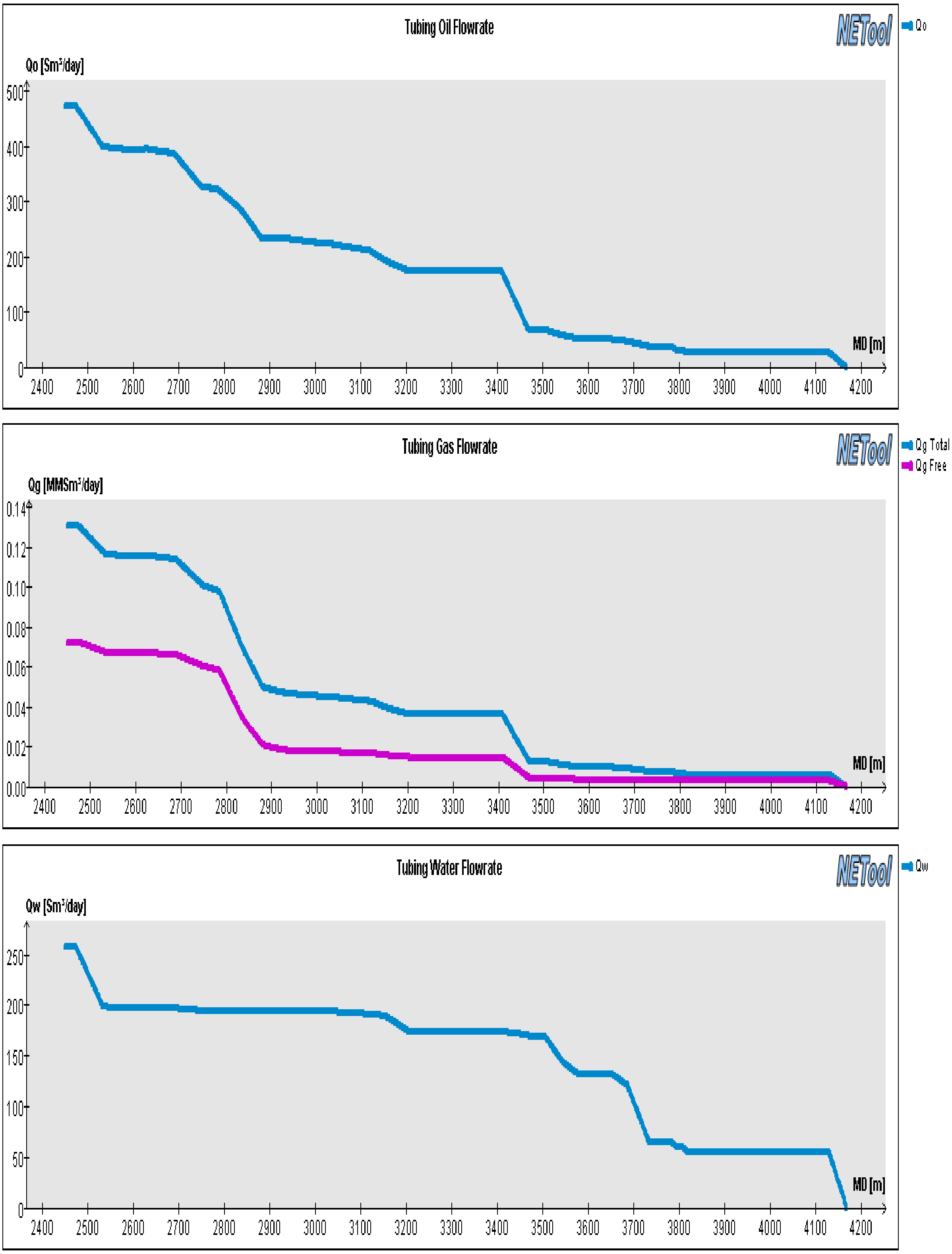


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

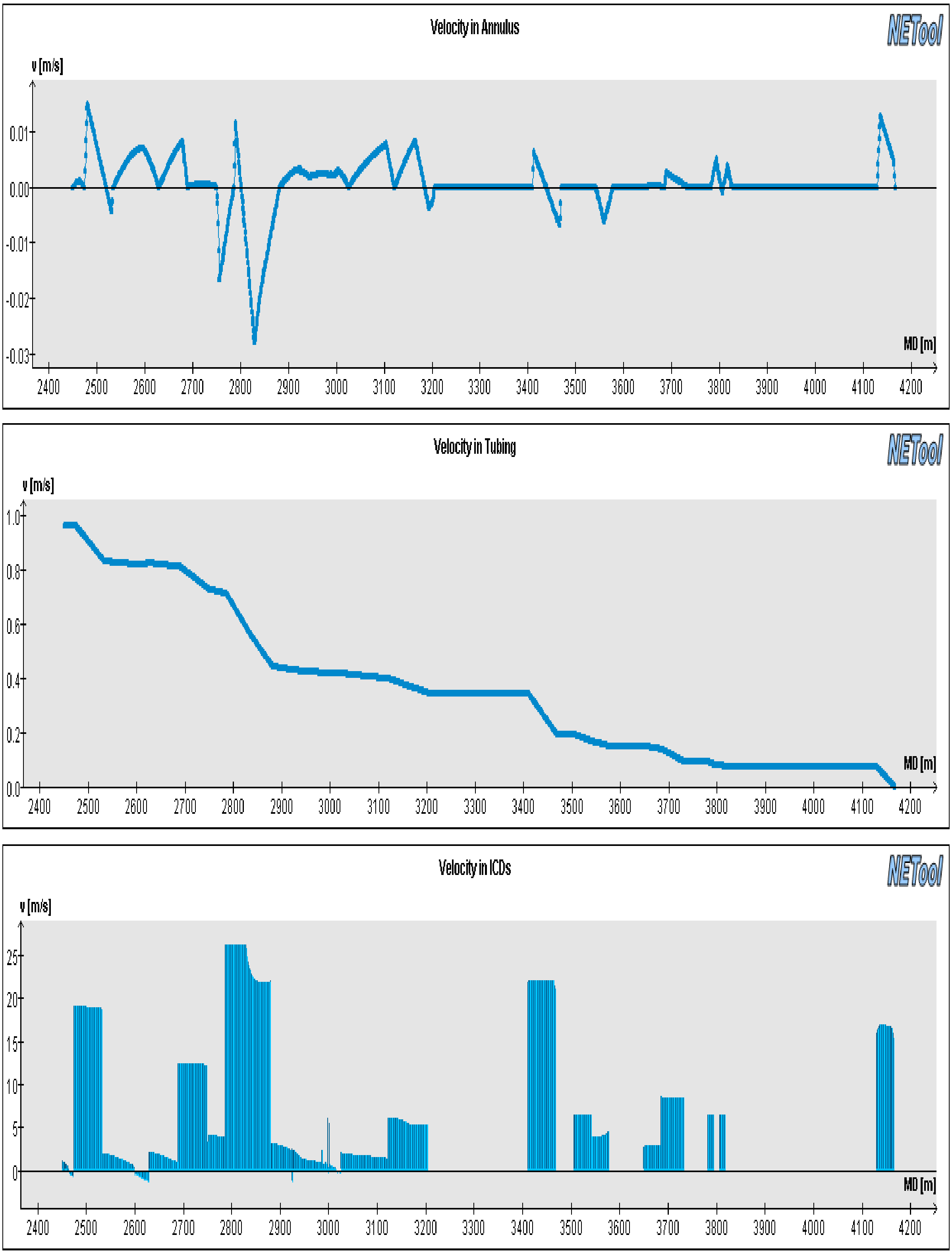


Influx of oil, gas and water from the reservoir and into the well along the wellbore

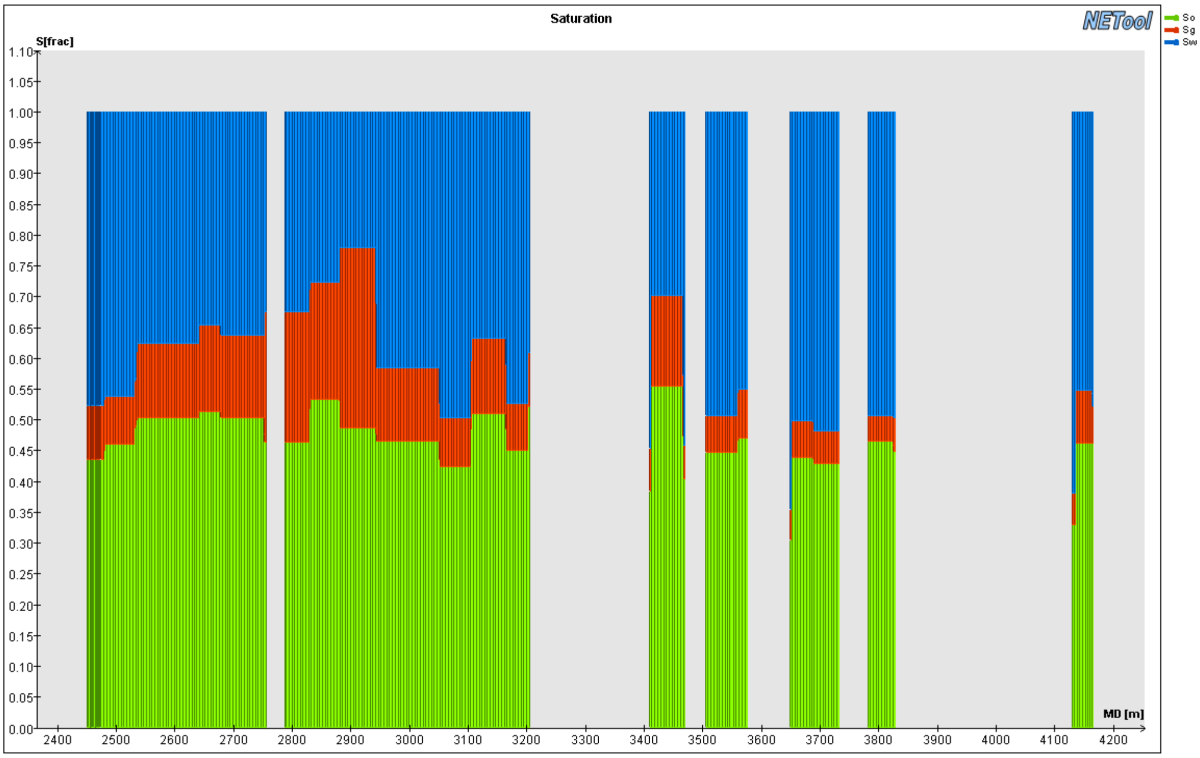
Annulus oil, gas and water flow rate along the wellbore.



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

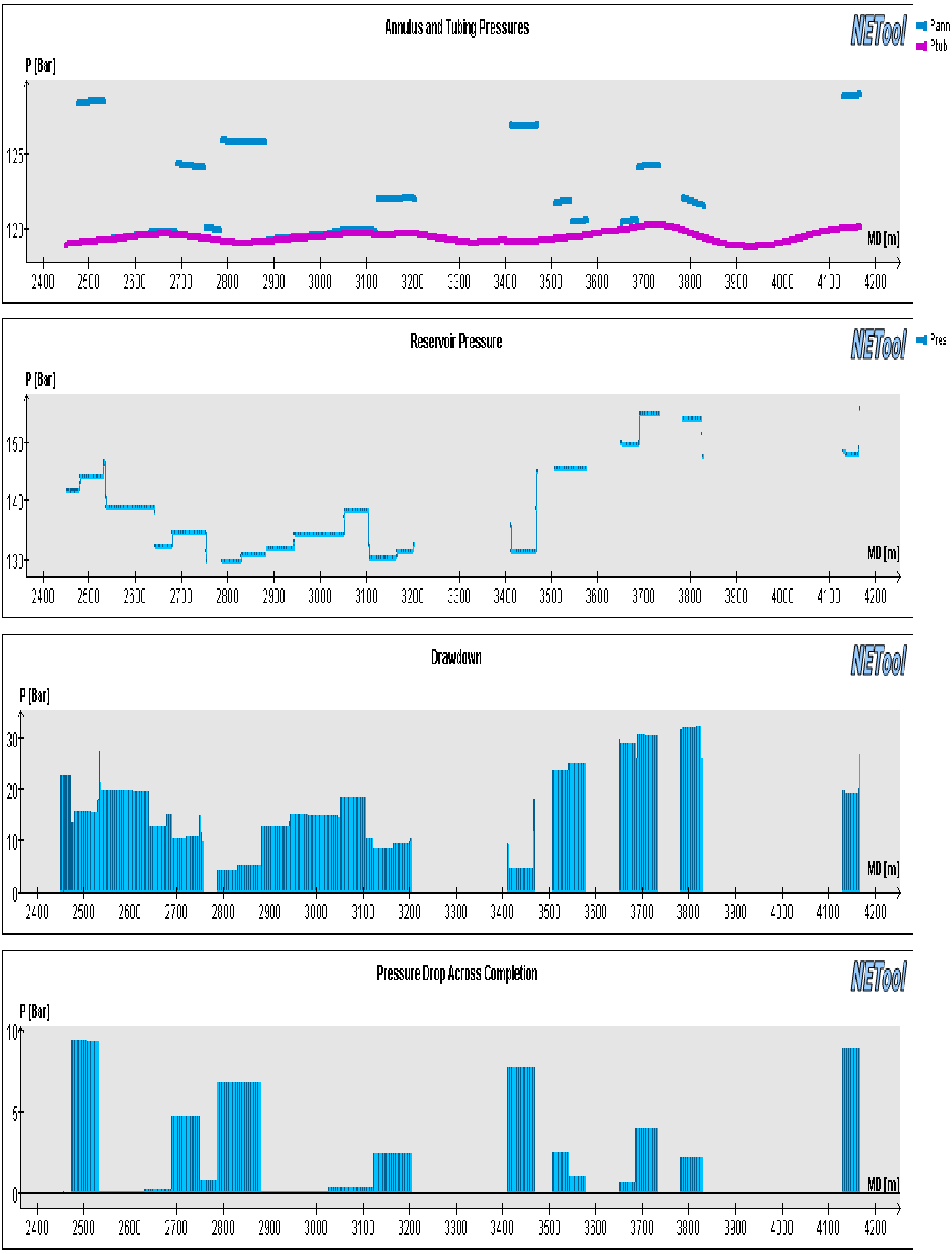
A.37 Plots for well KP9, 2556 days, 4x1,6 mm ICD and BP

Completion overview for the case:

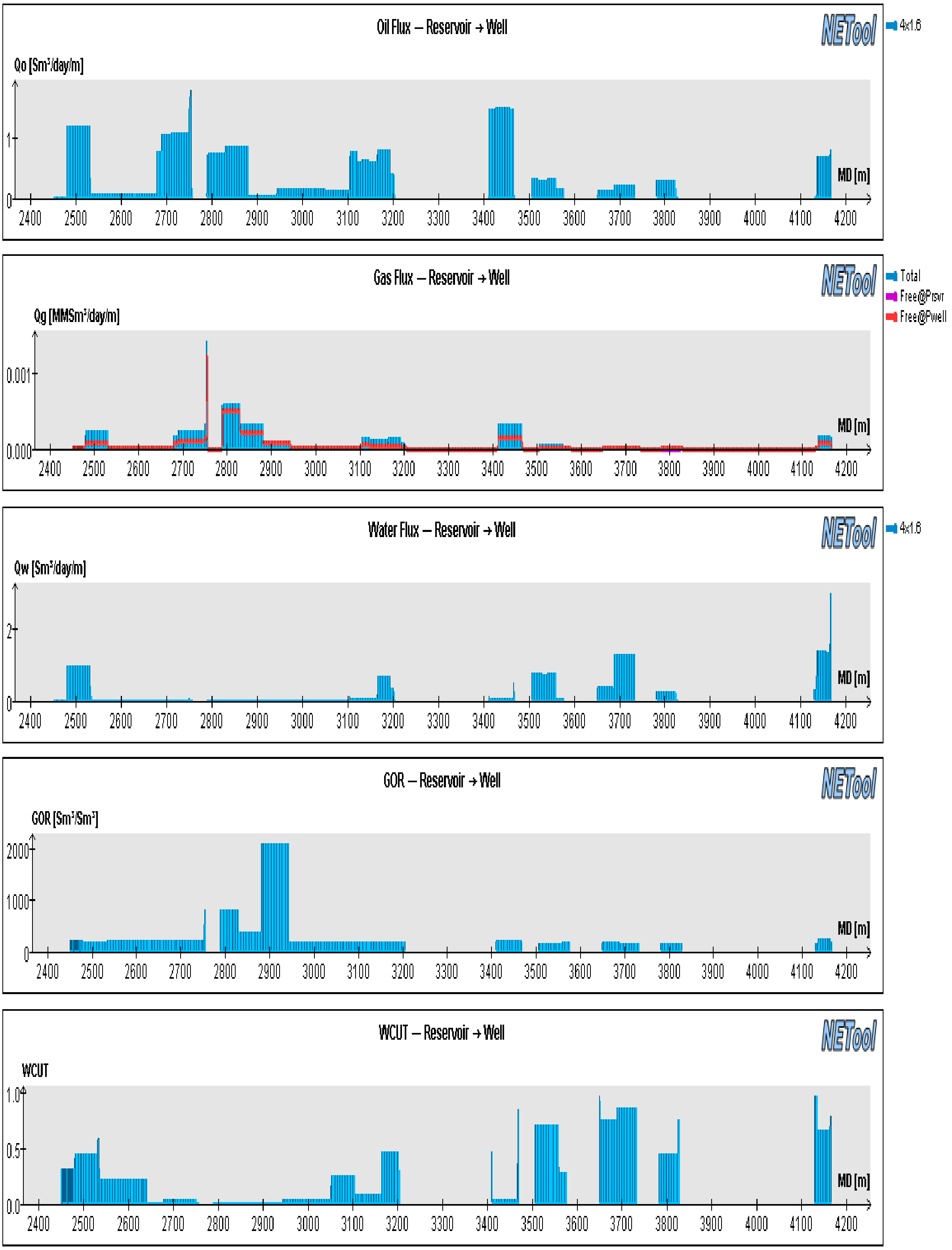
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	1,6	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	4	1,6	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	4	1,6	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	1,6	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A									

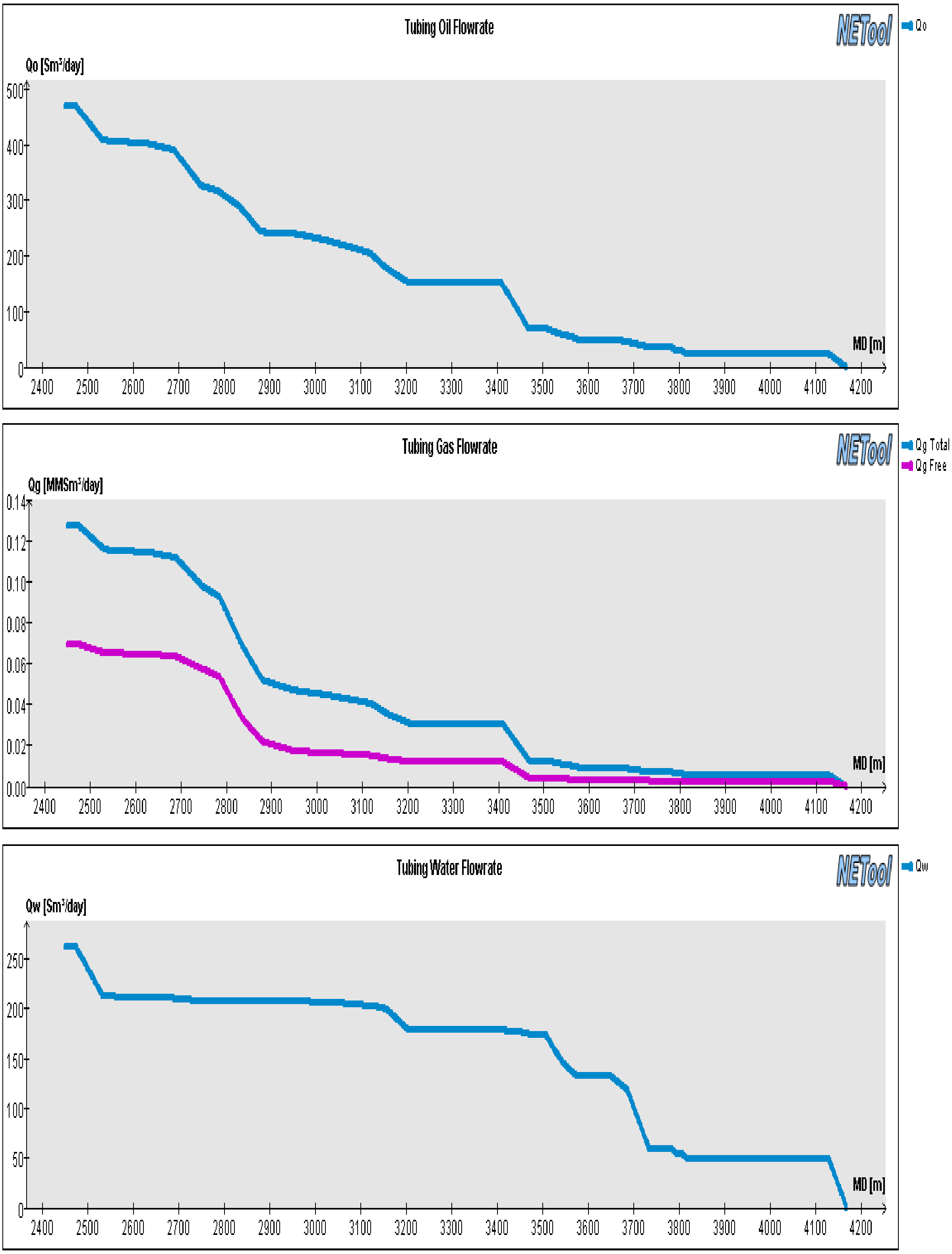


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

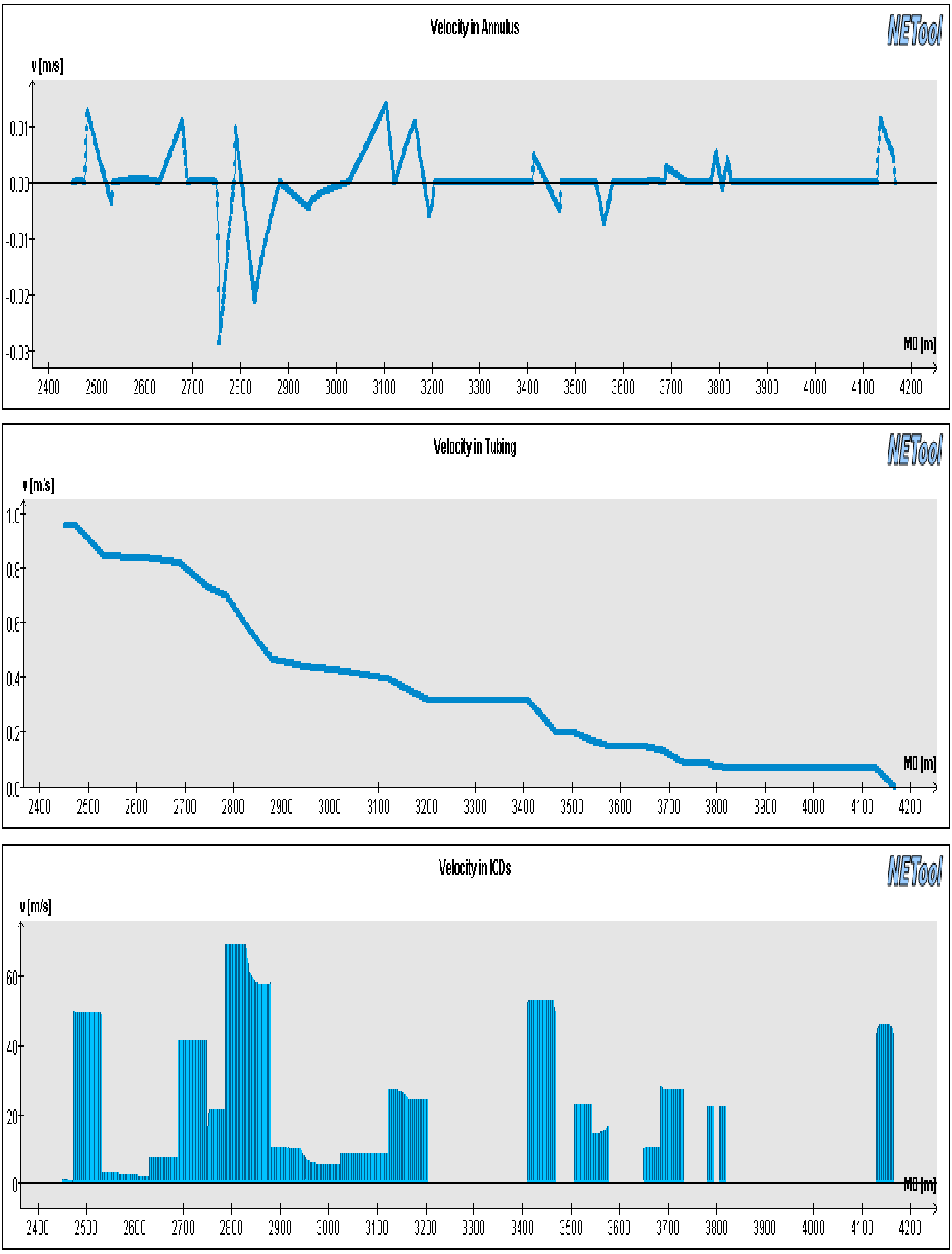


Influx of oil, gas and water from the reservoir and into the well along the wellbore

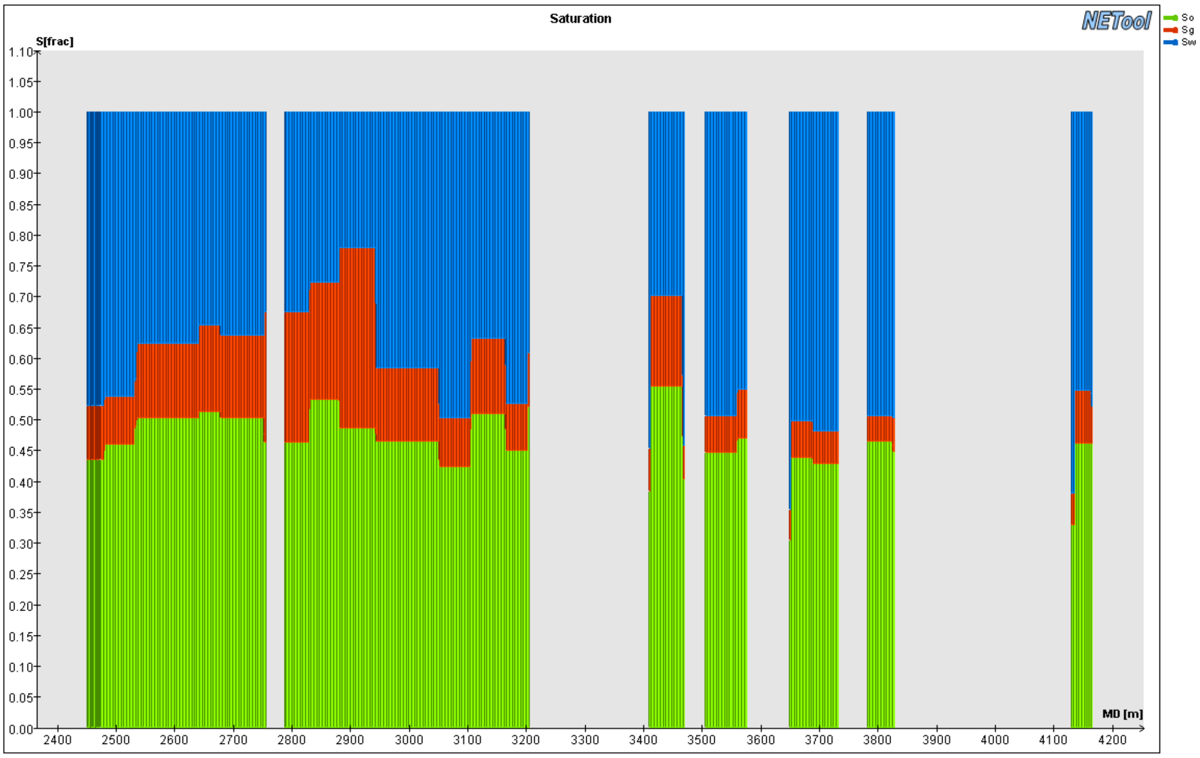
Annulus oil, gas and water flow rate along the wellbore.



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

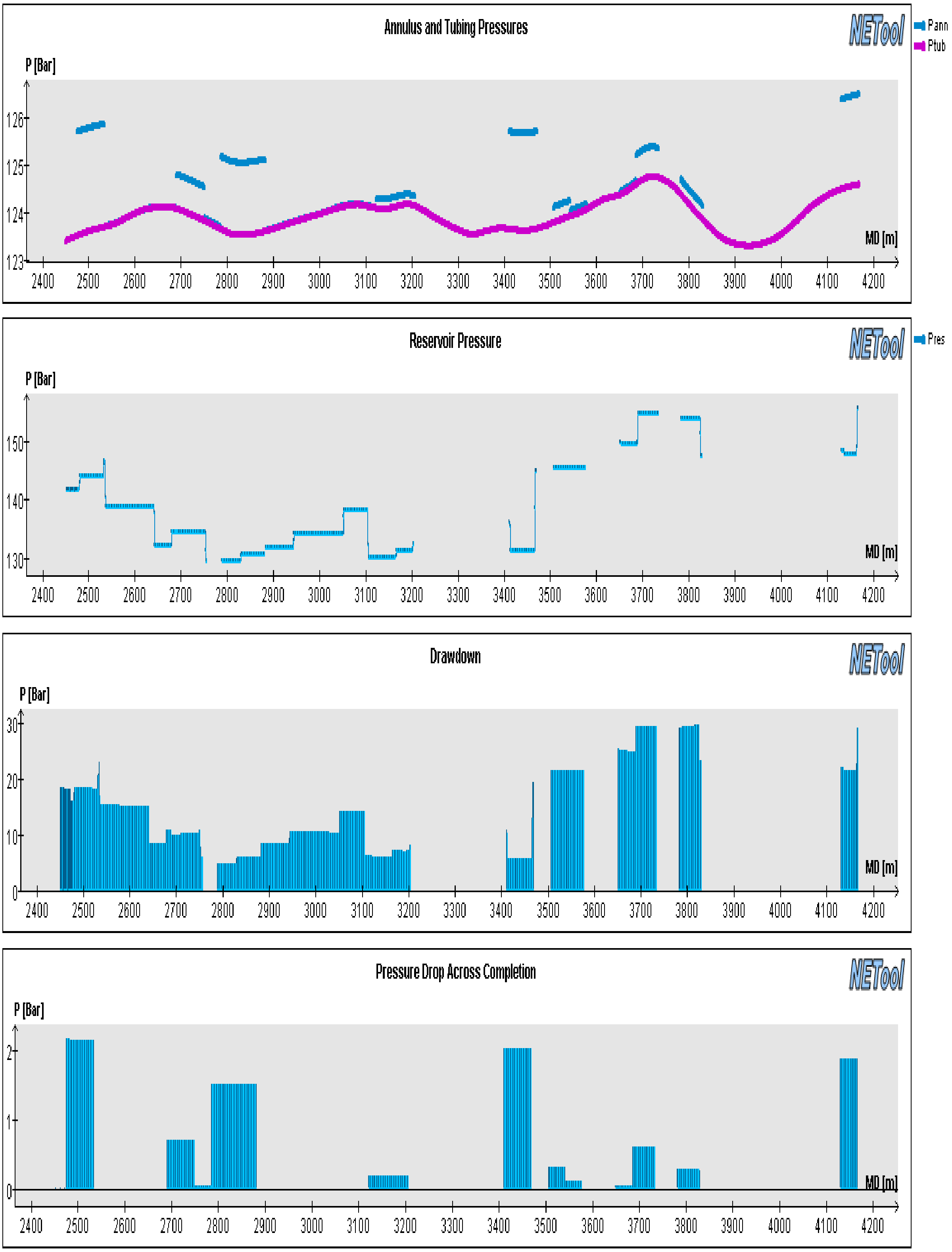
A.38 Plots for well KP9, 2556 days, 4x2,5 mm ICD and BP

Completion overview for the case:

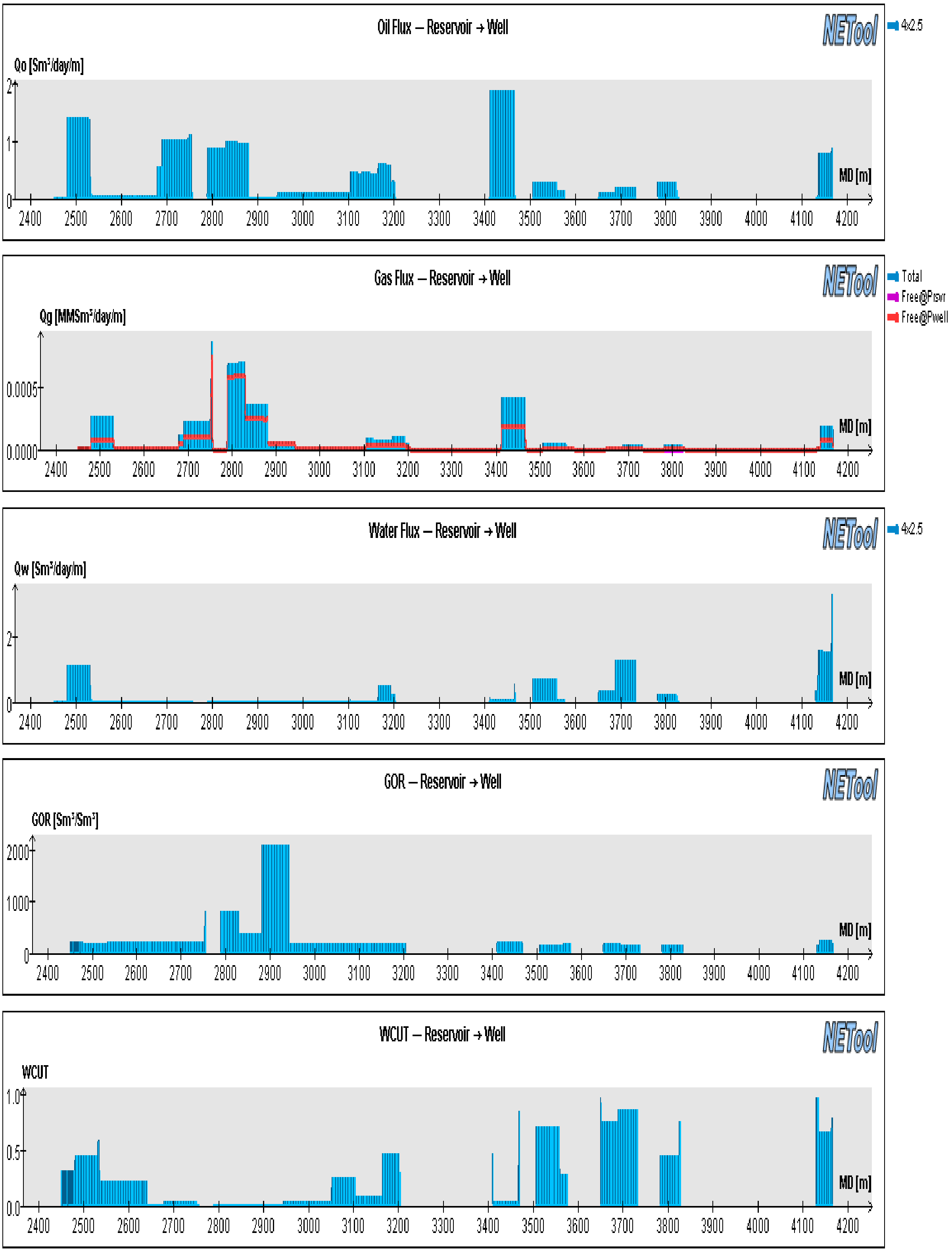
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	2,5	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	2,5	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	2,5	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	2,5	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	2,5	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	2,5	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	4	2,5	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	4	2,5	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	2,5	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	2,5	Yes	No	N/A									

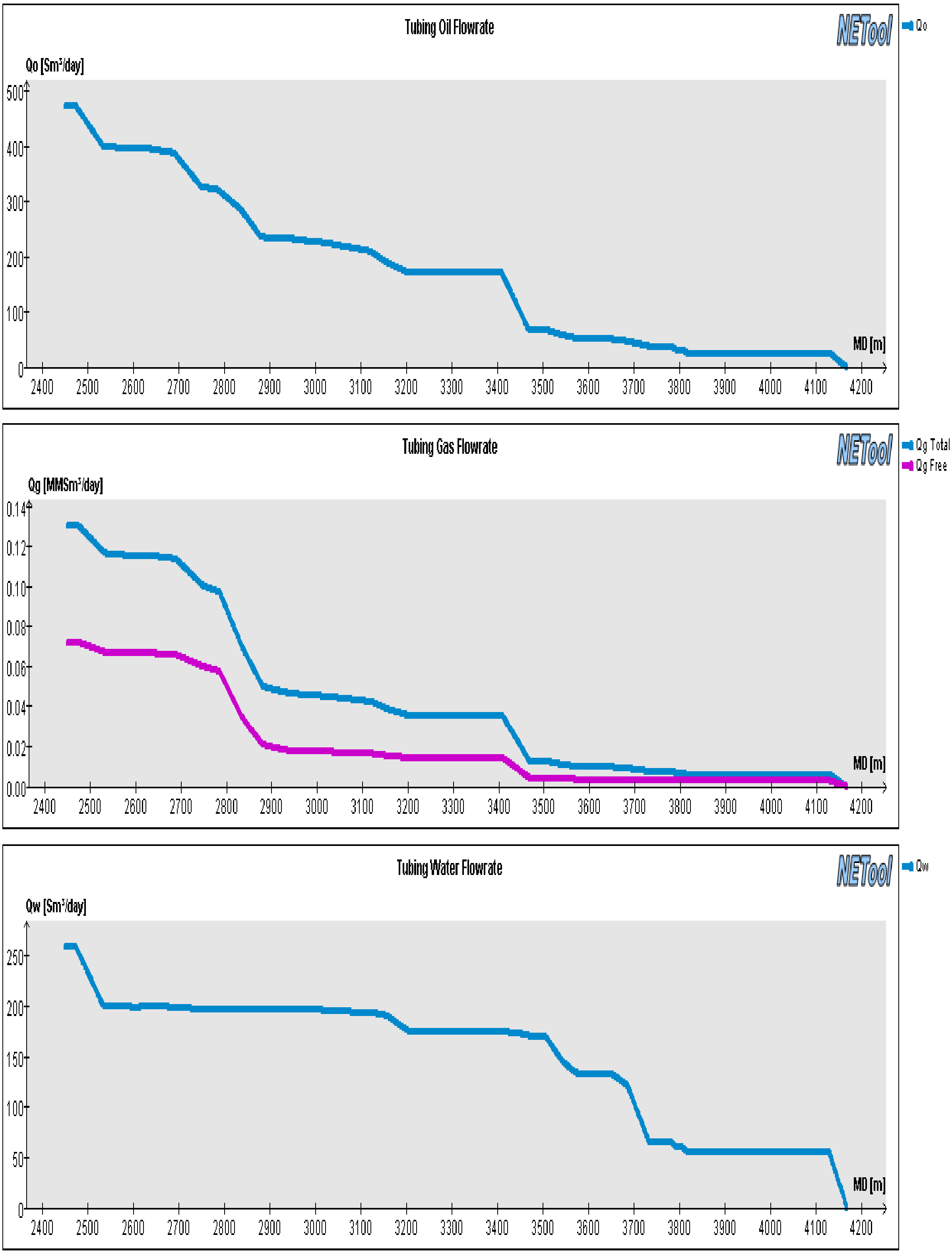


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

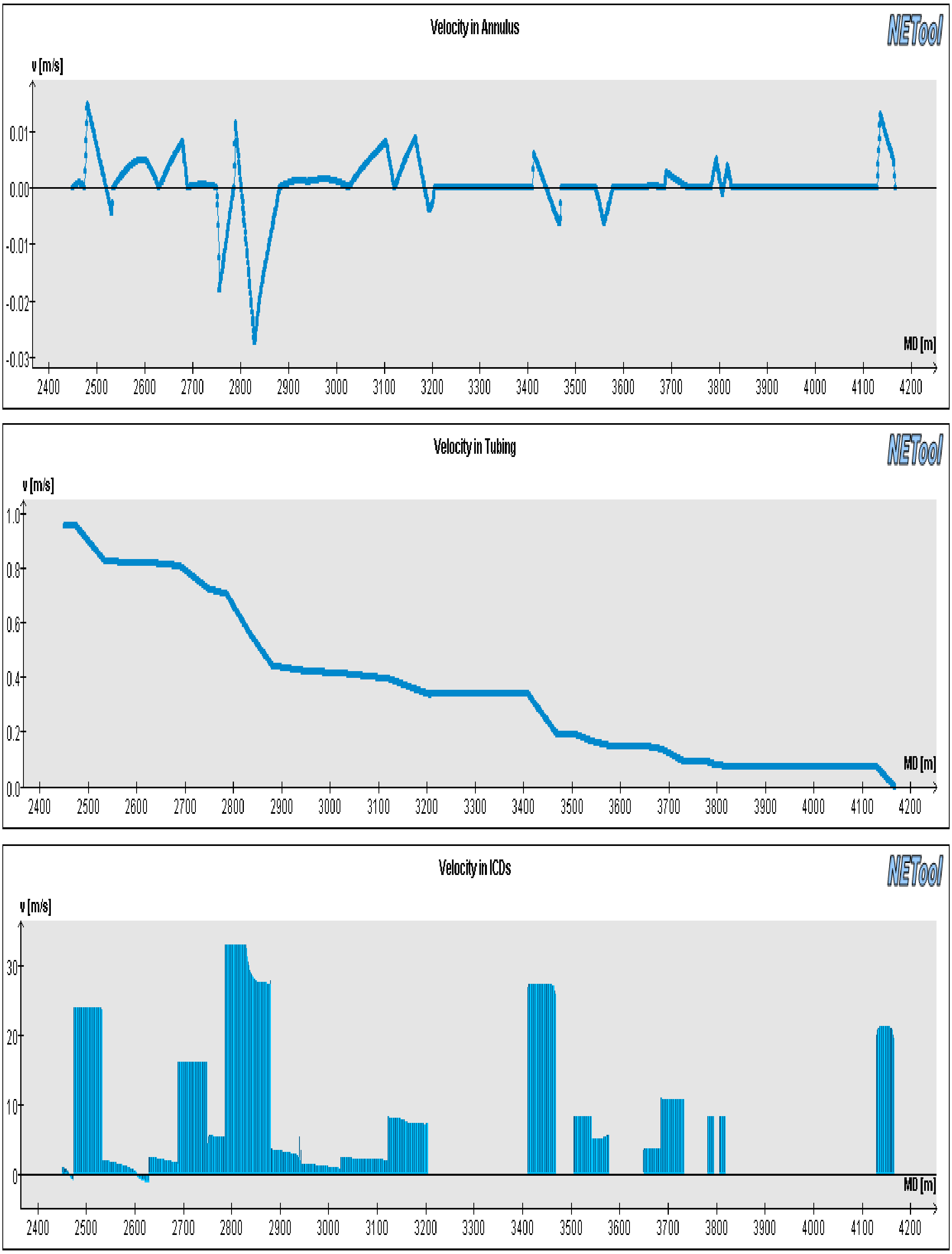


Influx of oil, gas and water from the reservoir and into the well along the wellbore

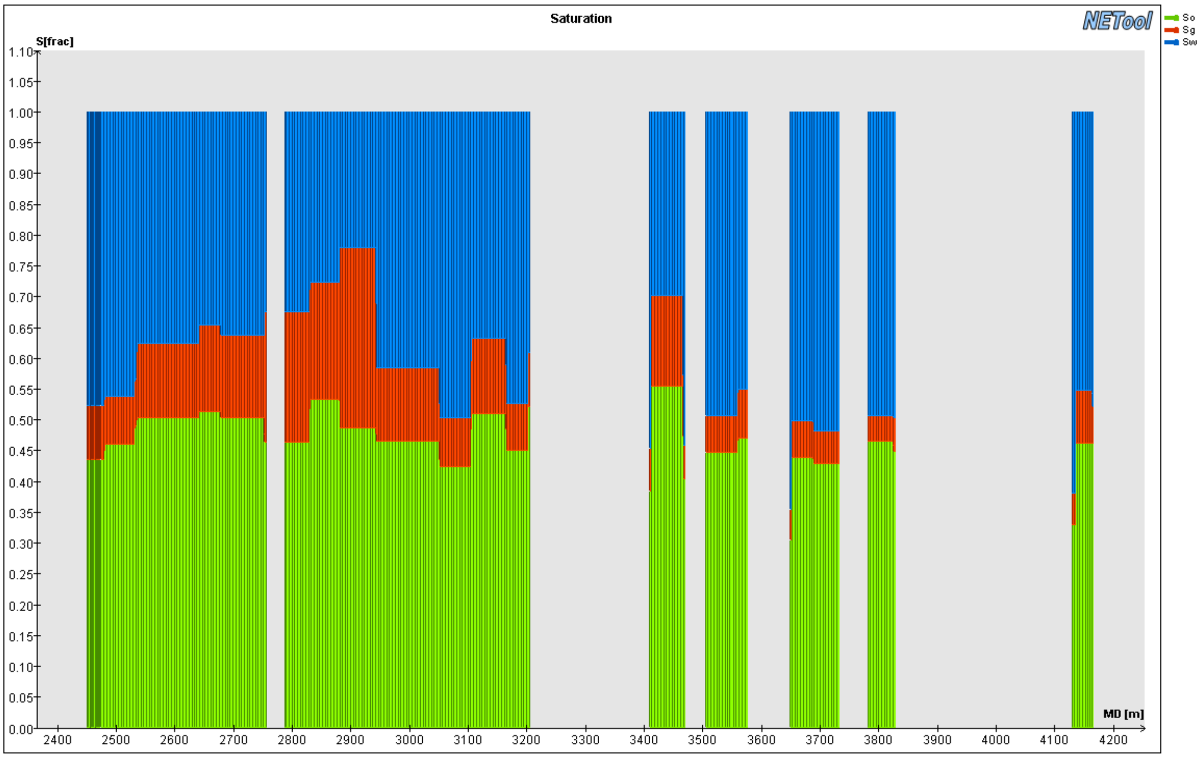
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

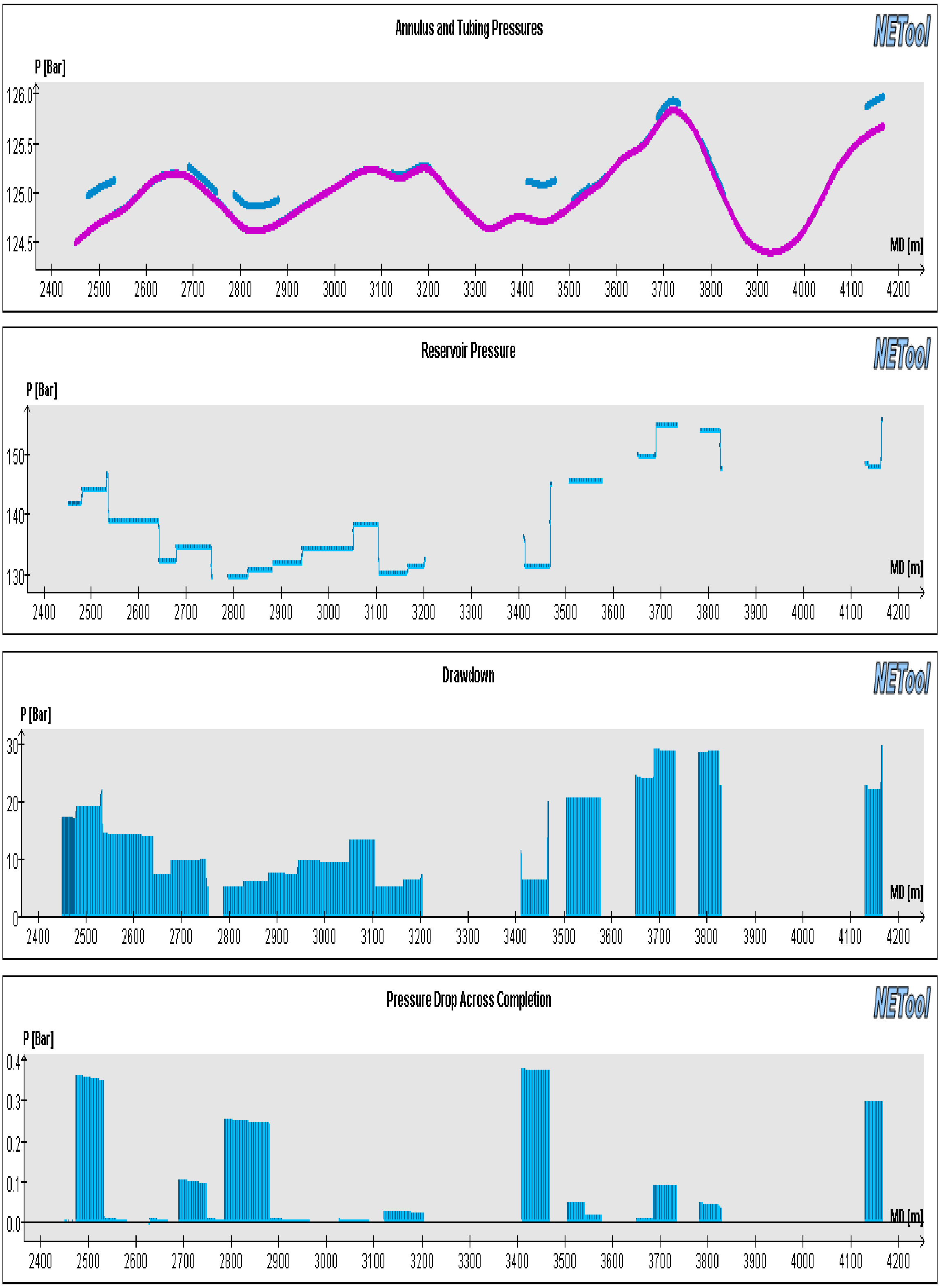
A.39 Plots for well KP9, 2556 days, 4x4 mm ICD and BP

Completion overview for the case:

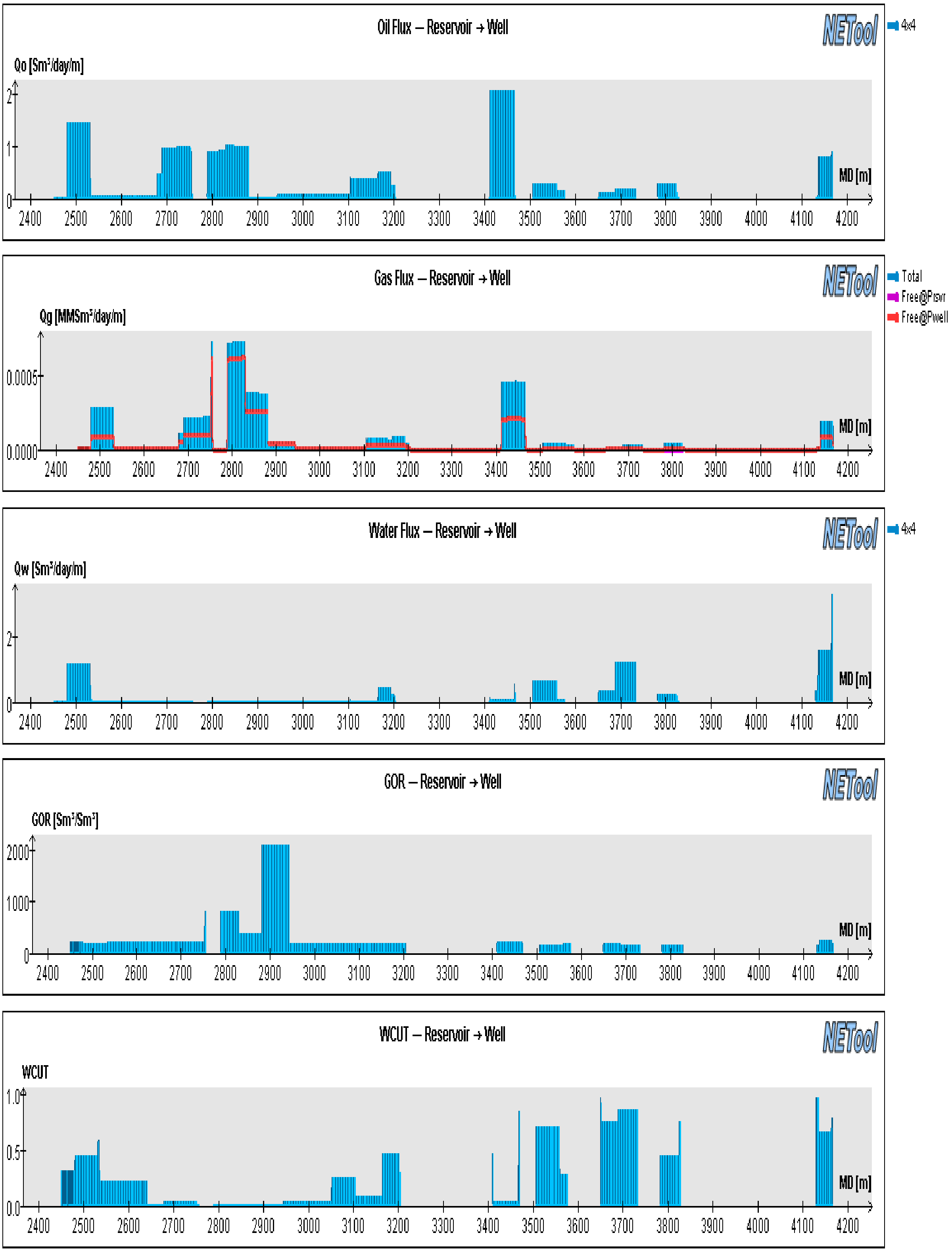
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	4,0	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4,0	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	4,0	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	4,0	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	4,0	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	4,0	Yes	Yes	No

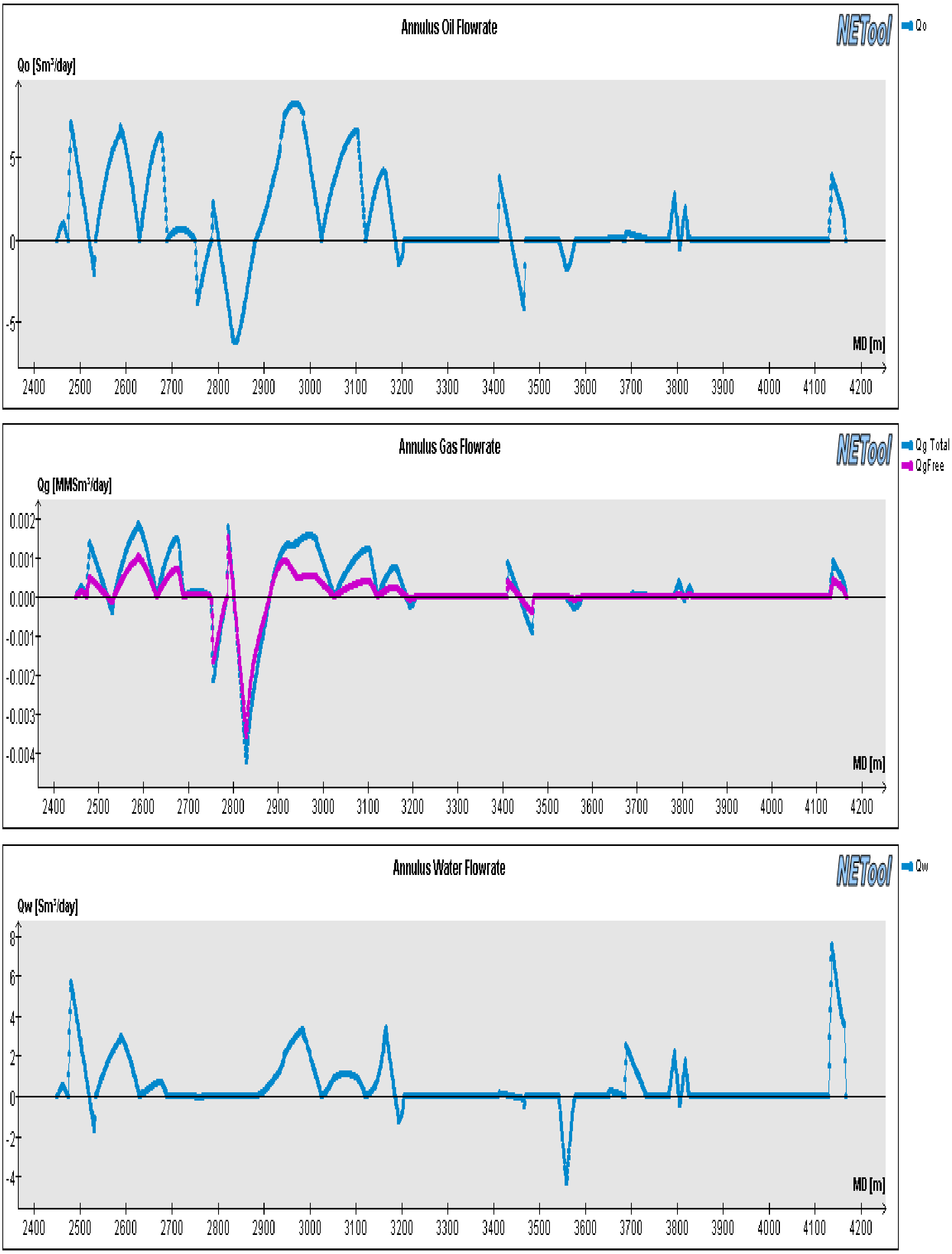
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	4	4,0	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	4	4,0	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	4,0	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A									



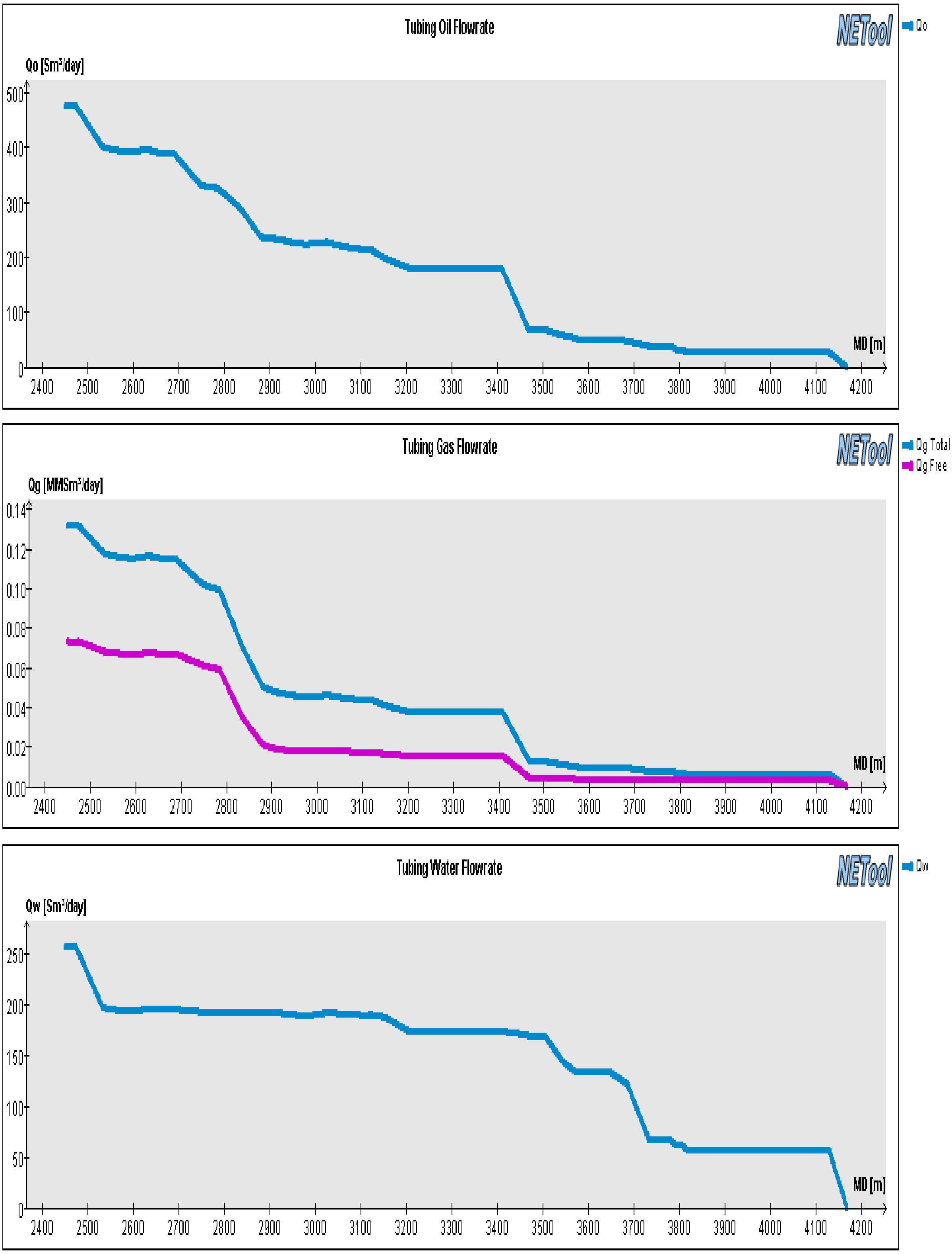
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



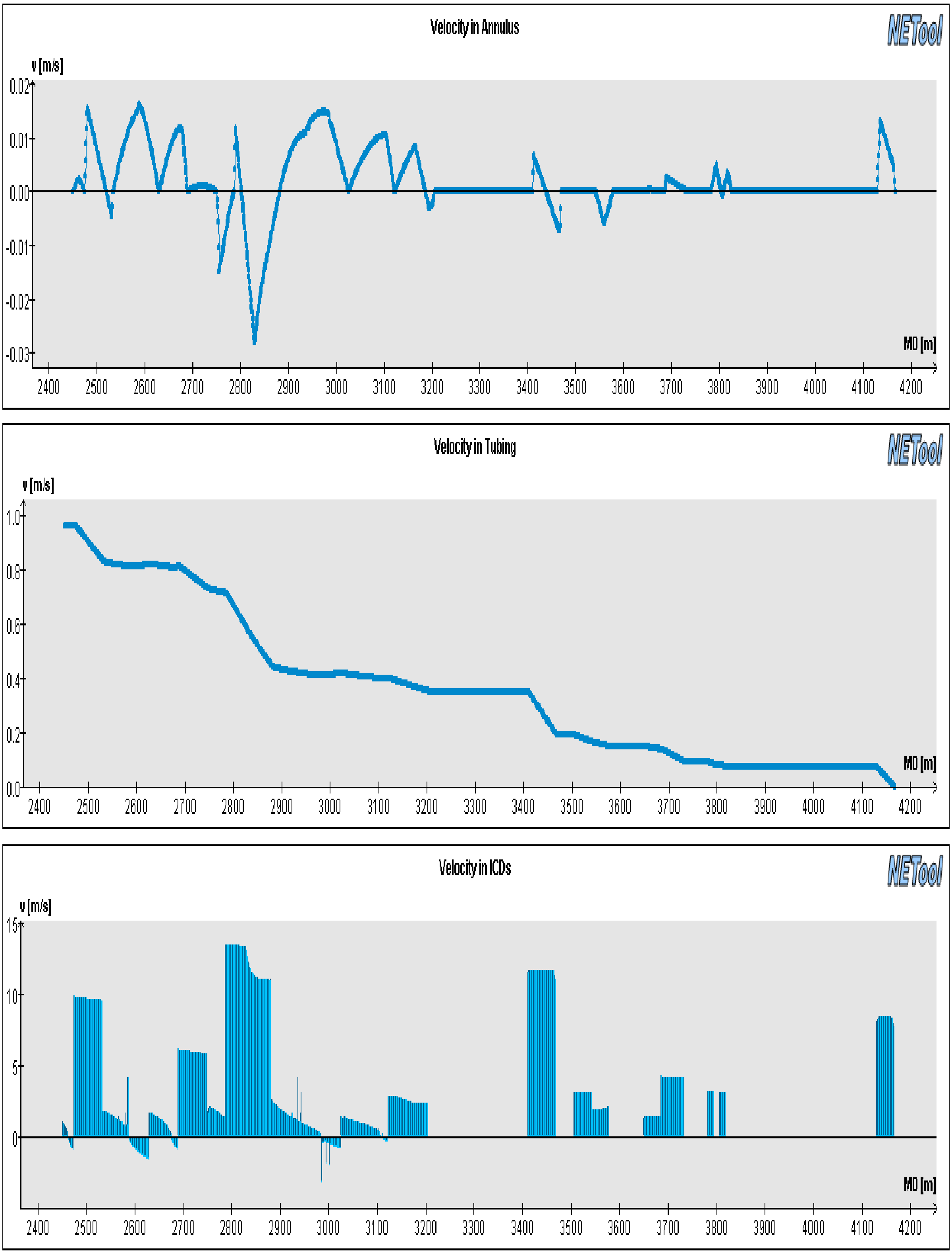
Influx of oil, gas and water from the reservoir and into the well along the wellbore



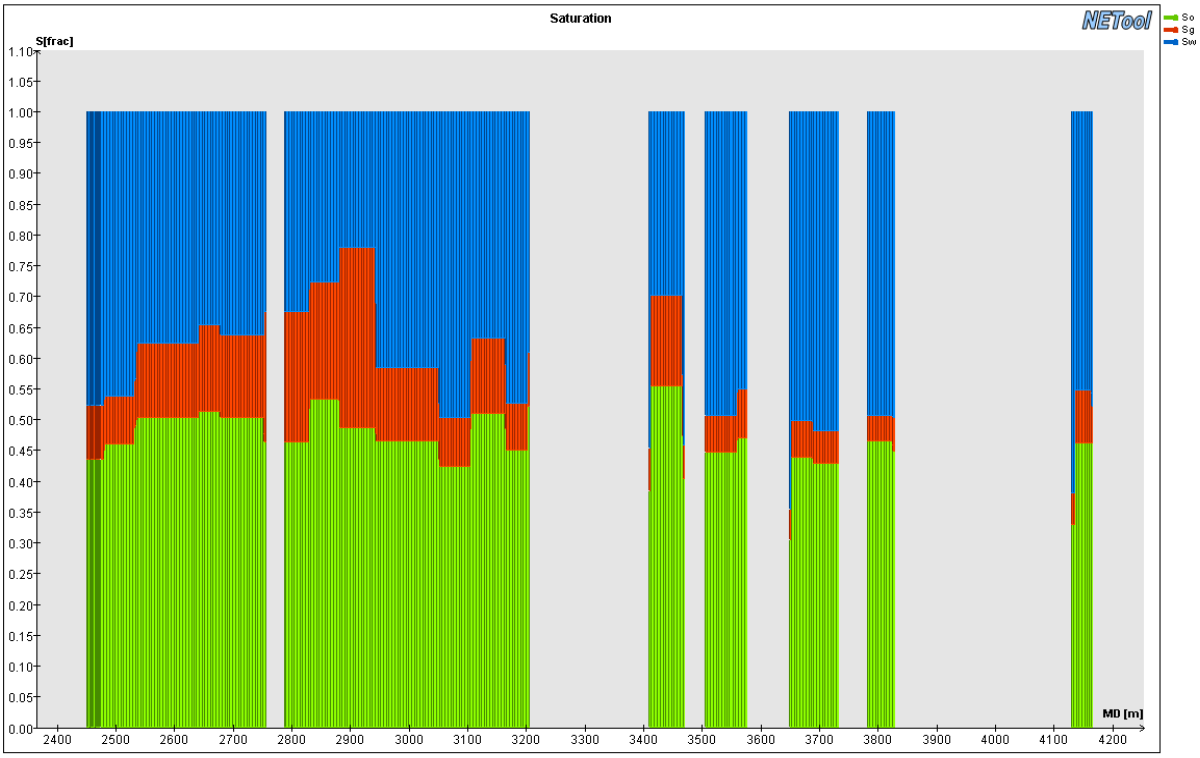
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

A.40 Plots for well KP9, 2556 days, Recommended tailored ICD setting

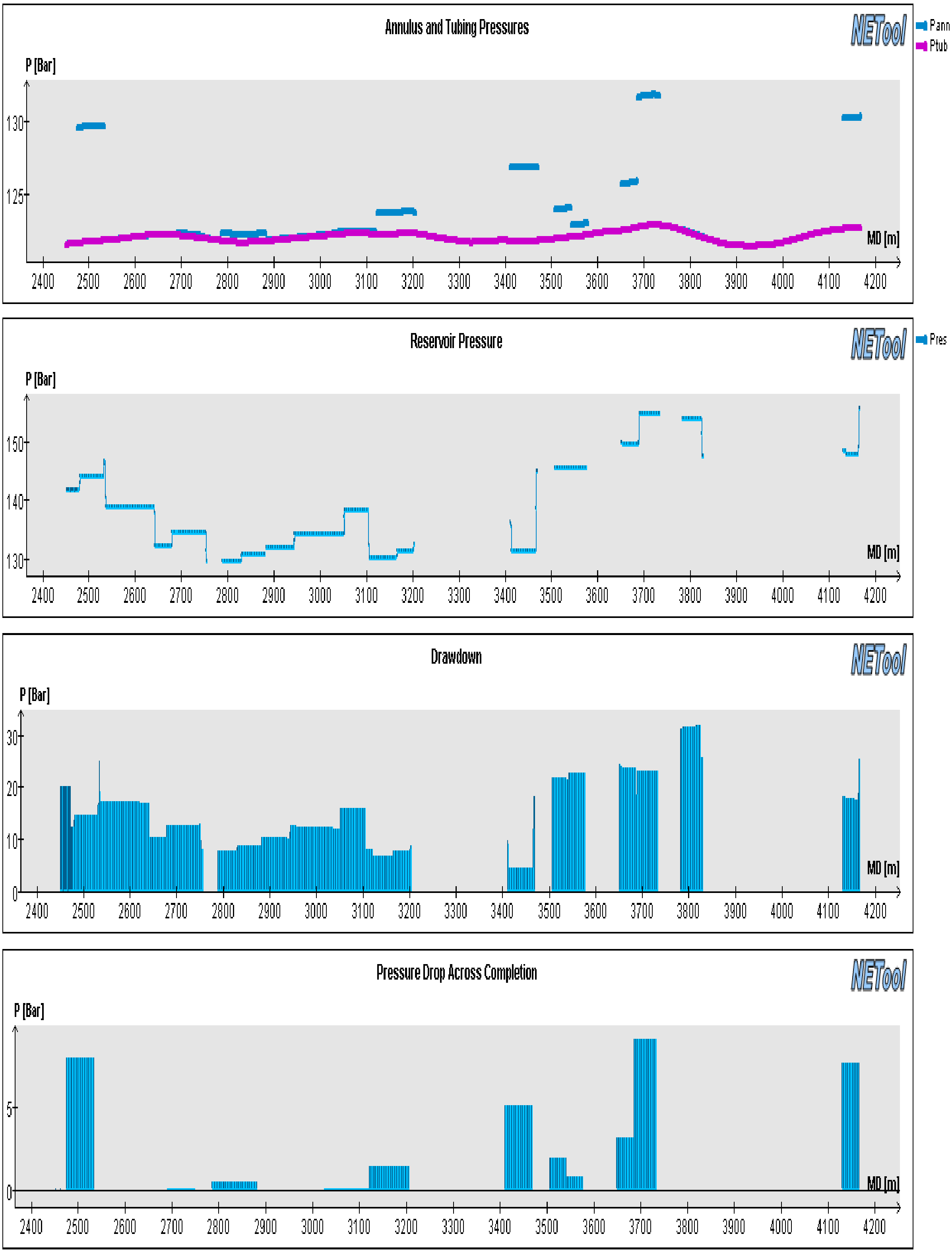
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

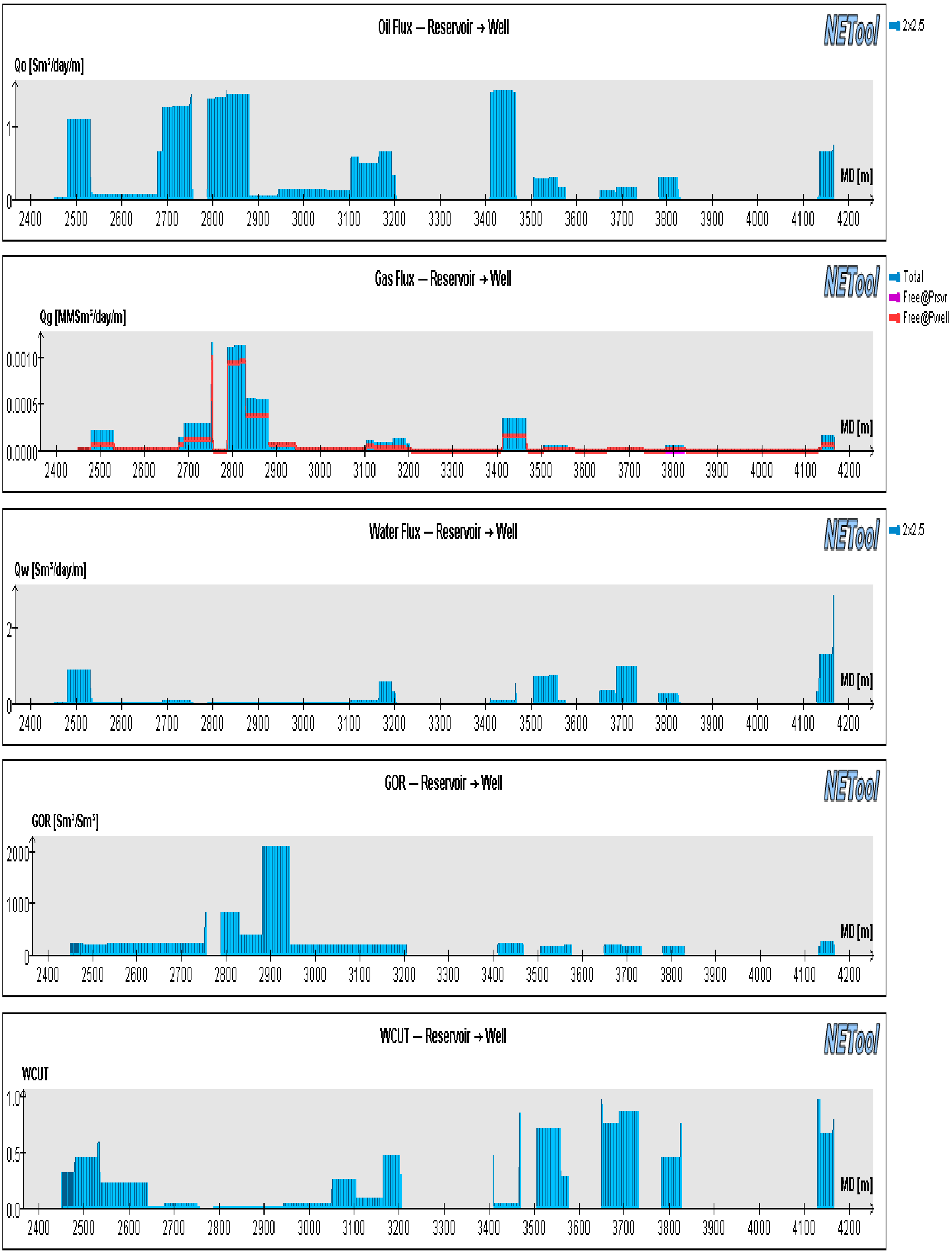
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	-	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]			
71	3182,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
72	3194	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
73	3205,7	0,3	Packer	-	-	No	No	N/A
74	3206	12,0	Blank pipe	-	-	Yes	No	No
75	3218	12,0	Blank pipe	-	-	Yes	No	No
76	3230	12,0	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No
78	3254	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No
83	3314	12,0	Blank pipe	-	-	Yes	No	No
84	3326	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No
86	3350	12,0	Blank pipe	-	-	Yes	No	No
87	3362	12,0	Blank pipe	-	-	Yes	No	No
88	3374	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A
92	3410	12,0	Nozzle ICD	2	2,5	Yes	No	N/A
93	3422	12,0	Nozzle ICD	2	2,5	Yes	No	N/A
94	3434	12,0	Nozzle ICD	2	2,5	Yes	No	N/A
95	3446	12,0	Nozzle ICD	2	2,5	Yes	No	N/A
96	3458	11,7	Nozzle ICD	2	2,5	Yes	No	N/A
97	3469,7	0,3	Packer	-	-	No	No	N/A
98	3470	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A
105	3541,7	0,3	Packer	-	-	No	No	N/A
106	3542,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
107	3554,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
108	3566,0	11,7	Nozzle ICD	4	1,6	Yes	No	N/A
109	3577,7	0,3	Packer	-	-	No	No	N/A
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No
116	3649,7	0,3	Packer	-	-	No	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No
118	3662,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]	-	#	[mm]	-	-	-
119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
120	3685,7	0,3	Packer	-	-	No	No	N/A
121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
122	3698,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
123	3710,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
125	3733,7	0,3	Packer	-	-	No	No	N/A
126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
130	3781,7	0,3	Packer	-	-	No	No	N/A
131	3782,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
133	3806,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
135	3829,7	0,3	Packer	-	-	No	No	N/A
136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
161	4129,7	0,3	Packer	-	-	No	No	N/A
162	4130,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
163	4142,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
164	4154,0	13,3	Nozzle ICD	4	1,6	Yes	No	N/A
TOE	4167,3	-	-	-	-	-	-	-

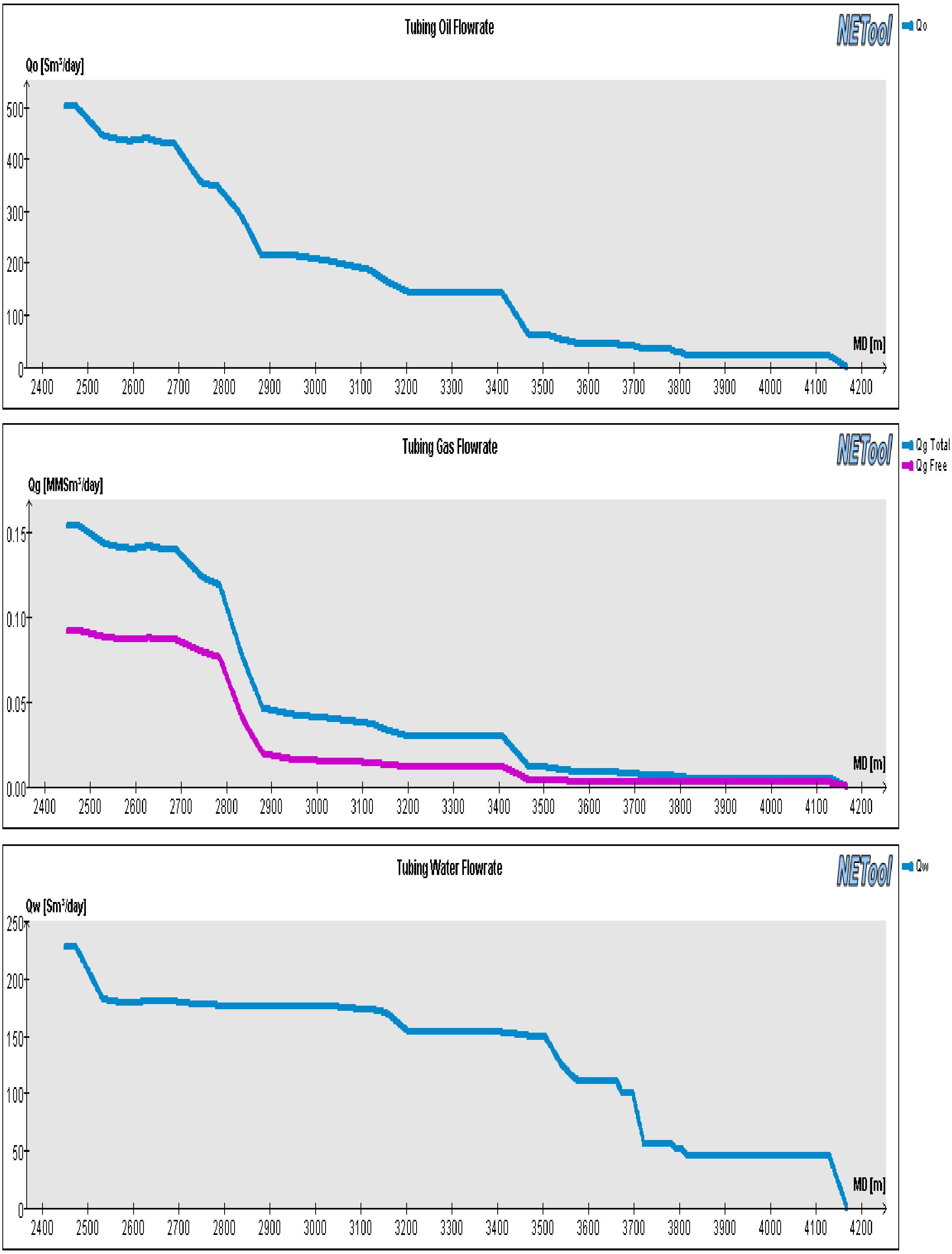


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



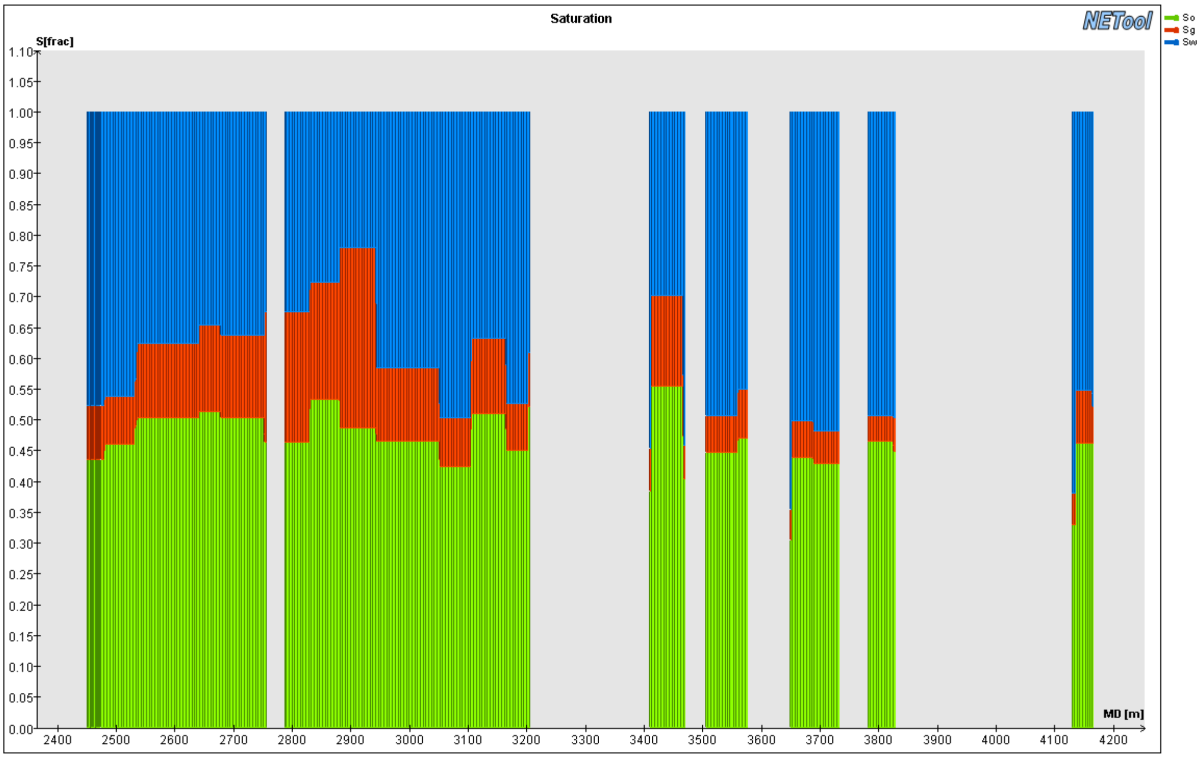
Influx of oil, gas and water from the reservoir and into the well along the wellbore

Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore

Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

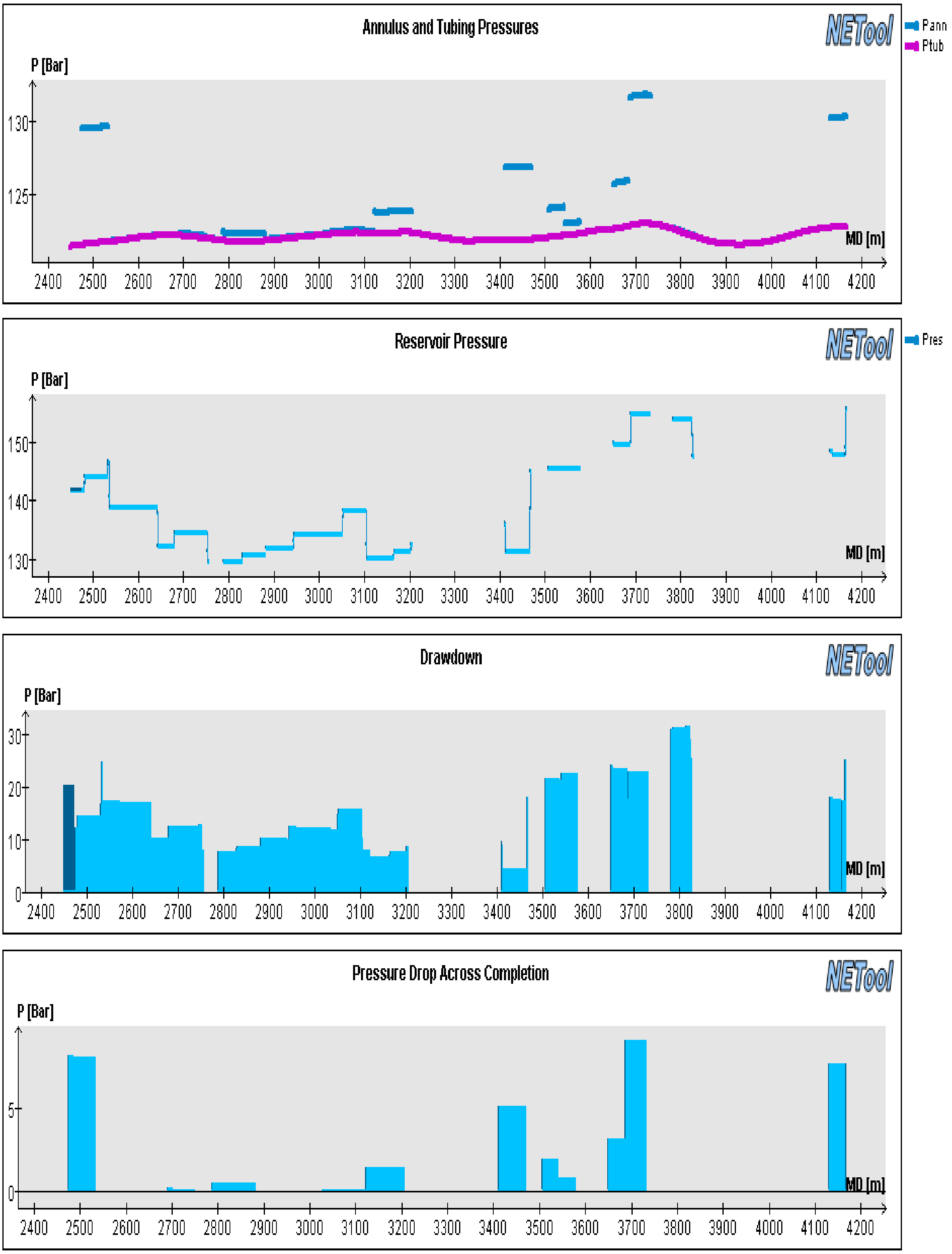
A.41 Plots for well KP9, 2556 days, 5,5" ICD Screen

Completion overview for the case:

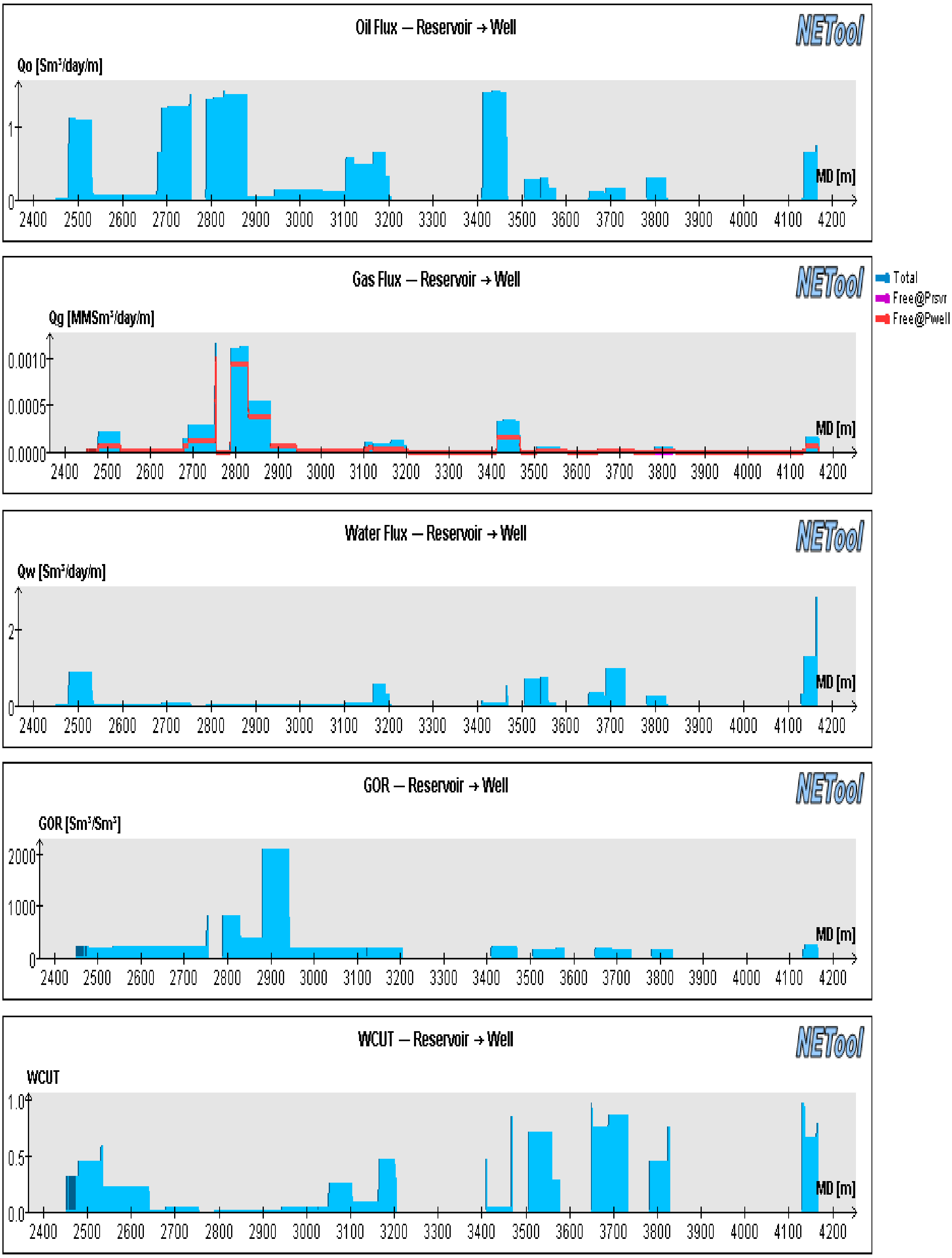
Reservoir section OD	8 ½"
Completion OD	6 5/8"
Completion ID	5,927"
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	-	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

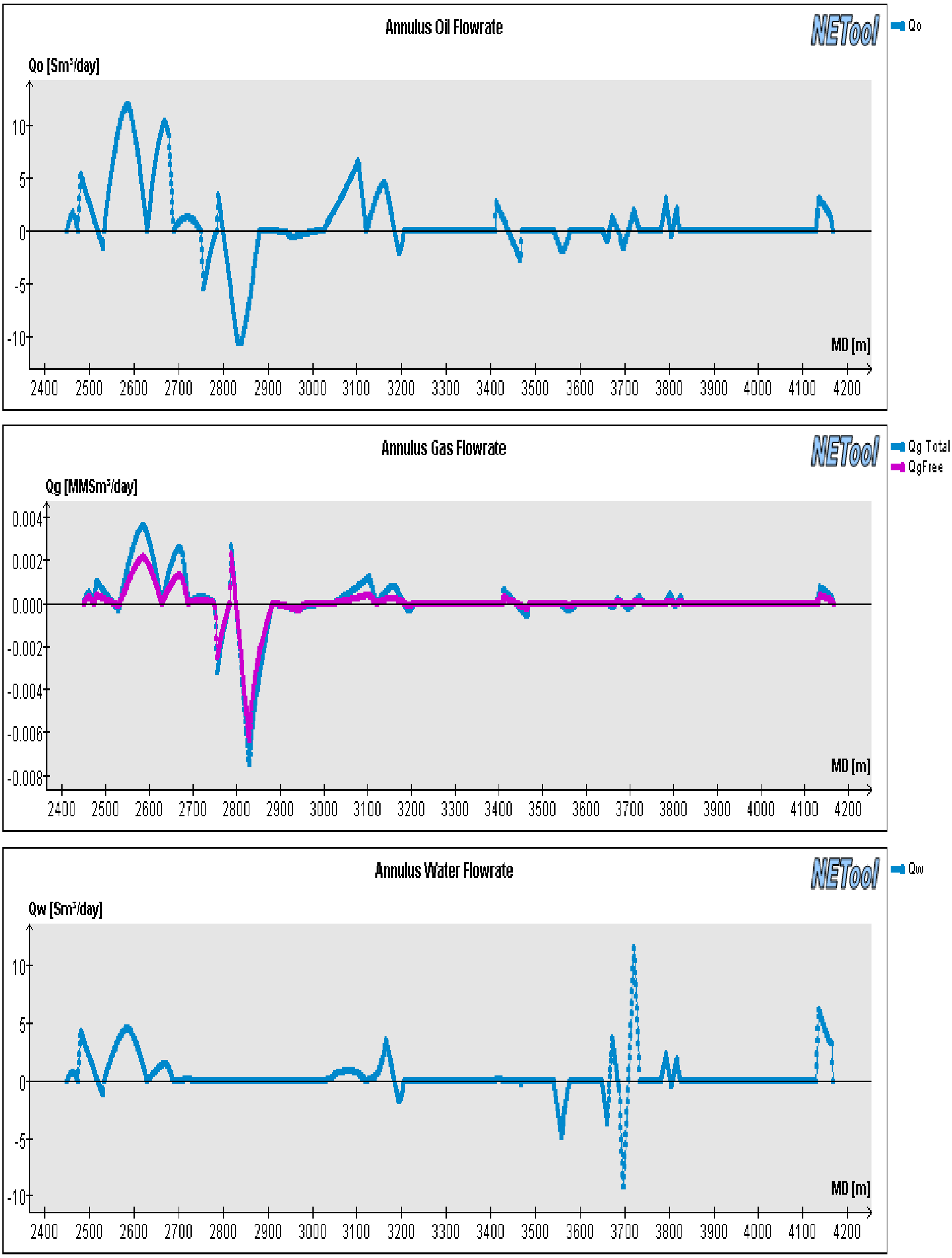
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	2	2,5	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	Yes	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	Yes	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	Yes	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	Yes	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	Yes	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	Yes	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	Yes	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	Yes	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	Yes	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	Yes	No	No
106	3542,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	Yes	No	No
107	3554,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	Yes	No	No
108	3566,0	11,7	Nozzle ICD	4	1,6	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	Yes	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	Yes	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	Yes	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	Yes	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	Yes	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	1,6	Yes	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A									



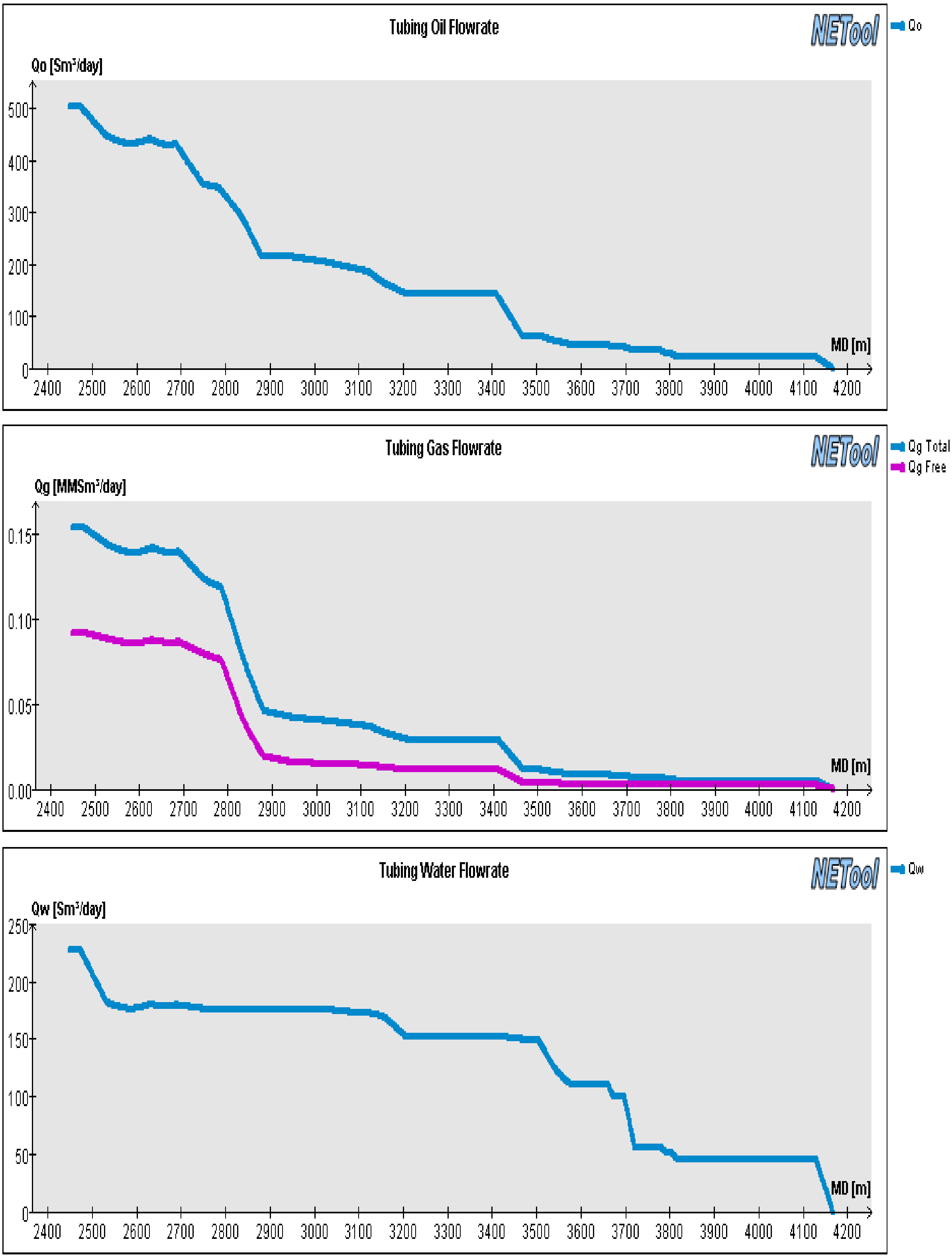
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



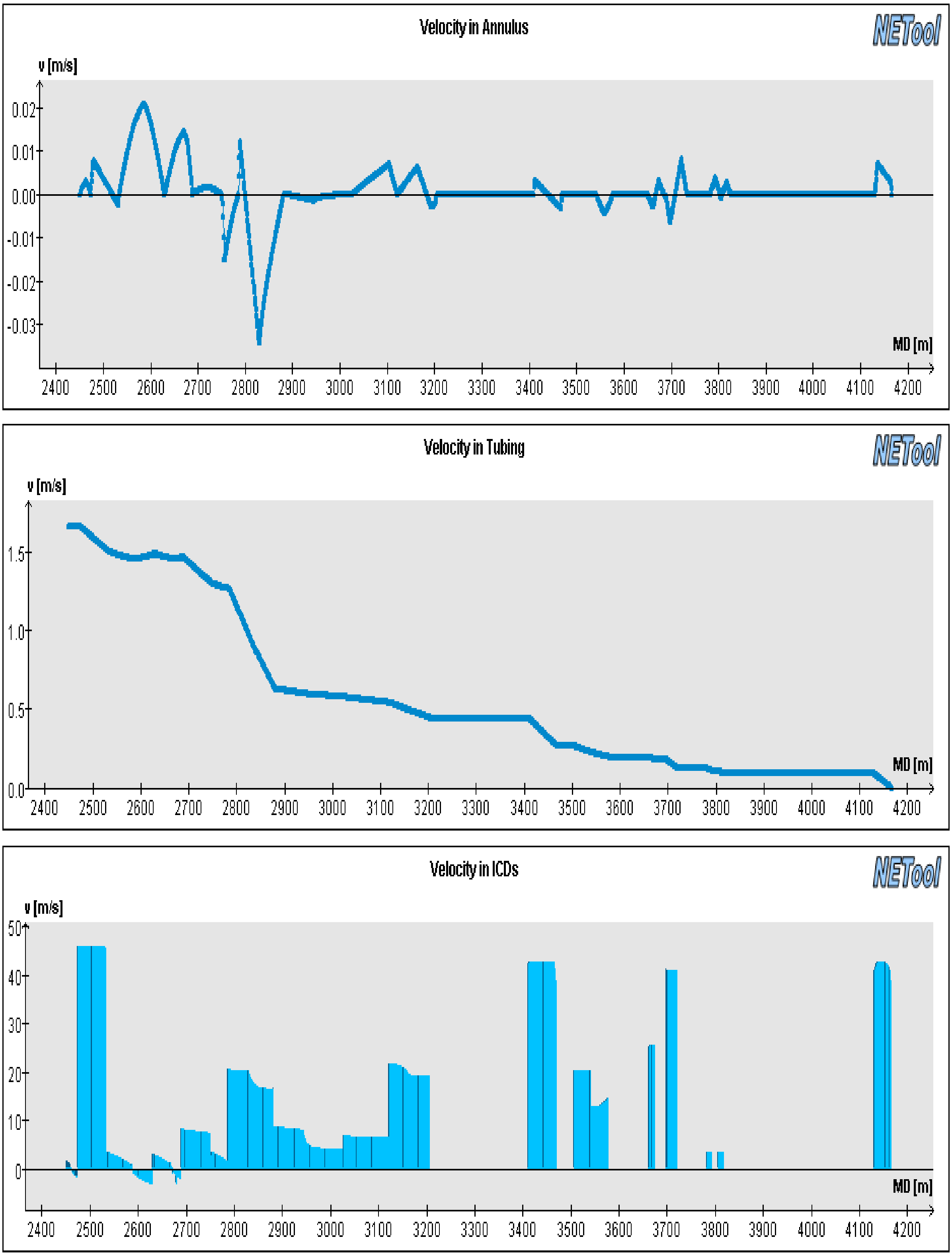
Influx of oil, gas and water from the reservoir and into the well along the wellbore



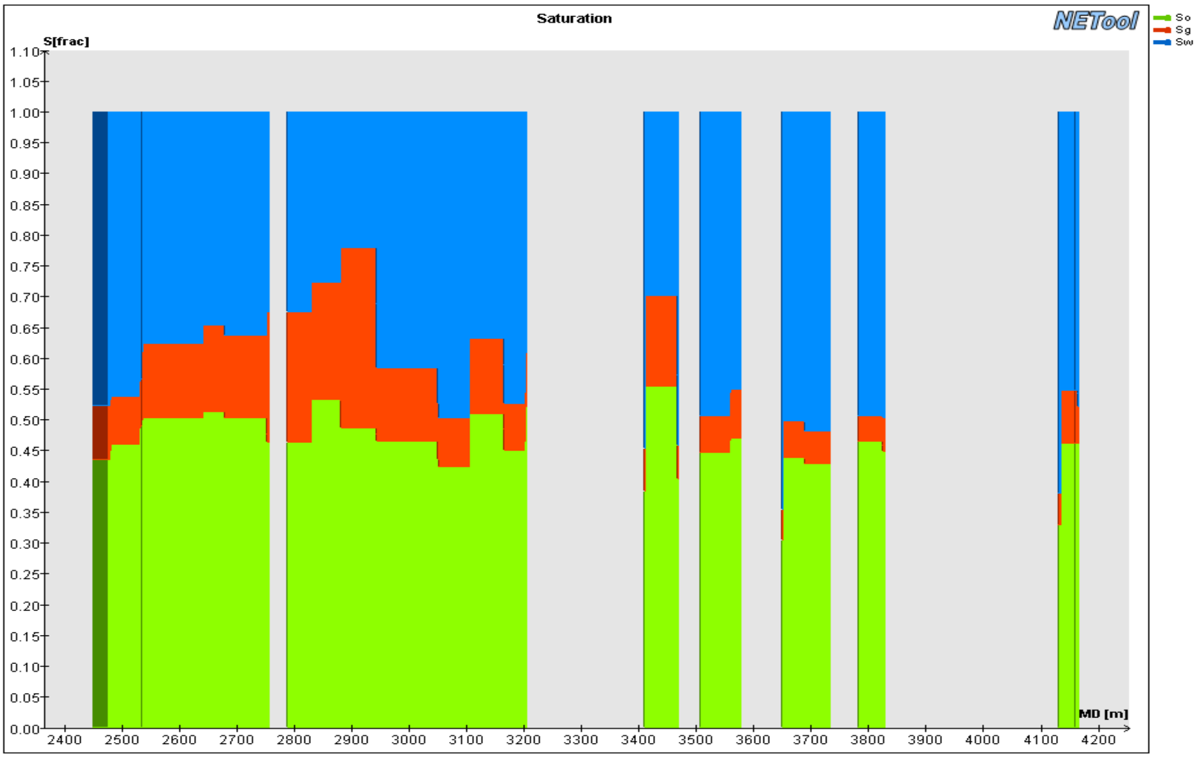
Annulus oil, gas and water flow rate along the wellbore



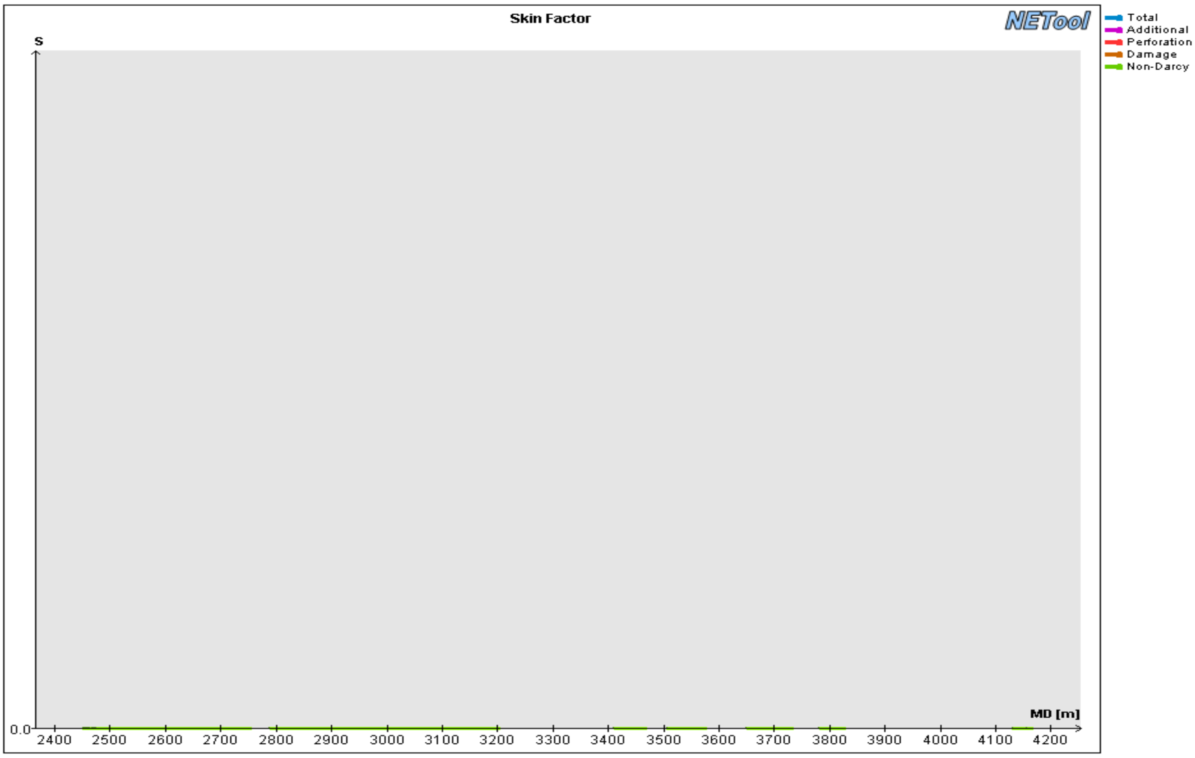
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus and tubing and ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.42 Plots for well KP9, 2556 days, Practical case

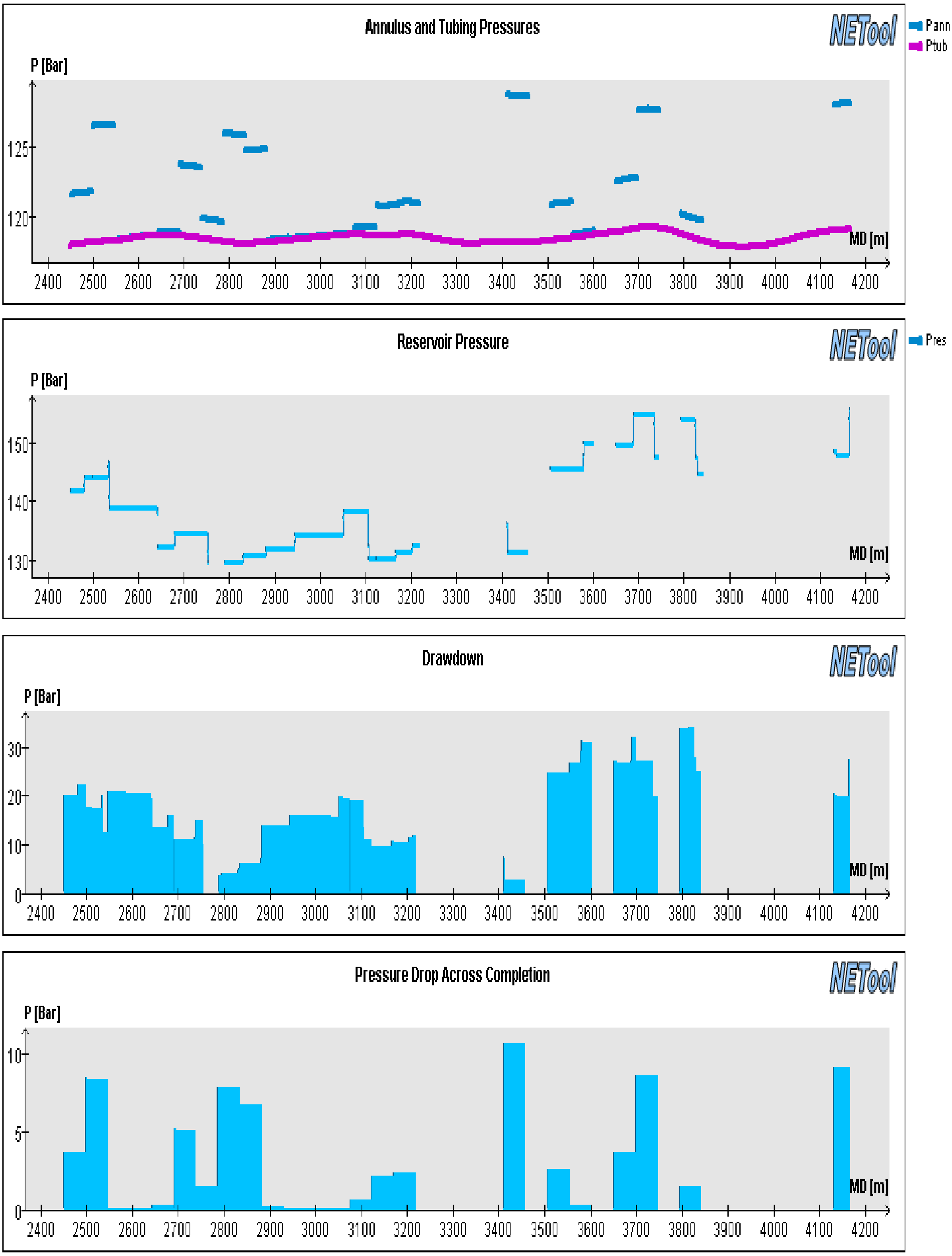
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

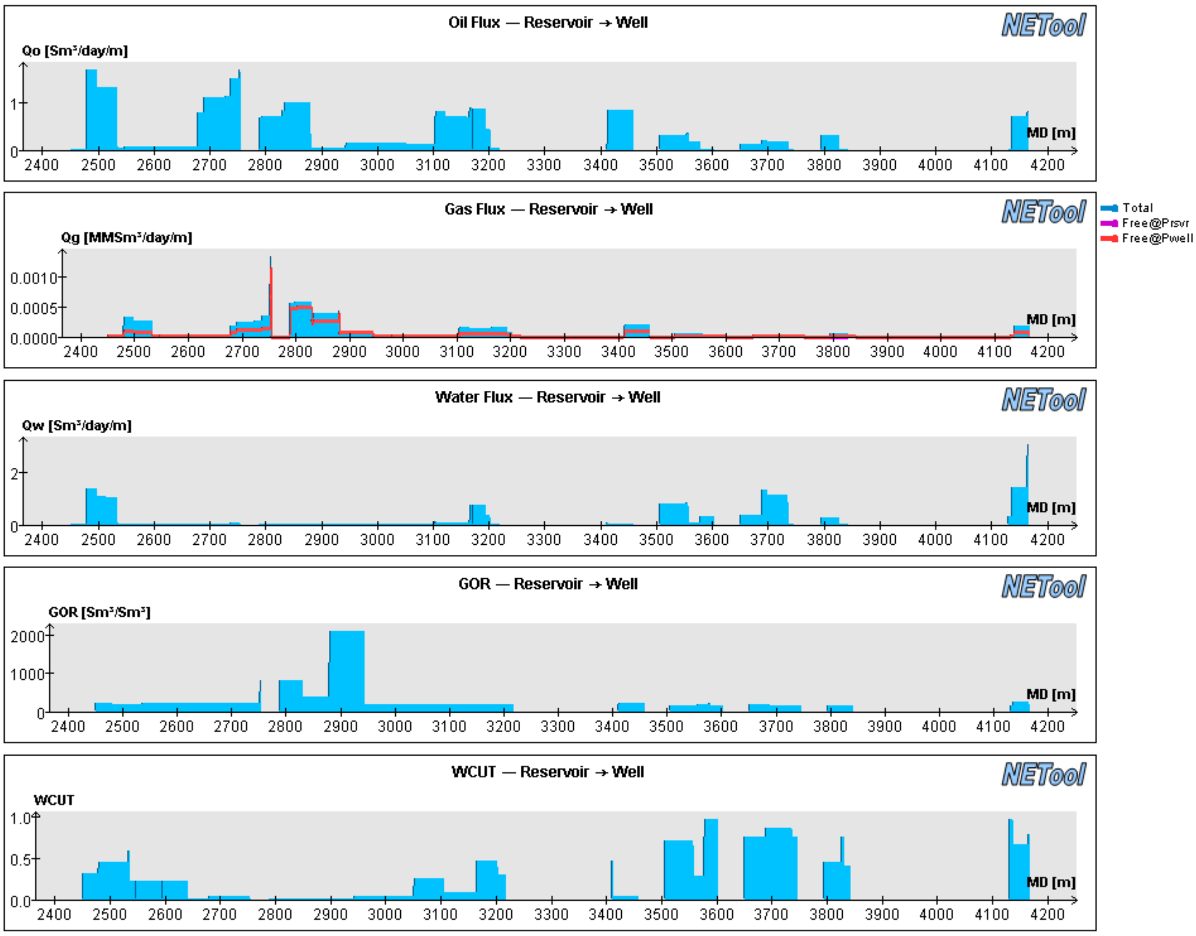
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	0,3	Packer	-	-	Yes	No	No
2	2450,3	11,7	Nozzle ICD	4	4,0	Yes	No	No	37	2798	11,7	Nozzle ICD	4	4,0	Yes	No	No
3	2462	12,0	Nozzle ICD	4	4,0	Yes	No	No	38	2809,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
4	2474	12,0	Nozzle ICD	4	4,0	Yes	No	No	39	2821,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
5	2486	12,0	Nozzle ICD	4	4,0	Yes	No	No	40	2833,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
6	2498	0,3	Packer	-	-	Yes	No	No	41	2845,7	0,3	Packer	-	-	Yes	No	No
7	2498,3	11,7	Nozzle ICD	4	4,0	Yes	No	No	42	2846	11,7	Nozzle ICD	4	4,0	Yes	No	No
8	2510	12,0	Nozzle ICD	4	4,0	Yes	No	No	43	2857,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
9	2522	12,0	Nozzle ICD	4	4,0	Yes	No	No	44	2869,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
10	2534	12,0	Nozzle ICD	4	4,0	Yes	No	No	45	2881,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
11	2546	0,3	Packer	-	-	Yes	No	No	46	2893,7	0,3	Packer	-	-	Yes	No	No
12	2546,3	11,7	Nozzle ICD	4	4,0	Yes	No	No	47	2894	11,7	Nozzle ICD	4	4,0	Yes	No	No
13	2558	12,0	Nozzle ICD	4	4,0	Yes	No	No	48	2905,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
14	2570	12,0	Nozzle ICD	4	4,0	Yes	No	No	49	2917,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
15	2582	12,0	Nozzle ICD	4	4,0	Yes	No	No	50	2929,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
16	2594	12,0	Packer	-	-	Yes	No	No	51	2941,7	0,3	Packer	-	-	Yes	No	No
17	2606	11,7	Nozzle ICD	4	4,0	Yes	No	No	52	2942	11,7	Nozzle ICD	4	4,0	Yes	No	No
18	2617,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	53	2953,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
19	2629,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	54	2965,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
20	2641,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	55	2977,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
21	2653,7	0,3	Packer	-	-	Yes	No	No	56	2989,7	0,3	Packer	-	-	Yes	No	No
22	2654	11,7	Nozzle ICD	4	4,0	Yes	No	No	57	2990	11,7	Nozzle ICD	4	4,0	Yes	No	No
23	2665,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	58	3001,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
24	2677,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	59	3013,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
25	2689,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	60	3025,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
26	2701,7	0,3	Packer	-	-	Yes	No	No	61	3037,7	0,3	Packer	-	-	Yes	No	No
27	2702	11,7	Nozzle ICD	4	4,0	Yes	No	No	N/A	3038	11,7	Nozzle ICD	4	4,0	Yes	No	No
28	2713,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	63	3049,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
29	2725,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	64	3061,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
30	2737,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	65	3073,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
31	2749,7	0,3	Packer	-	-	Yes	No	No	66	3085,7	0,3	Packer	-	-	Yes	No	No
32	2750	11,7	Nozzle ICD	4	4,0	Yes	No	No	67	3086	11,7	Nozzle ICD	4	4,0	Yes	No	No
33	2761,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	68	3097,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
34	2773,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	69	3109,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
35	2785,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	70	3121,7	12,0	Nozzle ICD	4	4,0	Yes	No	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3133,7	0,3	Packer	4	4,0	Yes	Yes	No	128	3673,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
72	3134	11,7	Nozzle ICD	4	4,0	Yes	No	No	129	3685,7	12,0	Blank pipe	-	-	Yes	No	No
73	3145,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	130	3697,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
74	3157,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	131	3709,7	0,3	Packer	4	4,0	Yes	No	N/A
75	3169,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	132	3710,0	11,7	Blank pipe	-	-	Yes	No	No
76	3181,7	0,3	Packer	-	-	Yes	No	No	133	3721,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
77	3182	11,7	Nozzle ICD	4	4,0	Yes	No	No	134	3733,7	12,0	Blank pipe	-	-	Yes	No	No
78	3193,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	135	3745,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
79	3205,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	136	3757,7	0,3	Packer	-	-	Yes	No	No
80	3217,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	137	3758,0	11,7	Blank pipe	-	-	Yes	No	No
81	3229,7	0,3	Packer	-	-	Yes	No	No	138	3769,7	12,0	Blank pipe	-	-	Yes	No	No
82	3230	11,7	Blank pipe	-	-	Yes	No	No	139	3781,7	12,0	Blank pipe	-	-	Yes	No	No
83	3241,7	12,0	Blank pipe	-	-	Yes	No	No	140	3793,7	12,0	Blank pipe	-	-	Yes	No	No
84	3253,7	12,0	Blank pipe	-	-	Yes	No	No	141	3805,7	0,3	Packer	-	-	Yes	No	No
85	3265,7	12,0	Blank pipe	-	-	Yes	No	No	142	3806,0	11,7	Nozzle ICD	4	4,0	Yes	No	No
86	3277,7	0,3	Packer	-	-	Yes	No	No	143	3817,7	12,0	Blank pipe	-	-	Yes	No	No
87	3278	11,7	Blank pipe	-	-	Yes	No	No	144	3829,7	12,0	Nozzle ICD	4	4,0	Yes	No	No
88	3289,7	12,0	Blank pipe	-	-	Yes	No	No	145	3841,7	12,0	Blank pipe	-	-	Yes	No	No
89	3301,7	12,0	Blank pipe	-	-	Yes	No	No	146	3853,7	0,3	Packer	-	-	Yes	No	No
90	3313,7	12,0	Blank pipe	-	-	Yes	No	No	147	3854,0	11,7	Blank pipe	-	-	Yes	No	No
91	3325,7	0,3	Packer	-	-	No	No	N/A	148	3865,7	12,0	Blank pipe	-	-	Yes	No	No
92	3326	11,7	Blank pipe	-	-	Yes	No	No	149	3877,7	12,0	Blank pipe	-	-	Yes	No	No
93	3337,7	12,0	Blank pipe	-	-	Yes	No	No	150	3889,7	12,0	Blank pipe	-	-	Yes	No	No
94	3349,7	12,0	Blank pipe	-	-	Yes	No	No	151	3901,7	0,3	Packer	-	-	Yes	No	No
95	3361,7	12,0	Blank pipe	-	-	Yes	No	No	152	3902,0	11,7	Blank pipe	-	-	Yes	No	No
96	3373,7	0,3	Packer	-	-	Yes	No	N/A	153	3913,7	12,0	Blank pipe	-	-	Yes	No	No
97	3374	11,7	Blank pipe	-	-	Yes	No	No	154	3925,7	12,0	Blank pipe	-	-	Yes	No	No
98	3385,7	12,0	Blank pipe	-	-	Yes	No	No	155	3937,7	12,0	Blank pipe	-	-	Yes	No	No
99	3397,7	12,0	Blank pipe	-	-	Yes	No	No	156	3949,7	0,3	Packer	-	-	Yes	No	No
100	3409,7	12,0	Blank pipe	-	-	Yes	No	No	157	3950,0	11,7	Blank pipe	-	-	Yes	No	No
101	3421,7	0,3	Packer	-	-	No	No	N/A	158	3961,7	12,0	Blank pipe	-	-	Yes	No	No
102	3422,0	11,7	Nozzle ICD	4	4,0	Yes	No	No	159	3973,7	12,0	Blank pipe	-	-	Yes	No	No
103	3433,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	160	3985,7	12,0	Blank pipe	-	-	Yes	No	No
104	3445,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	161	3997,7	0,3	Packer	-	-	No	No	N/A
105	3457,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	162	3998,0	11,7	Blank pipe	-	-	Yes	No	No
106	3469,7	0,3	Packer	-	-	Yes	No	N/A	163	4009,7	12,0	Blank pipe	-	-	Yes	No	No
107	3470,0	11,7	Blank pipe	-	-	Yes	No	No	164	4021,7	12,0	Blank pipe	-	-	Yes	No	No
108	3481,7	12,0	Blank pipe	-	-	Yes	No	No	165	4033,7	12,0	Blank pipe	-	-	Yes	No	No
109	3493,7	12,0	Blank pipe	-	-	Yes	No	No	166	4045,7	0,3	Packer	-	-	Yes	No	No
110	3505,7	12,0	Blank pipe	-	-	Yes	No	No	167	4046,0	11,7	Blank pipe	-	-	Yes	No	No
111	3517,7	0,3	Packer	-	-	Yes	No	No	168	4057,7	12,0	Blank pipe	-	-	Yes	No	No
112	3518,0	11,7	Nozzle ICD	4	4,0	Yes	No	No	169	4069,7	12,0	Blank pipe	-	-	Yes	No	No
113	3529,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	170	4081,7	12,0	Blank pipe	-	-	Yes	No	No
114	3541,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	171	4093,7	0,3	Packer	-	-	Yes	No	No
115	3553,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	172	4094,0	11,7	Blank pipe	-	-	Yes	No	No
116	3565,7	0,3	Packer	-	-	No	No	N/A	173	4105,7	12,0	Blank pipe	-	-	Yes	No	No
117	3566,0	11,7	Nozzle ICD	4	4,0	Yes	No	No	174	4117,7	12,0	Blank pipe	-	-	Yes	No	No
118	3577,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	175	4129,7	12,0	Blank pipe	-	-	Yes	No	No
119	3589,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	176	4141,7	0,3	Packer	-	-	Yes	No	No
120	3601,7	12,0	Nozzle ICD	4	4,0	Yes	No	No	177	4142,0	11,7	Nozzle ICD	4	4,0	Yes	No	N/A
121	3613,7	0,3	Packer	-	-	Yes	No	No	178	4153,7	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
122	3614,0	11,7	Blank pipe	-	-	Yes	No	No	TOE	4165,7	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
123	3625,7	12,0	Blank pipe	-	-	Yes	No	No									

124	3637,7	12,0	**Blank pipe**	-	-	Yes	No	No									
125	3649,7	12,0	**Blank pipe**	-	-	Yes	No	No									
126	3661,7	0,3	**Packer**	-	-	Yes	No	No									
127	3662,0	11,7	**Blank pipe**	-	-	Yes	No	No									

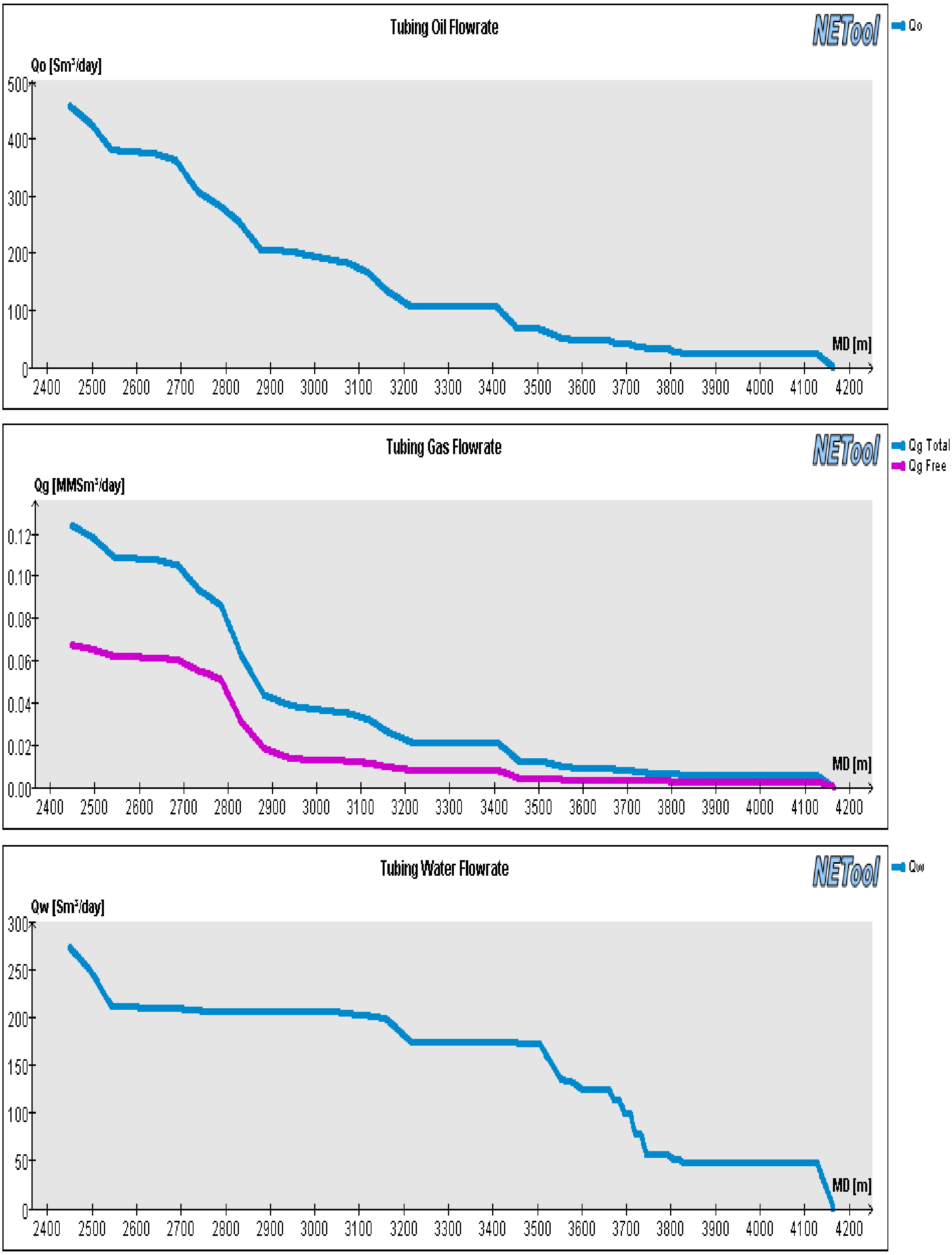


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

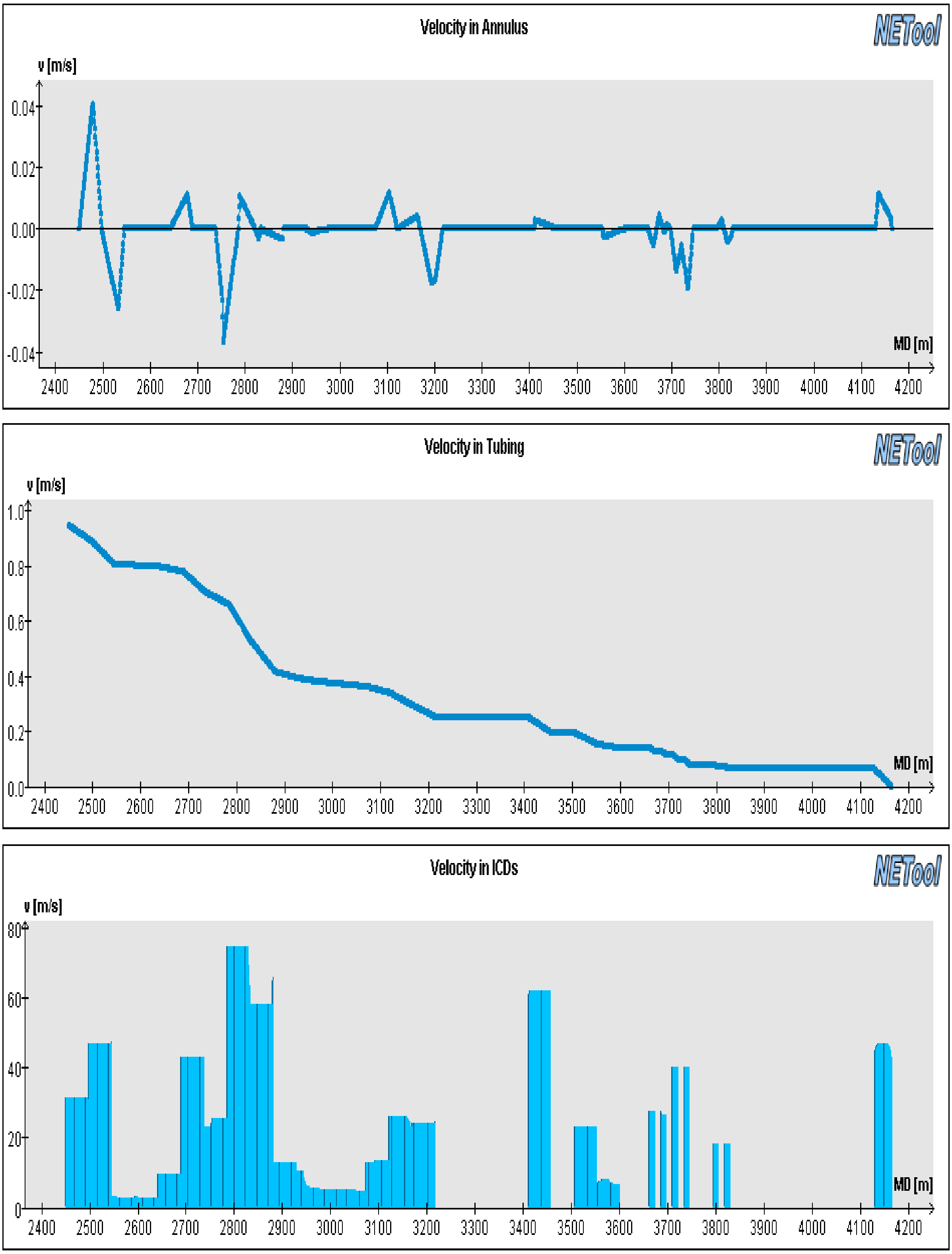


Influx of oil, gas and water from the reservoir and into the well along the wellbore

Annulus oil, gas and water flow rate along the wellbore

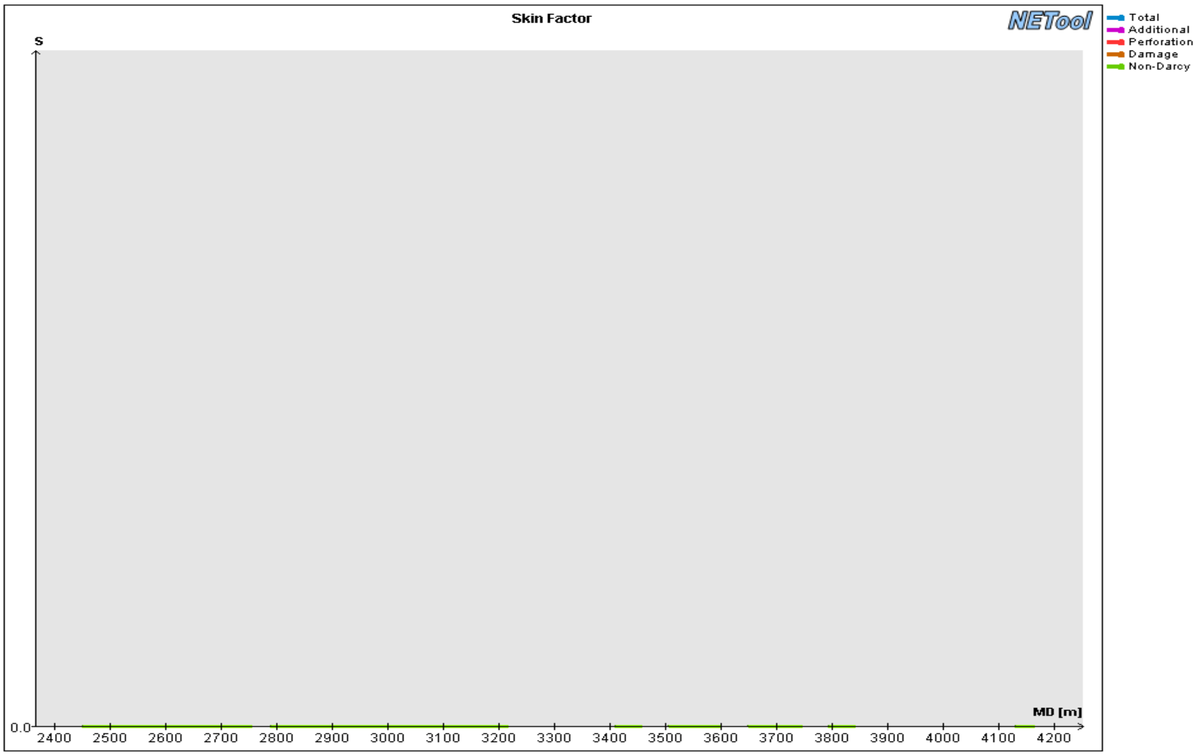


Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus and tubing and ICDs

Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



Skin factor plot for the well and given time step

A.43 Plots for well KP9, 2556 days, WWS case

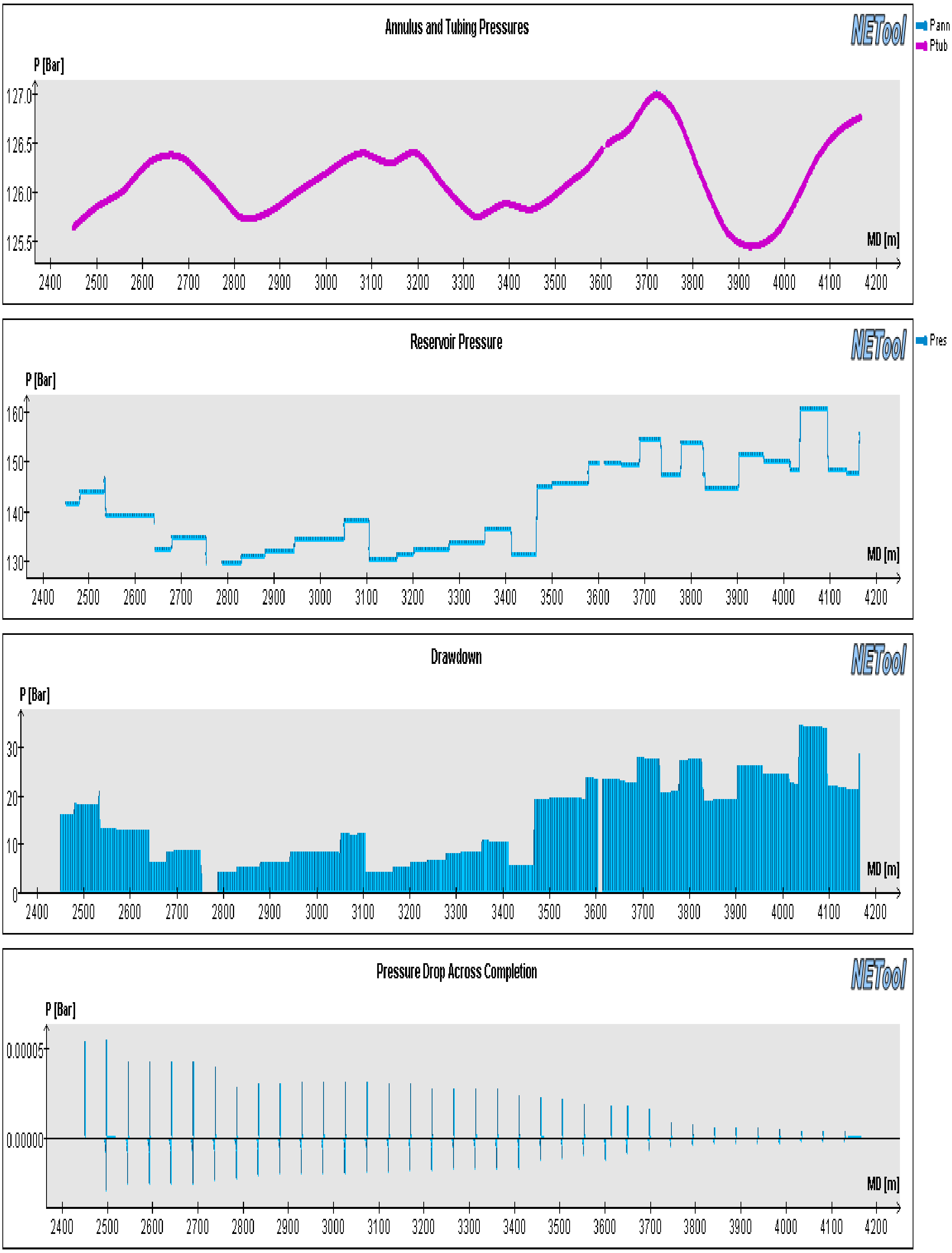
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”

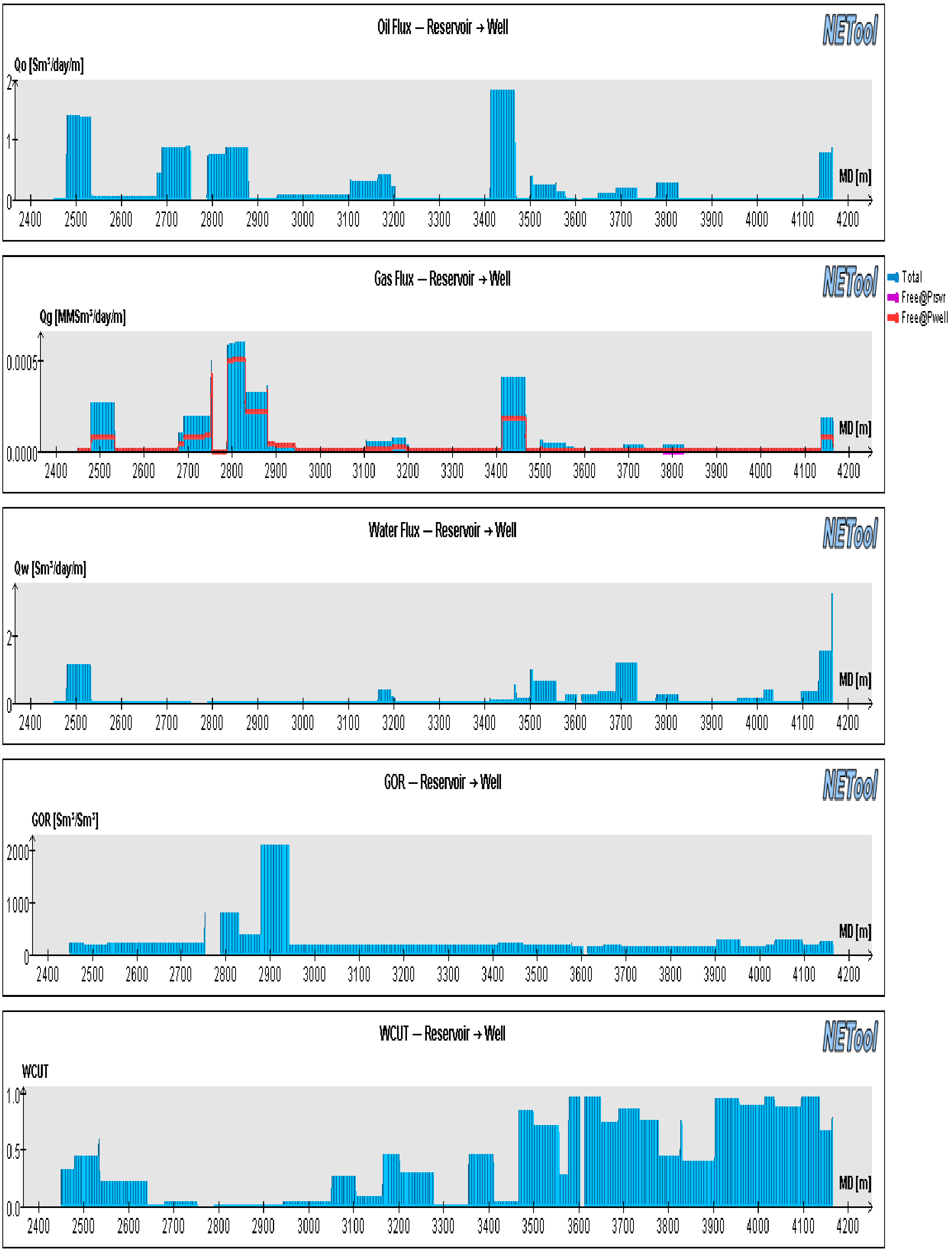
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	**Cemented bp**	-	-	No	No	N/A	**36**	2798	0,3	**Packer**	-	-	Yes	No	No
2	2450,3	11,7	**WWS**	4	4,0	Yes	No	No	**37**	2798	11,7	**WWS**	4	4,0	Yes	No	No
3	2462	12,0	**WWS**	4	4,0	Yes	No	No	**38**	2809,7	12,0	**WWS**	4	4,0	Yes	No	No
4	2474	12,0	**WWS**	4	4,0	Yes	No	No	**39**	2821,7	12,0	**WWS**	4	4,0	Yes	No	No
5	2486	12,0	**WWS**	4	4,0	Yes	No	No	**40**	2833,7	12,0	**WWS**	4	4,0	Yes	No	No
6	2498	0,3	**Packer**	-	-	Yes	No	No	**41**	2845,7	0,3	**Packer**	-	-	Yes	No	No
7	2498,3	11,7	**WWS**	4	4,0	Yes	No	No	**42**	2846	11,7	**WWS**	4	4,0	Yes	No	No
8	2510	12,0	**WWS**	4	4,0	Yes	No	No	**43**	2857,7	12,0	**WWS**	4	4,0	Yes	No	No
9	2522	12,0	**WWS**	4	4,0	Yes	No	No	**44**	2869,7	12,0	**WWS**	4	4,0	Yes	No	No
10	2534	12,0	**WWS**	4	4,0	Yes	No	No	**45**	2881,7	12,0	**WWS**	4	4,0	Yes	No	No
11	2546	0,3	**Packer**	-	-	Yes	No	No	**46**	2893,7	0,3	**Packer**	-	-	Yes	No	No
12	2546,3	11,7	**WWS**	4	4,0	Yes	No	No	**47**	2894	11,7	**WWS**	4	4,0	Yes	No	No
13	2558	12,0	**WWS**	4	4,0	Yes	No	No	**48**	2905,7	12,0	**WWS**	4	4,0	Yes	No	No
14	2570	12,0	**WWS**	4	4,0	Yes	No	No	**49**	2917,7	12,0	**WWS**	4	4,0	Yes	No	No
15	2582	12,0	**WWS**	4	4,0	Yes	No	No	**50**	2929,7	12,0	**WWS**	4	4,0	Yes	No	No
16	2594	12,0	**Packer**	-	-	Yes	No	No	**51**	2941,7	0,3	**Packer**	-	-	Yes	No	No
17	2606	11,7	**WWS**	4	4,0	Yes	No	No	**52**	2942	11,7	**WWS**	4	4,0	Yes	No	No
18	2617,7	12,0	**WWS**	4	4,0	Yes	No	No	**53**	2953,7	12,0	**WWS**	4	4,0	Yes	No	No
19	2629,7	12,0	**WWS**	4	4,0	Yes	No	No	**54**	2965,7	12,0	**WWS**	4	4,0	Yes	No	No
20	2641,7	12,0	**WWS**	4	4,0	Yes	No	No	**55**	2977,7	12,0	**WWS**	4	4,0	Yes	No	No
21	2653,7	0,3	**Packer**	-	-	Yes	No	No	**56**	2989,7	0,3	**Packer**	-	-	Yes	No	No
22	2654	11,7	**WWS**	4	4,0	Yes	No	No	**57**	2990	11,7	**WWS**	4	4,0	Yes	No	No
23	2665,7	12,0	**WWS**	4	4,0	Yes	No	No	**58**	3001,7	12,0	**WWS**	4	4,0	Yes	No	No
24	2677,7	12,0	**WWS**	4	4,0	Yes	No	No	**59**	3013,7	12,0	**WWS**	4	4,0	Yes	No	No
25	2689,7	12,0	**WWS**	4	4,0	Yes	No	No	**60**	3025,7	12,0	**WWS**	4	4,0	Yes	No	No
26	2701,7	0,3	**Packer**	-	-	Yes	No	No	**61**	3037,7	0,3	**Packer**	-	-	Yes	No	No
27	2702	11,7	**WWS**	4	4,0	Yes	No	No	N/A	3038	11,7	**WWS**	4	4,0	Yes	No	No
28	2713,7	12,0	**WWS**	4	4,0	Yes	No	No	**63**	3049,7	12,0	**WWS**	4	4,0	Yes	No	No
29	2725,7	12,0	**WWS**	4	4,0	Yes	No	No	**64**	3061,7	12,0	**WWS**	4	4,0	Yes	No	No
30	2737,7	12,0	**WWS**	4	4,0	Yes	No	No	**65**	3073,7	12,0	**WWS**	4	4,0	Yes	No	No
31	2749,7	0,3	**Packer**	-	-	Yes	No	No	**66**	3085,7	0,3	**Packer**	-	-	Yes	No	No
32	2750	11,7	**WWS**	4	4,0	Yes	No	No	**67**	3086	11,7	**WWS**	4	4,0	Yes	No	No
33	2761,7	12,0	**WWS**	4	4,0	Yes	No	No	**68**	3097,7	12,0	**WWS**	4	4,0	Yes	No	No
34	2773,7	12,0	**WWS**	4	4,0	Yes	No	No	**69**	3109,7	12,0	**WWS**	4	4,0	Yes	No	No
35	2785,7	12,0	**WWS**	4	4,0	Yes	No	No	**70**	3121,7	12,0	**WWS**	4	4,0	Yes	No	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3133,7	0,3	Packer	4	4,0	Yes	Yes	No	128	3673,7	12,0	WWS	4	4,0	Yes	No	No
72	3134	11,7	WWS	4	4,0	Yes	No	No	129	3685,7	12,0		-	-	Yes	No	No
73	3145,7	12,0	WWS	4	4,0	Yes	No	No	130	3697,7	12,0	WWS	4	4,0	Yes	No	No
74	3157,7	12,0	WWS	4	4,0	Yes	No	No	131	3709,7	0,3	Packer	4	4,0	Yes	No	N/A
75	3169,7	12,0	WWS	4	4,0	Yes	No	No	132	3710,0	11,7	WWS	-	-	Yes	No	No
76	3181,7	0,3	Packer	-	-	Yes	No	No	133	3721,7	12,0	WWS	4	4,0	Yes	No	No
77	3182	11,7	WWS	4	4,0	Yes	No	No	134	3733,7	12,0	WWS	-	-	Yes	No	No
78	3193,7	12,0	WWS	4	4,0	Yes	No	No	135	3745,7	12,0	WWS	4	4,0	Yes	No	No
79	3205,7	12,0	WWS	4	4,0	Yes	No	No	136	3757,7	0,3	Packer	-	-	Yes	No	No
80	3217,7	12,0	WWS	4	4,0	Yes	No	No	137	3758,0	11,7	WWS	-	-	Yes	No	No
81	3229,7	0,3	Packer	-	-	Yes	No	No	138	3769,7	12,0	WWS	-	-	Yes	No	No
82	3230	11,7	WWS	-	-	Yes	No	No	139	3781,7	12,0	WWS	-	-	Yes	No	No
83	3241,7	12,0	WWS	-	-	Yes	No	No	140	3793,7	12,0	WWS	-	-	Yes	No	No
84	3253,7	12,0	WWS	-	-	Yes	No	No	141	3805,7	0,3	Packer	-	-	Yes	No	No
85	3265,7	12,0	WWS	-	-	Yes	No	No	142	3806,0	11,7	WWS	4	4,0	Yes	No	No
86	3277,7	0,3	Packer	-	-	Yes	No	No	143	3817,7	12,0	WWS	-	-	Yes	No	No
87	3278	11,7	WWS	-	-	Yes	No	No	144	3829,7	12,0	WWS	4	4,0	Yes	No	No
88	3289,7	12,0	WWS	-	-	Yes	No	No	145	3841,7	12,0	WWS	-	-	Yes	No	No
89	3301,7	12,0	WWS	-	-	Yes	No	No	146	3853,7	0,3	Packer	-	-	Yes	No	No
90	3313,7	12,0	WWS	-	-	Yes	No	No	147	3854,0	11,7	WWS	-	-	Yes	No	No
91	3325,7	0,3	Packer	-	-	No	No	N/A	148	3865,7	12,0	WWS	-	-	Yes	No	No
92	3326	11,7	WWS	-	-	Yes	No	No	149	3877,7	12,0	WWS	-	-	Yes	No	No
93	3337,7	12,0	WWS	-	-	Yes	No	No	150	3889,7	12,0	WWS	-	-	Yes	No	No
94	3349,7	12,0	WWS	-	-	Yes	No	No	151	3901,7	0,3	Packer	-	-	Yes	No	No
95	3361,7	12,0	WWS	-	-	Yes	No	No	152	3902,0	11,7	WWS	-	-	Yes	No	No
96	3373,7	0,3	Packer	-	-	Yes	No	N/A	153	3913,7	12,0	WWS	-	-	Yes	No	No
97	3374	11,7	WWS	-	-	Yes	No	No	154	3925,7	12,0	WWS	-	-	Yes	No	No
98	3385,7	12,0	WWS	-	-	Yes	No	No	155	3937,7	12,0	WWS	-	-	Yes	No	No
99	3397,7	12,0	WWS	-	-	Yes	No	No	156	3949,7	0,3	Packer	-	-	Yes	No	No
100	3409,7	12,0	WWS	-	-	Yes	No	No	157	3950,0	11,7	WWS	-	-	Yes	No	No
101	3421,7	0,3	Packer	-	-	No	No	N/A	158	3961,7	12,0	WWS	-	-	Yes	No	No
102	3422,0	11,7	WWS	4	4,0	Yes	No	No	159	3973,7	12,0	WWS	-	-	Yes	No	No
103	3433,7	12,0	WWS	4	4,0	Yes	No	No	160	3985,7	12,0	WWS	-	-	Yes	No	No
104	3445,7	12,0	WWS	4	4,0	Yes	No	No	161	3997,7	0,3	Packer	-	-	No	No	N/A
105	3457,7	12,0	WWS	4	4,0	Yes	No	No	162	3998,0	11,7	WWS	-	-	Yes	No	No
106	3469,7	0,3	Packer	-	-	Yes	No	N/A	163	4009,7	12,0	WWS	-	-	Yes	No	No
107	3470,0	11,7	WWS	-	-	Yes	No	No	164	4021,7	12,0	WWS	-	-	Yes	No	No
108	3481,7	12,0	WWS	-	-	Yes	No	No	165	4033,7	12,0	WWS	-	-	Yes	No	No
109	3493,7	12,0	WWS	-	-	Yes	No	No	166	4045,7	0,3	Packer	-	-	Yes	No	No
110	3505,7	12,0	WWS	-	-	Yes	No	No	167	4046,0	11,7	WWS	-	-	Yes	No	No
111	3517,7	0,3	Packer	-	-	Yes	No	No	168	4057,7	12,0	WWS	-	-	Yes	No	No
112	3518,0	11,7	WWS	4	4,0	Yes	No	No	169	4069,7	12,0	WWS	-	-	Yes	No	No
113	3529,7	12,0	WWS	4	4,0	Yes	No	No	170	4081,7	12,0	WWS	-	-	Yes	No	No
114	3541,7	12,0	WWS	4	4,0	Yes	No	No	171	4093,7	0,3	Packer	-	-	Yes	No	No
115	3553,7	12,0	WWS	4	4,0	Yes	No	No	172	4094,0	11,7	WWS	-	-	Yes	No	No
116	3565,7	0,3	Packer	-	-	No	No	N/A	173	4105,7	12,0	WWS	-	-	Yes	No	No
117	3566,0	11,7	WWS	4	4,0	Yes	No	No	174	4117,7	12,0	WWS	-	-	Yes	No	No
118	3577,7	12,0	WWS	4	4,0	Yes	No	No	175	4129,7	12,0	WWS	-	-	Yes	No	No
119	3589,7	12,0	WWS	4	4,0	Yes	No	No	176	4141,7	0,3	Packer	-	-	Yes	No	No
120	3601,7	12,0	WWS	4	4,0	Yes	No	No	177	4142,0	11,7	WWS	4	4,0	Yes	No	N/A
121	3613,7	0,3	Packer	-	-	Yes	No	No	178	4153,7	12,0	WWS	4	4,0	Yes	No	N/A

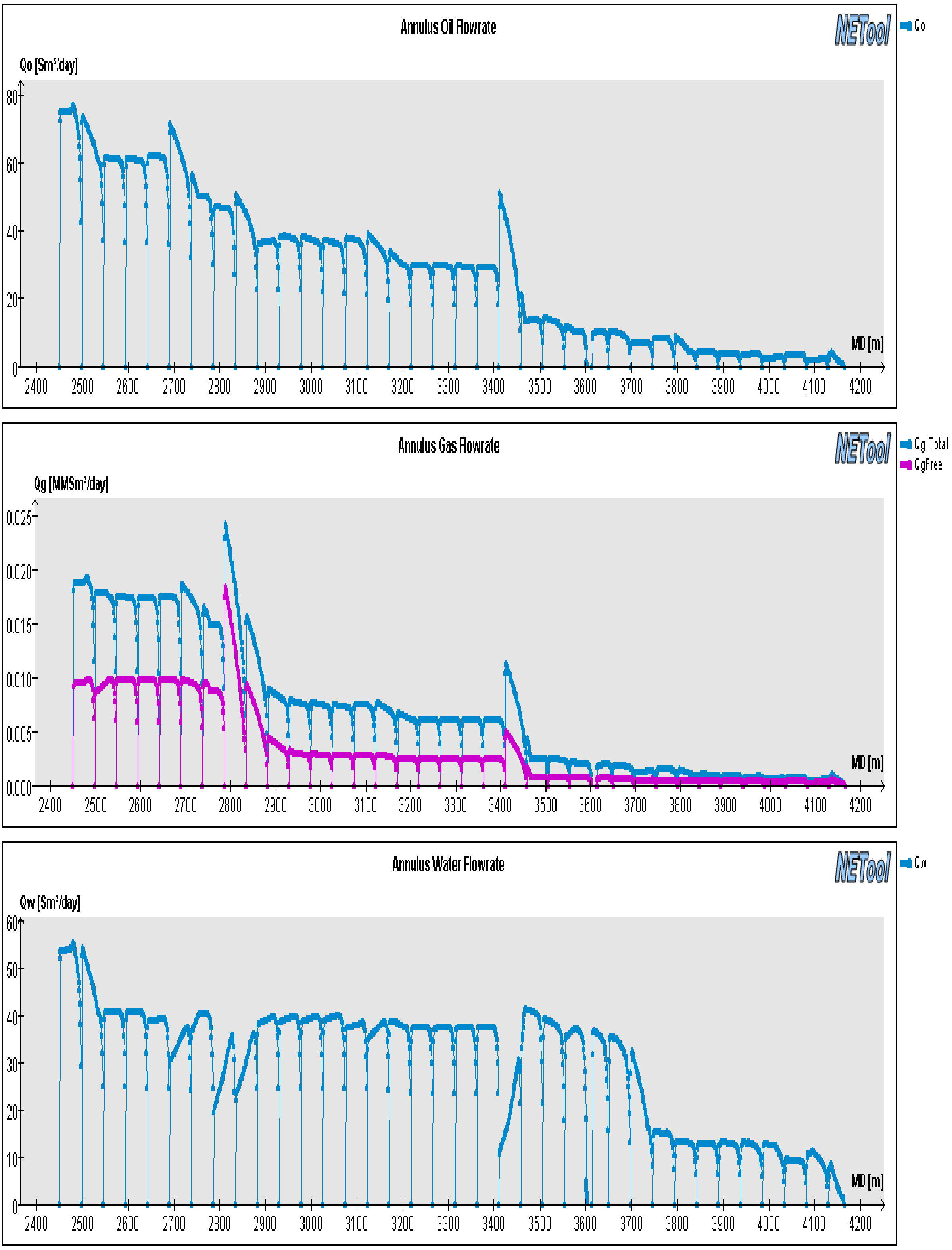
122	3614,0	11,7	**WWS**	-	-	Yes	No	No	**TOE**	4165,7	12,0	**WWS**	4	4,0	Yes	No	N/A
123	3625,7	12,0	**WWS**	-	-	Yes	No	No									
124	3637,7	12,0	**WWS**	-	-	Yes	No	No									
125	3649,7	12,0	**WWS**	-	-	Yes	No	No									
126	3661,7	0,3	**Packer**	-	-	Yes	No	No									
127	3662,0	11,7	**WWS**	-	-	Yes	No	No									



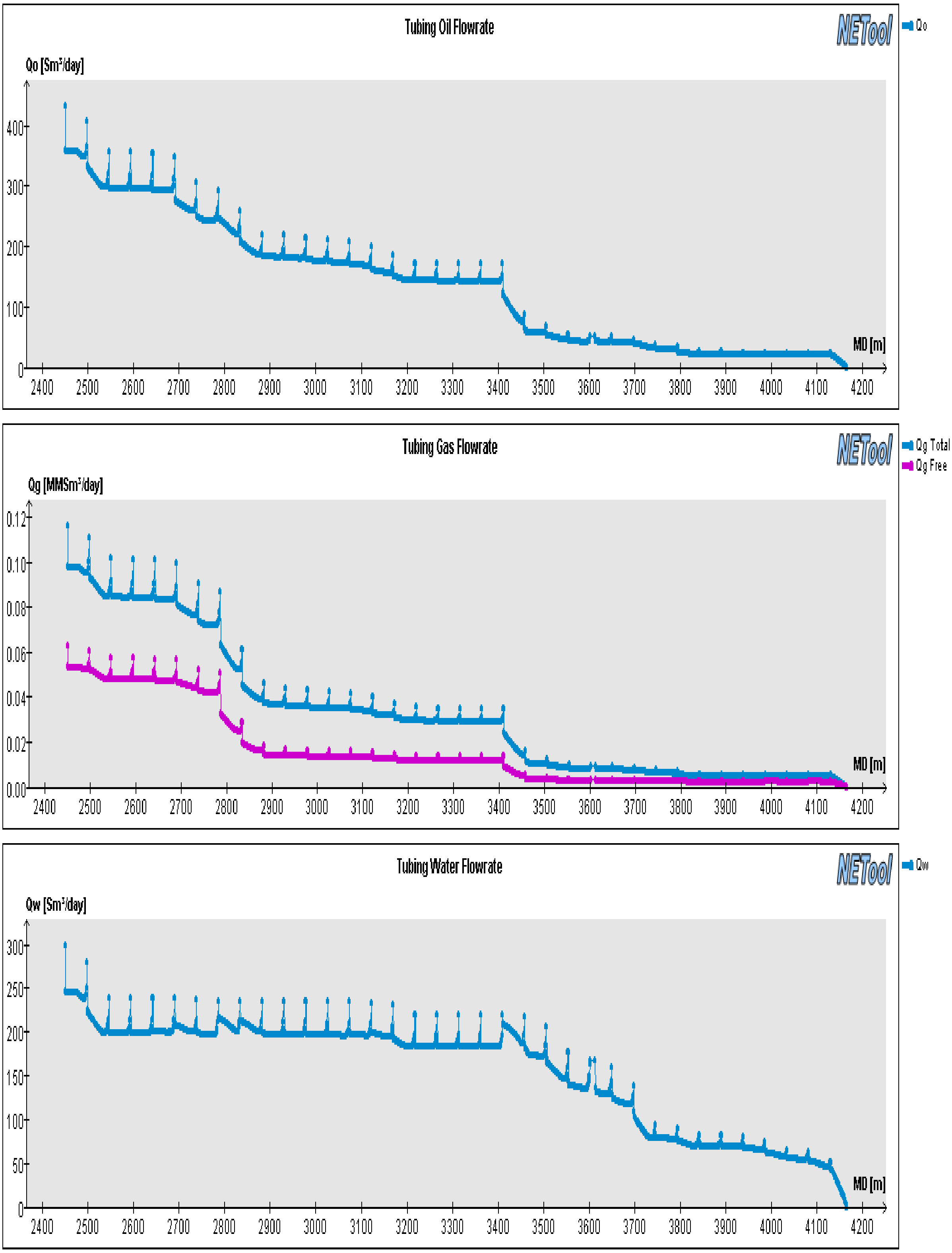
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



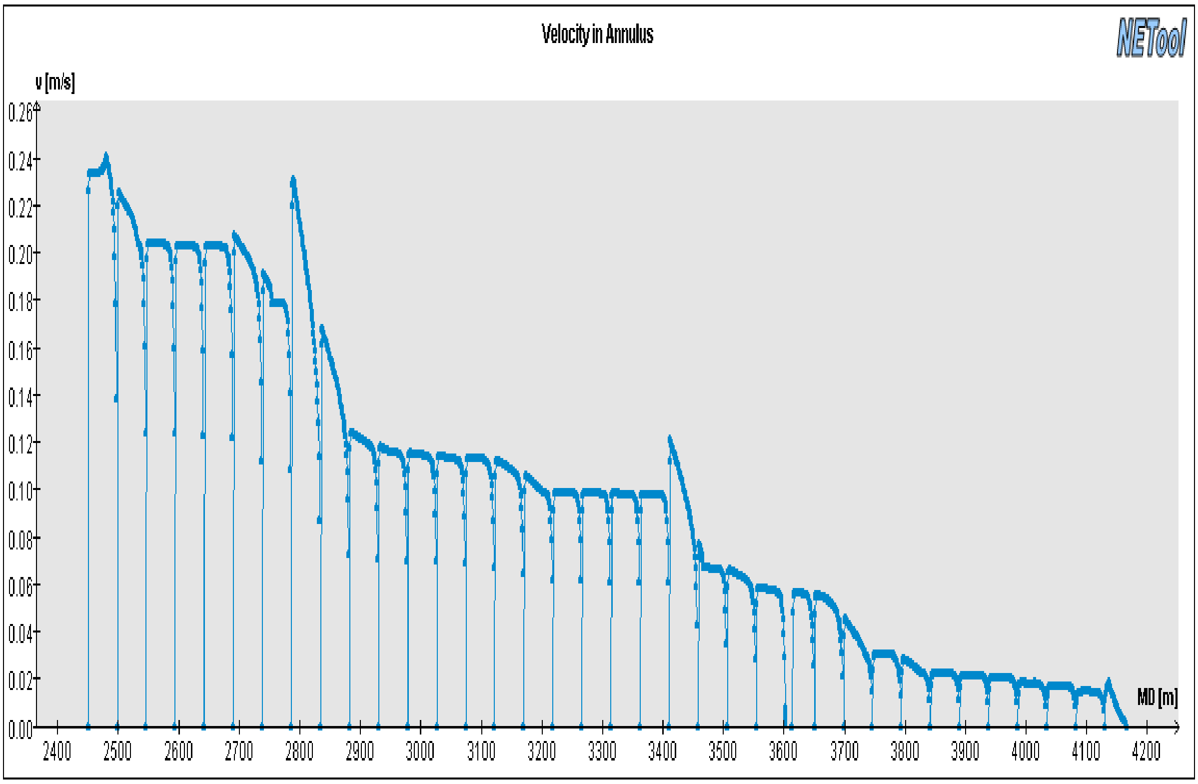
Influx of oil, gas and water from the reservoir and into the well along the wellbore

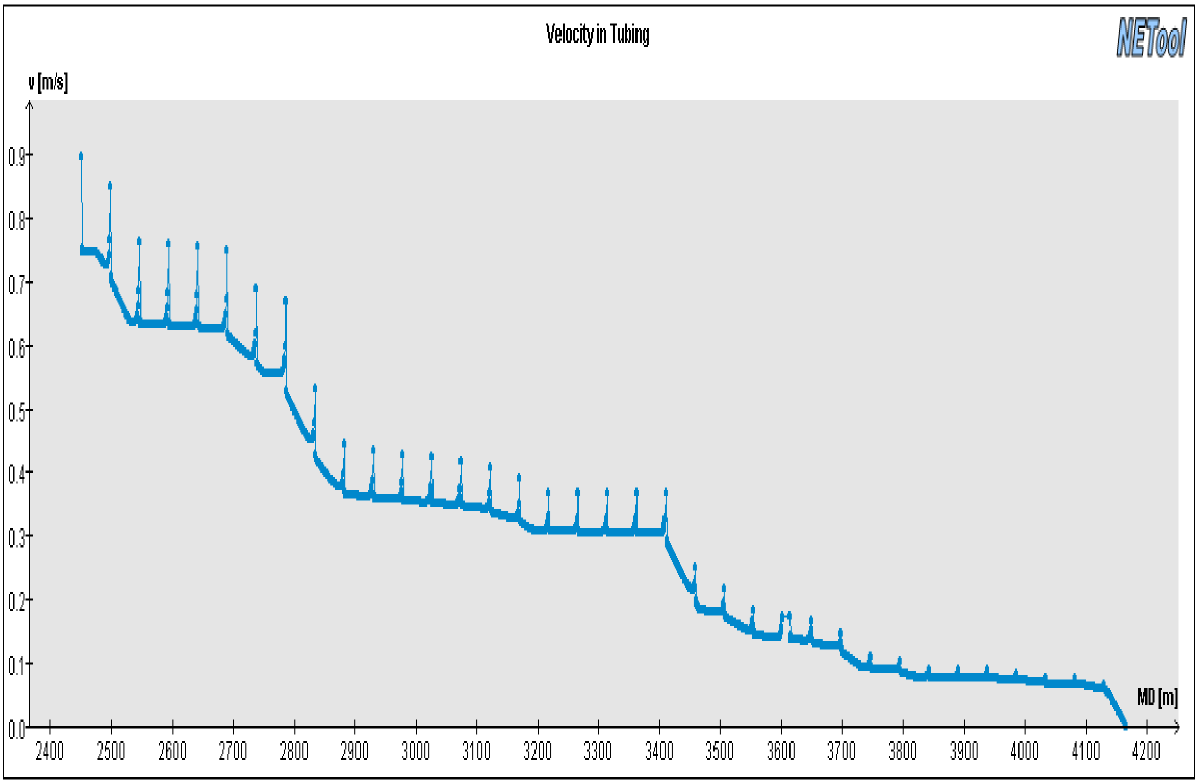


Annulus oil, gas and water flow rate along the wellbore

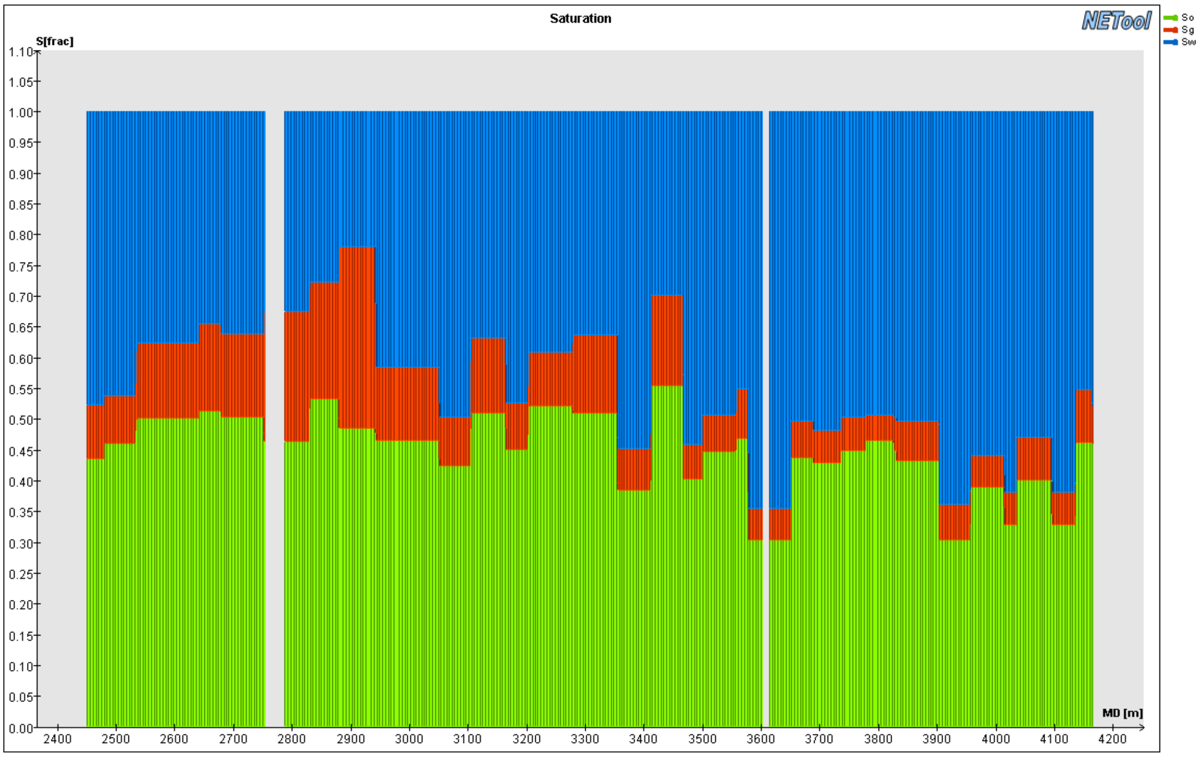


Tubing flow of oil, gas and water along the wellbore

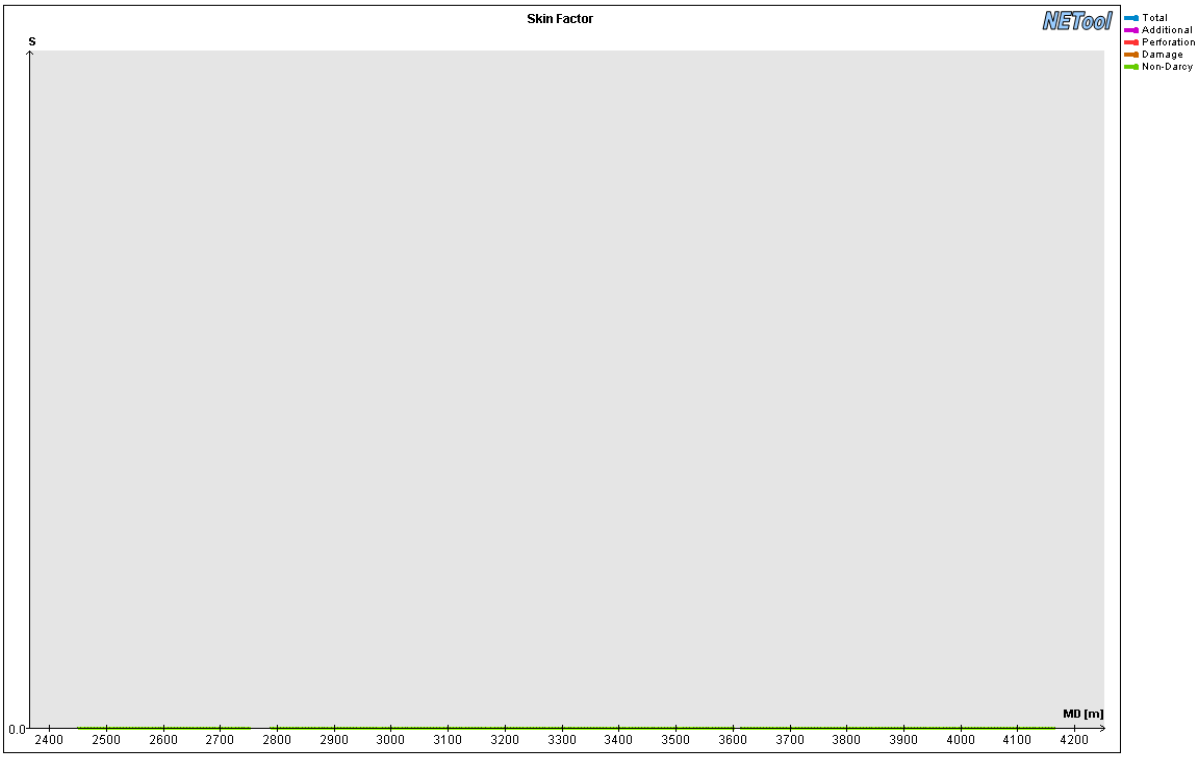




Velocity of the flow in the Annulus and tubing



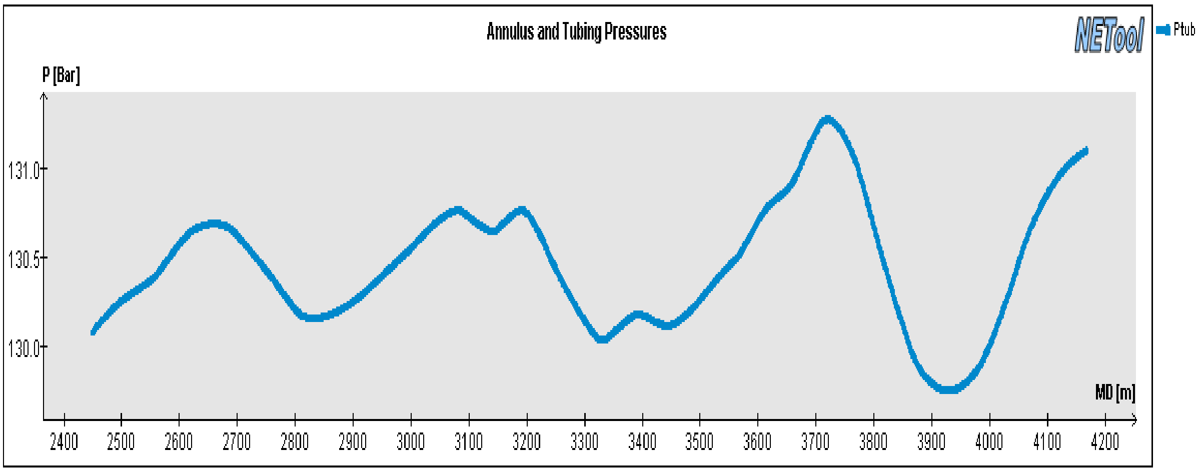
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

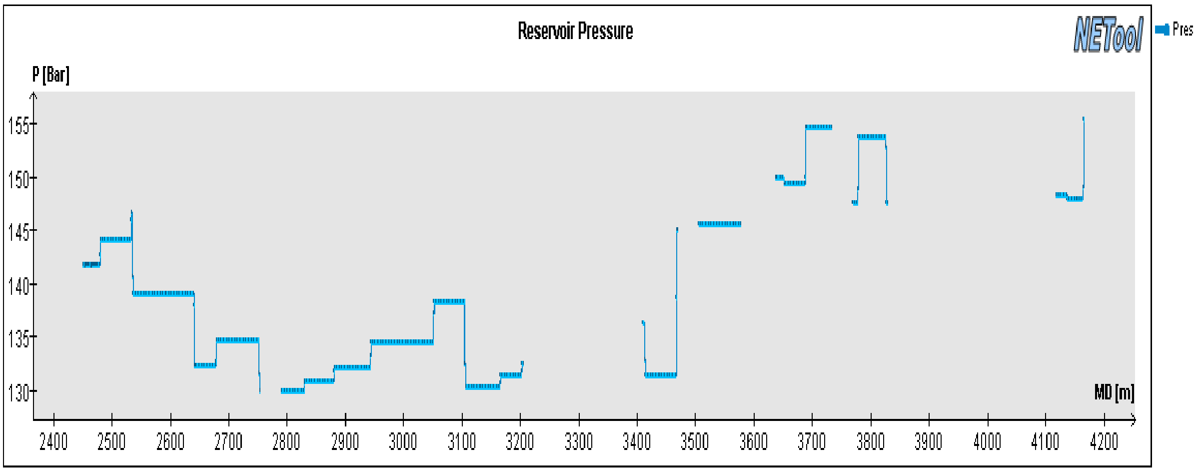


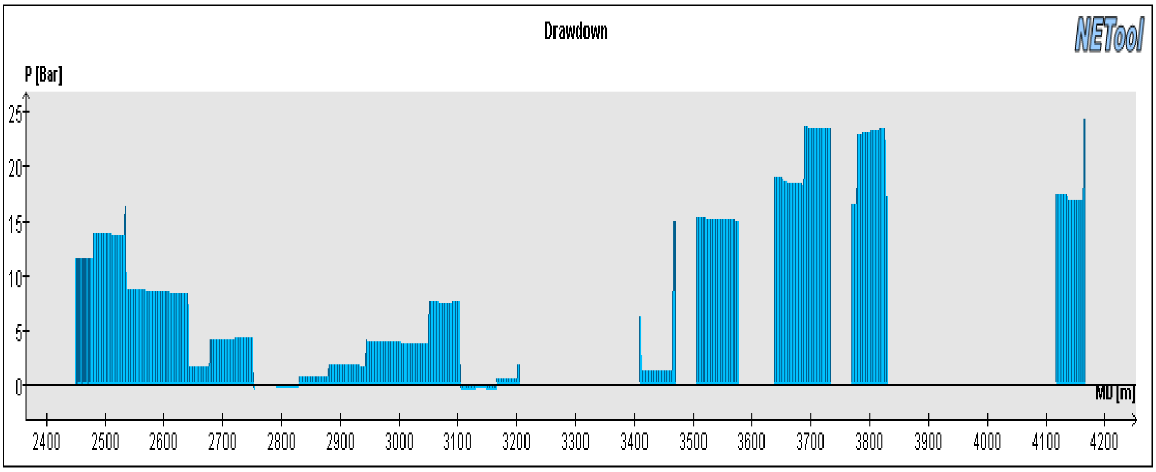
Skin factor plot for the well and given time step

A.44 Plots for well KP9, 2556 days, OH+25% in K_h

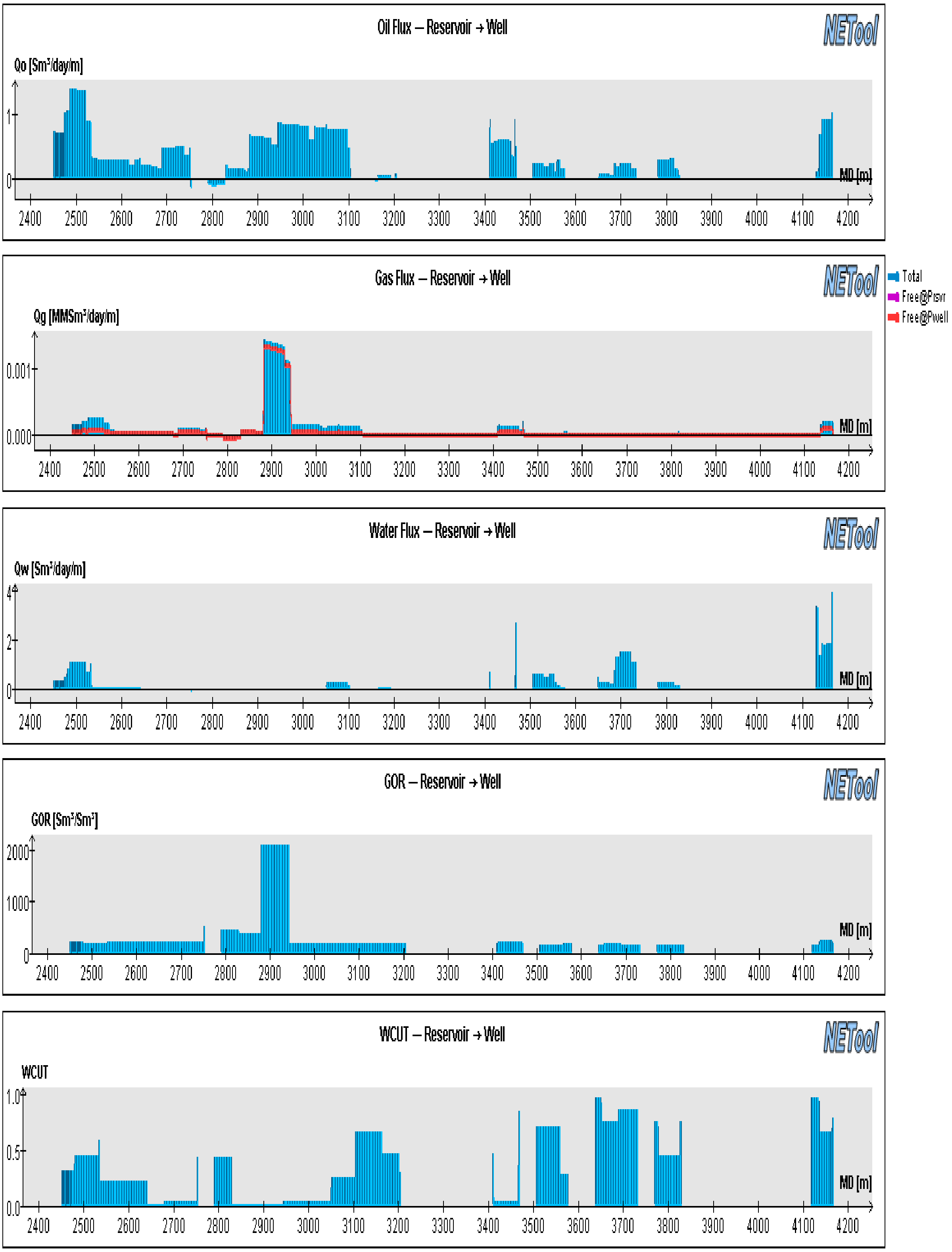
Reference case for 25% change in permeability. Completion set up can be found in Appendix A…. 2556d OH



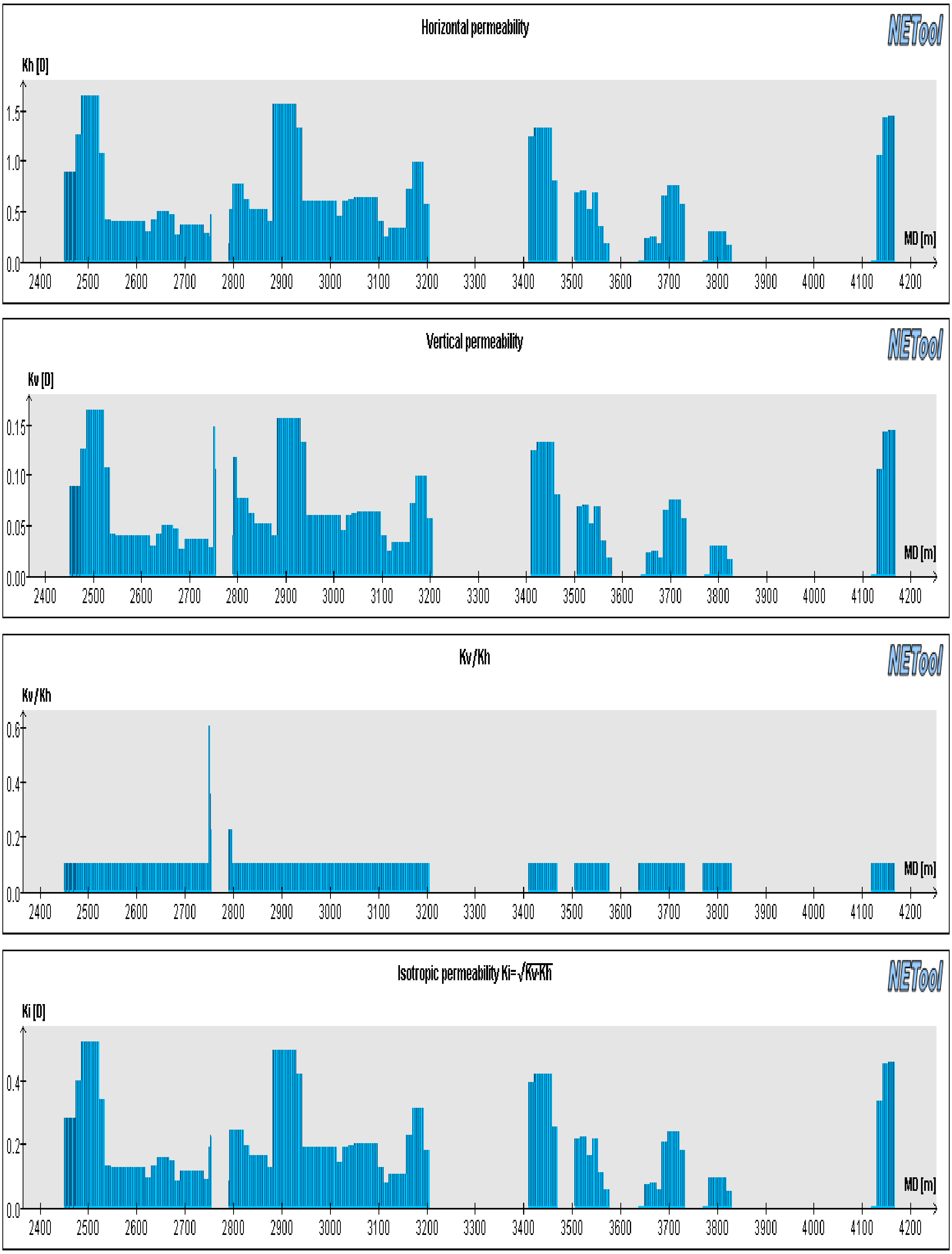




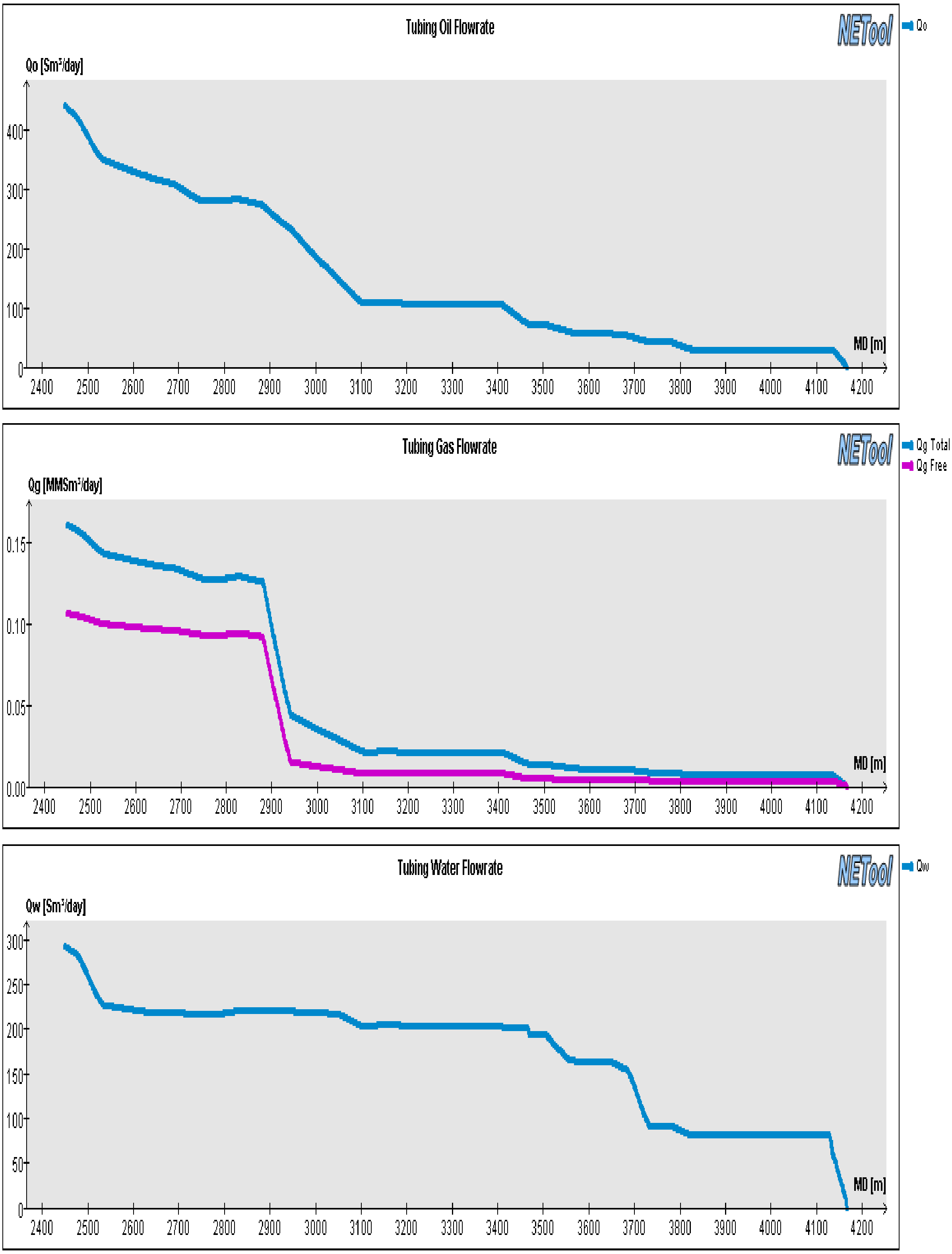
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



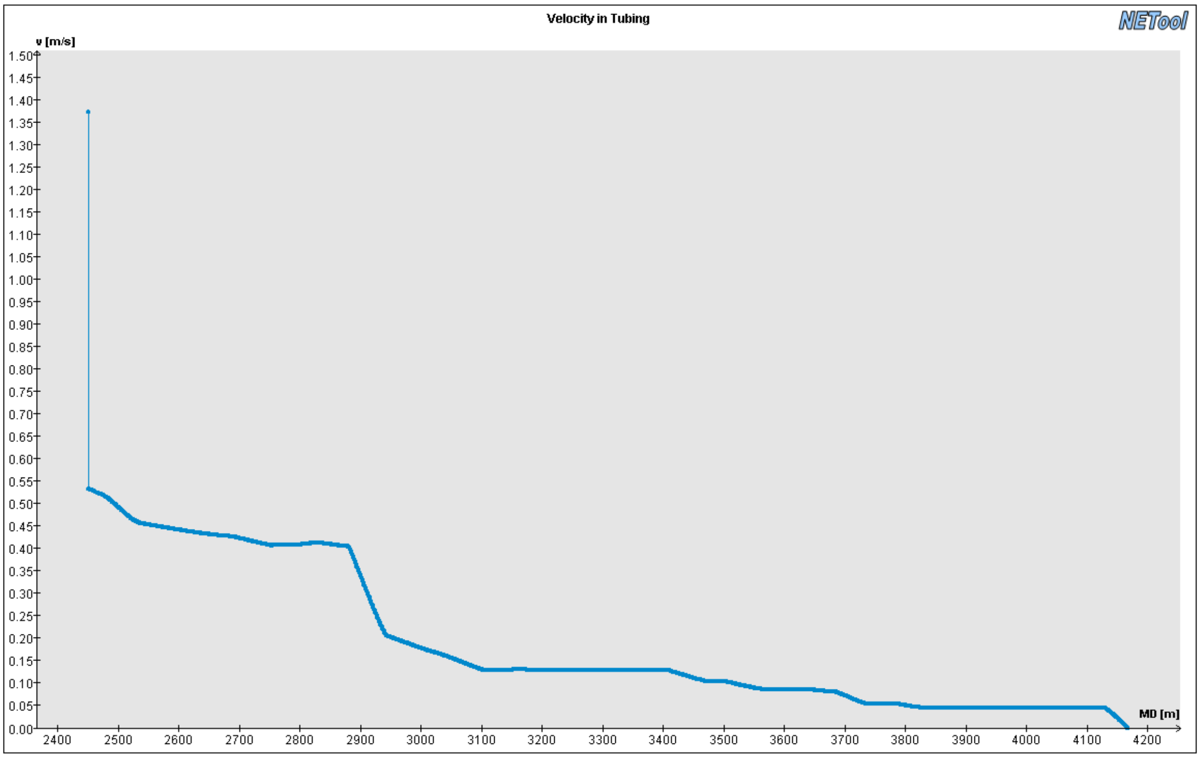
Influx of oil, gas and water from the reservoir and into the well along the wellbore



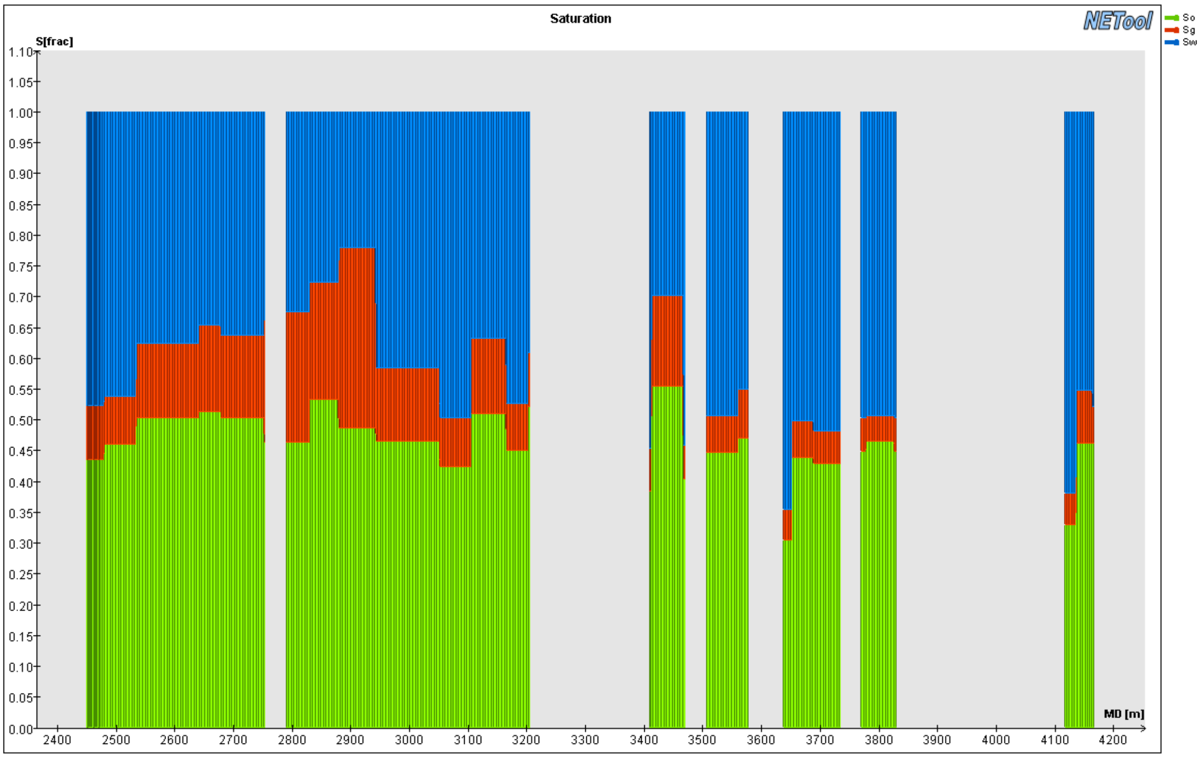
Permeability plot, horizontal, vertical and K_v/K_h



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing

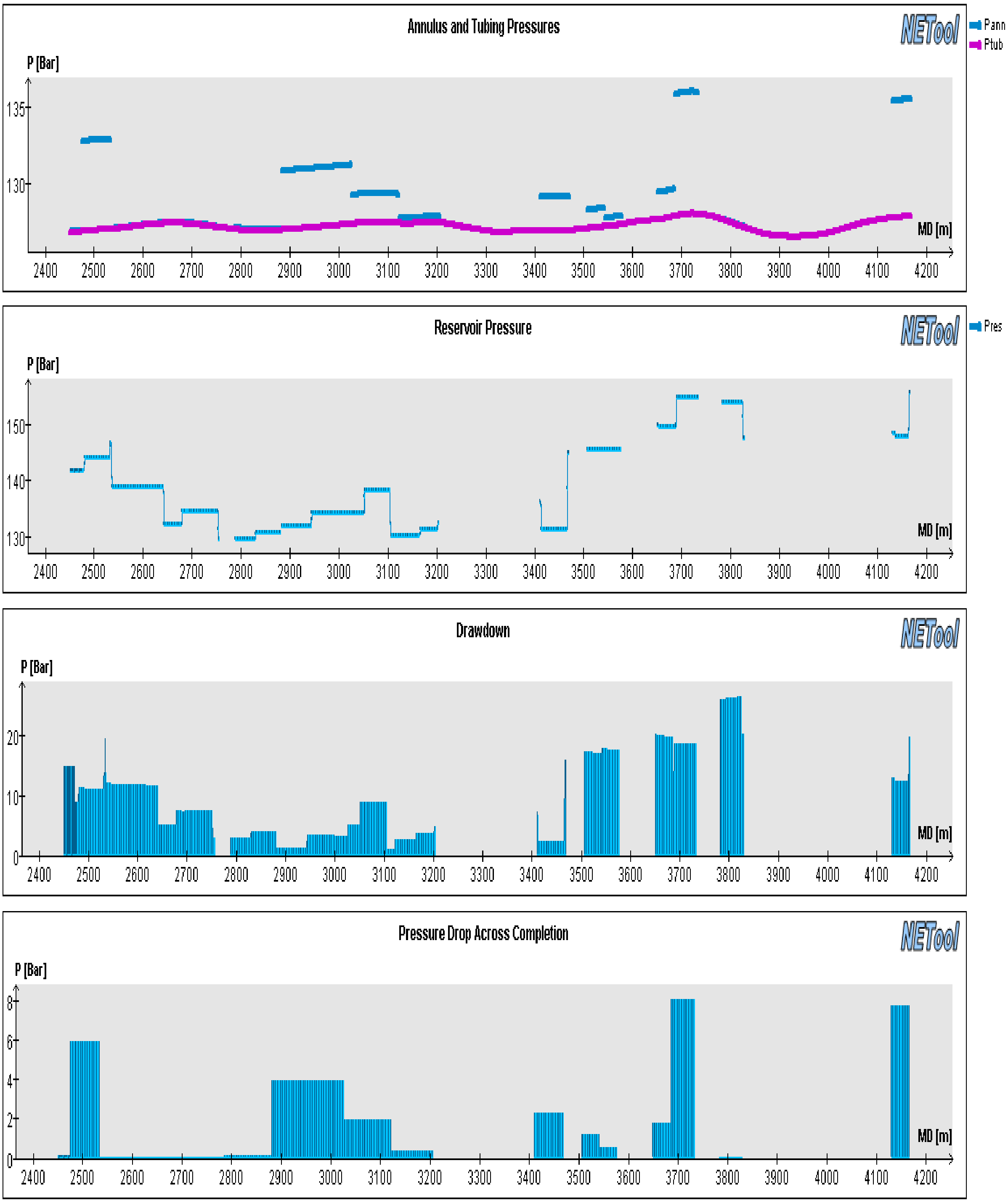


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

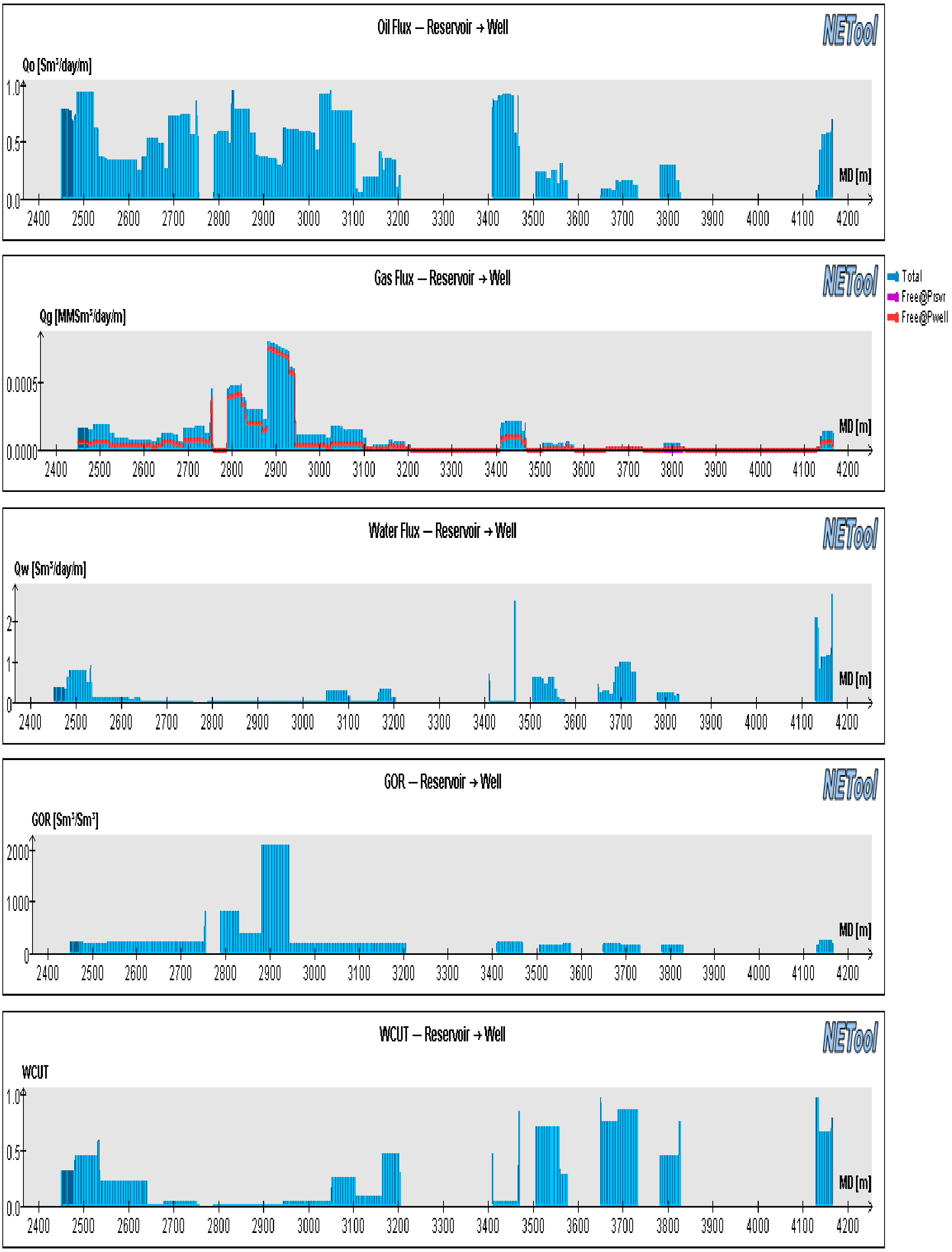
Skin factor plot for the well and given time step

A.45 Plots for well KP7, 1826 days, Tailored ICD design run with+25% in K_h

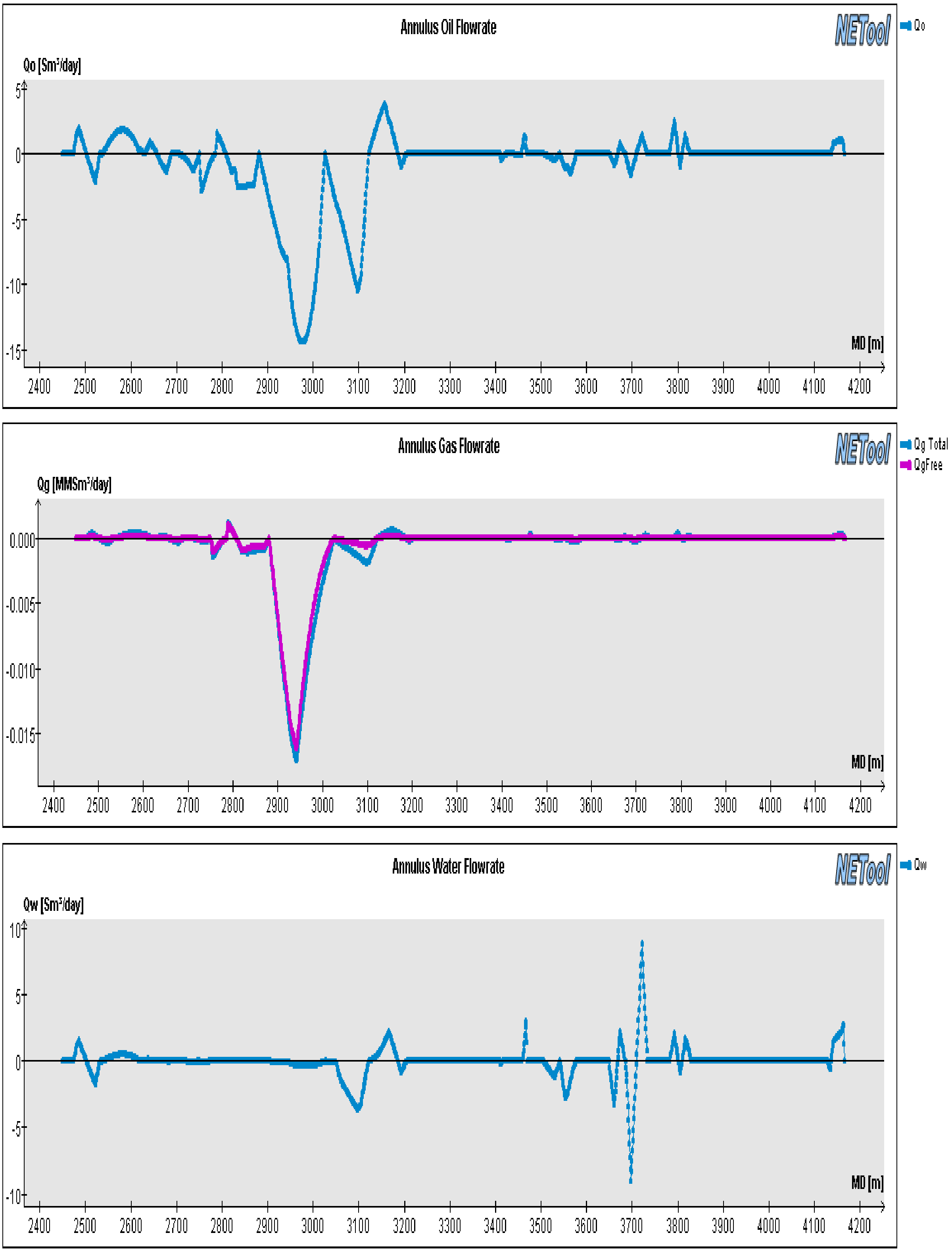
Tailored ICD set up run with 25% increae in K_h. Completion set up can be found in Appendix A…. Permeability profile the same as in A….



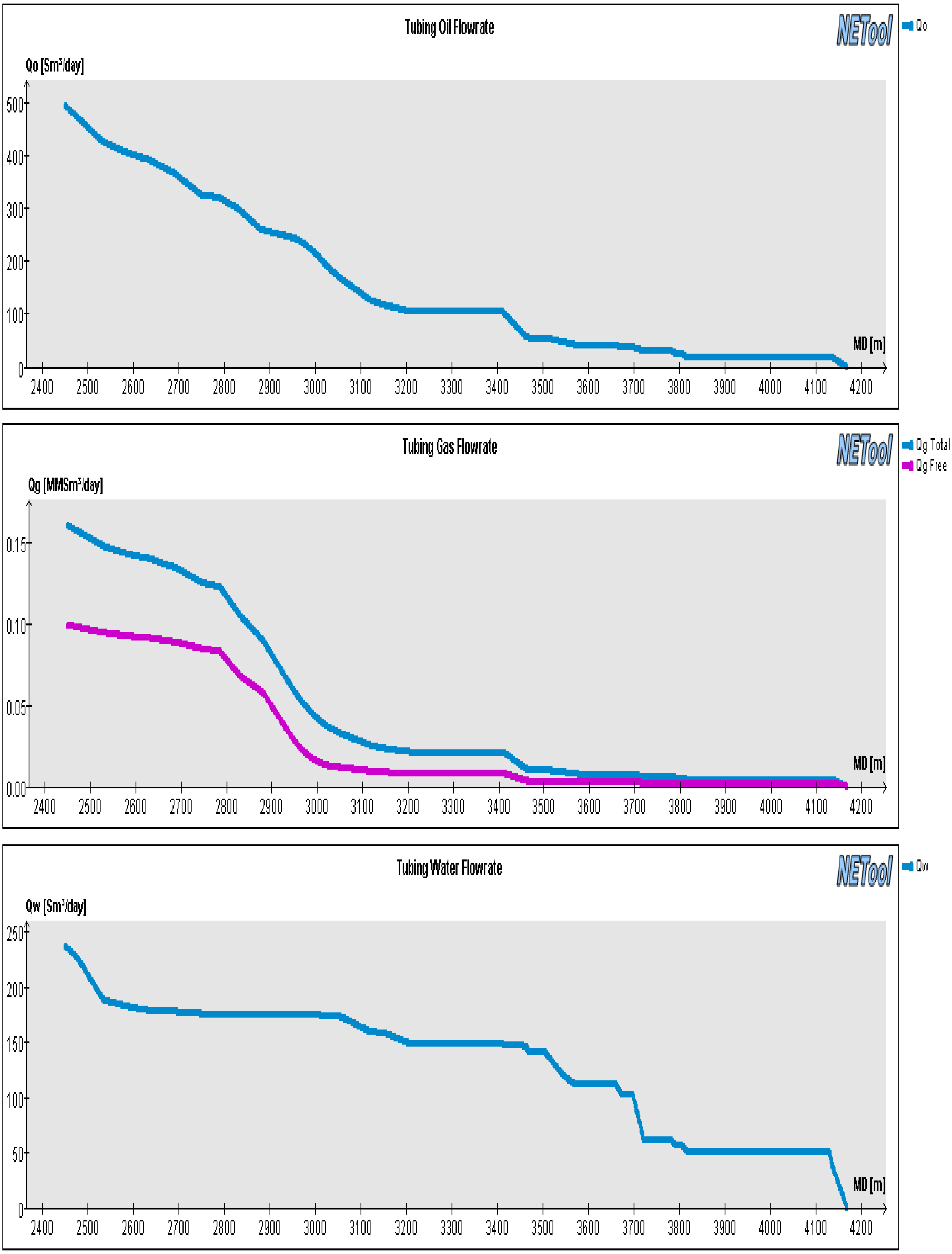
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



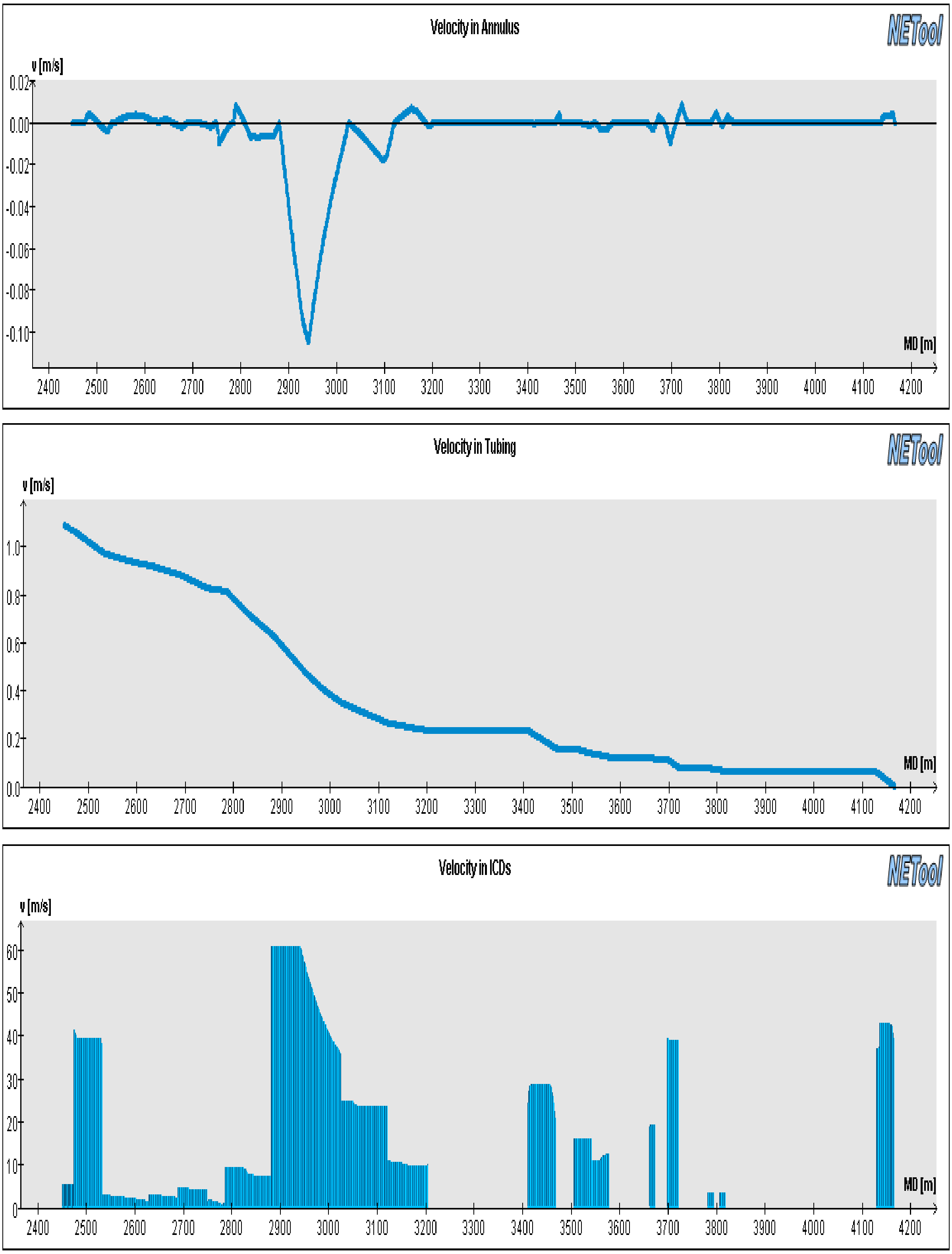
Influx of oil, gas and water from the reservoir and into the well along the wellbore



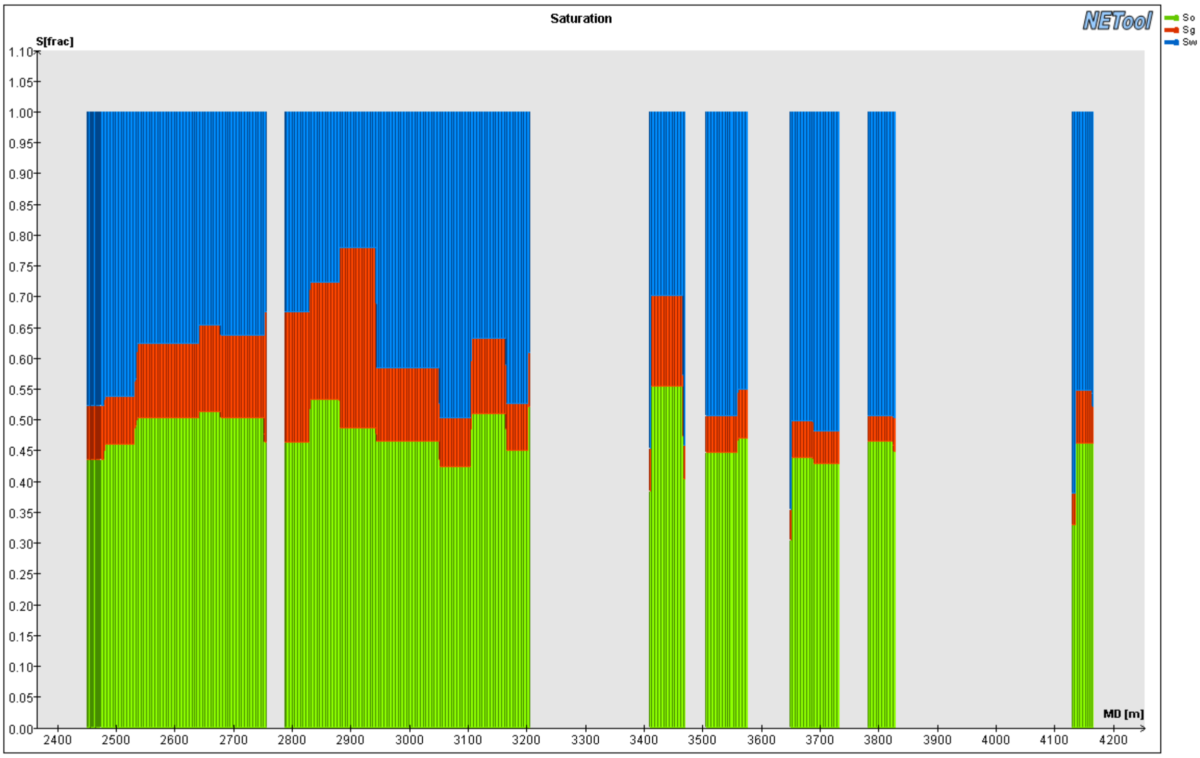
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs

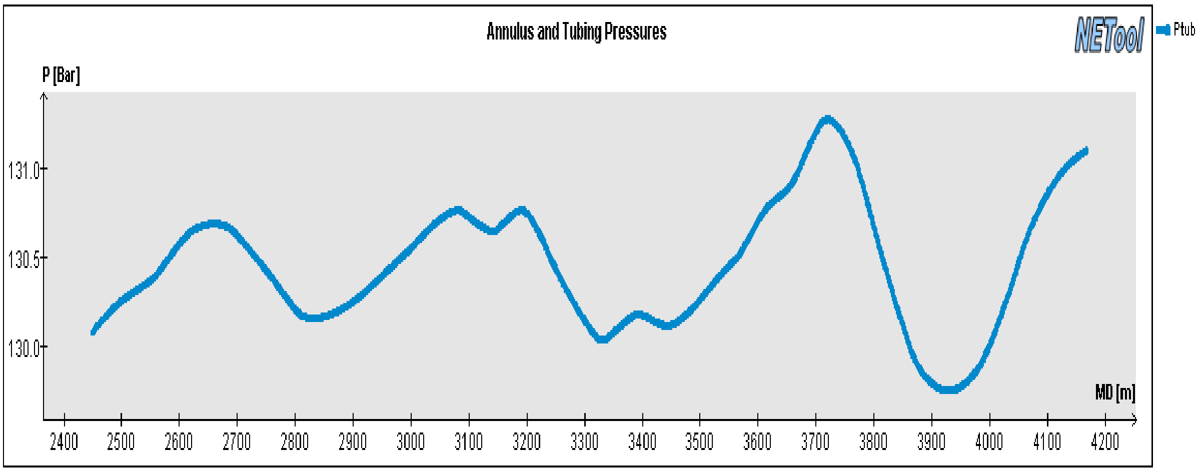


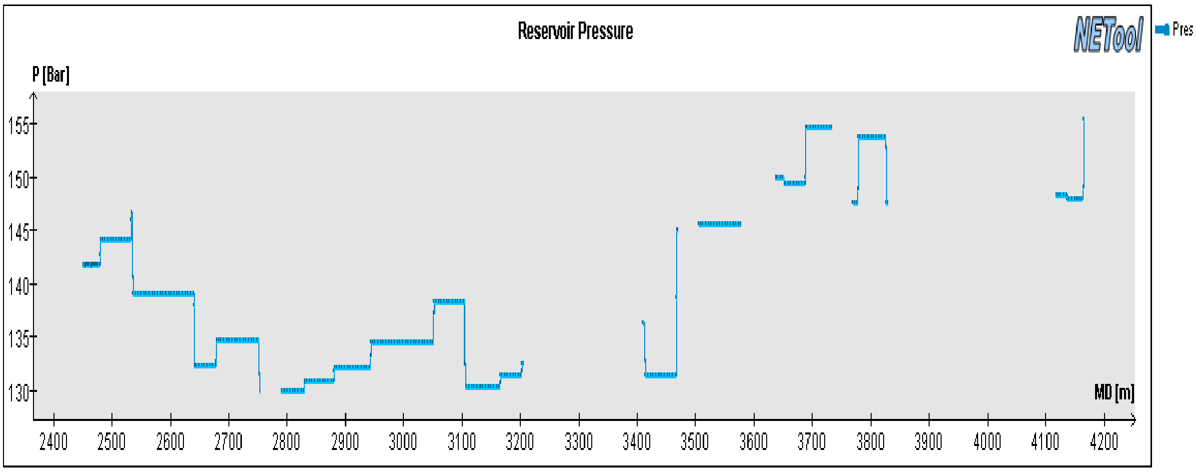
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

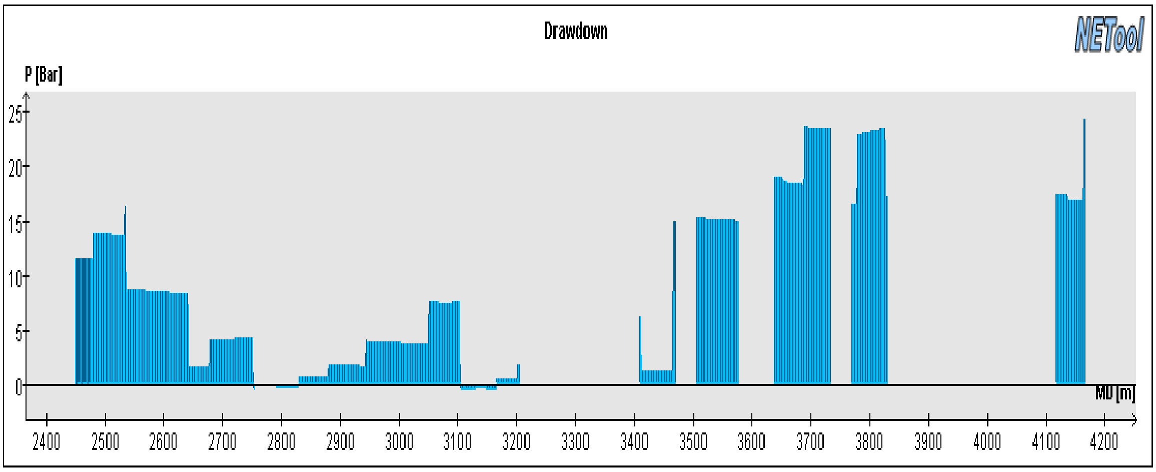
Skin factor plot for the well and given time step

A.46 Plots for well KP9, 2556 days, OH+50% in K_h

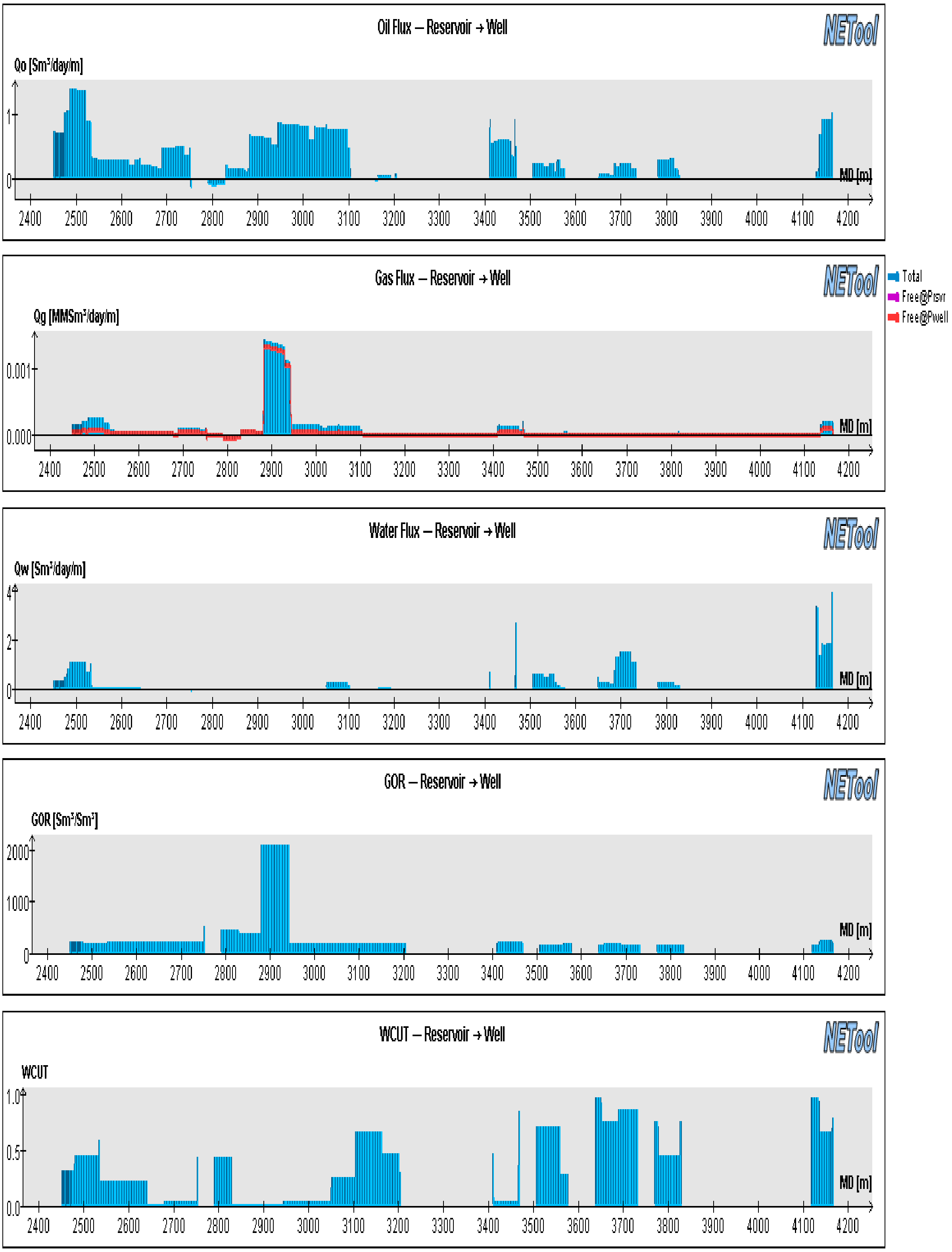
Reference case for 50% change in permeability. Completion set up can be found in Appendix A….



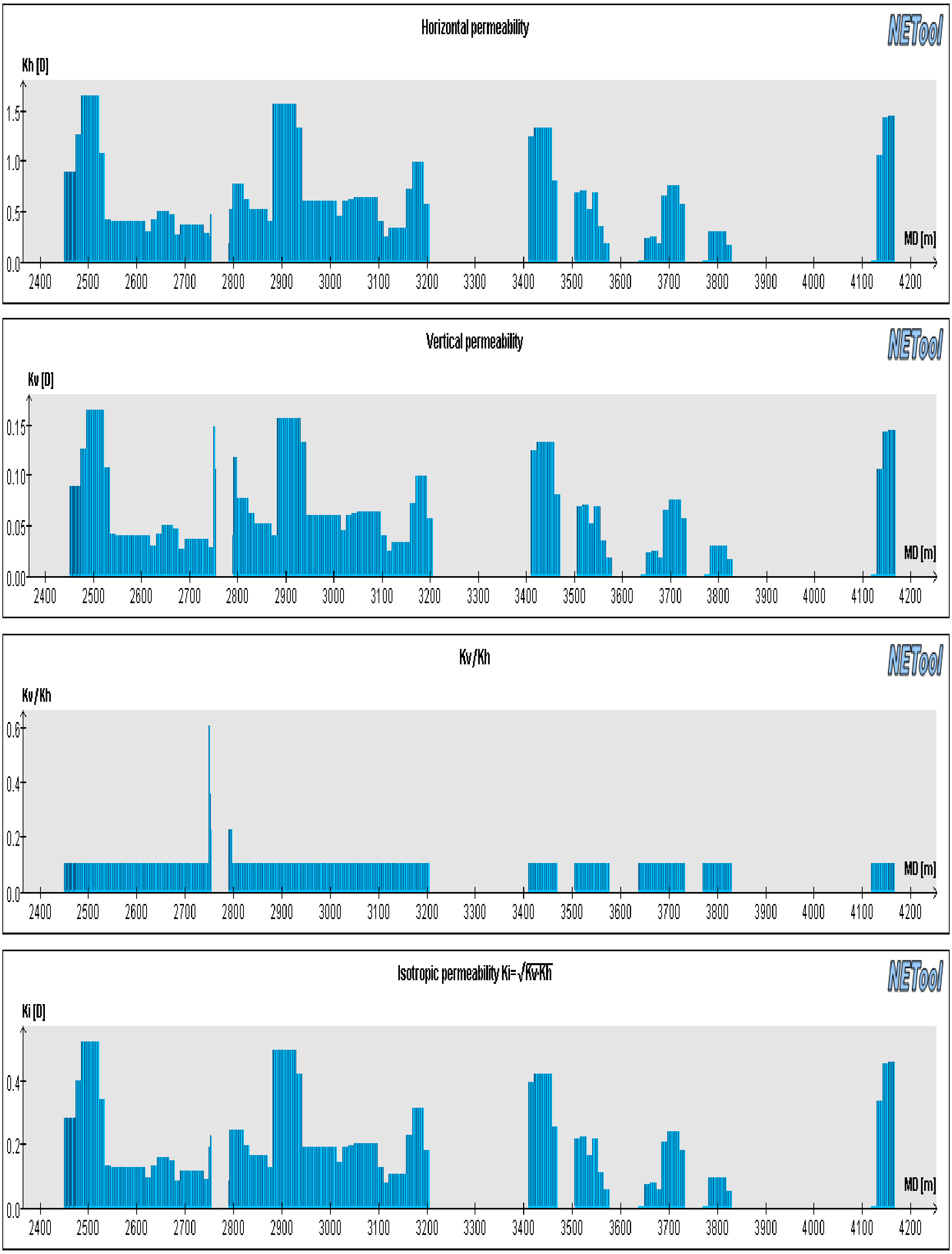




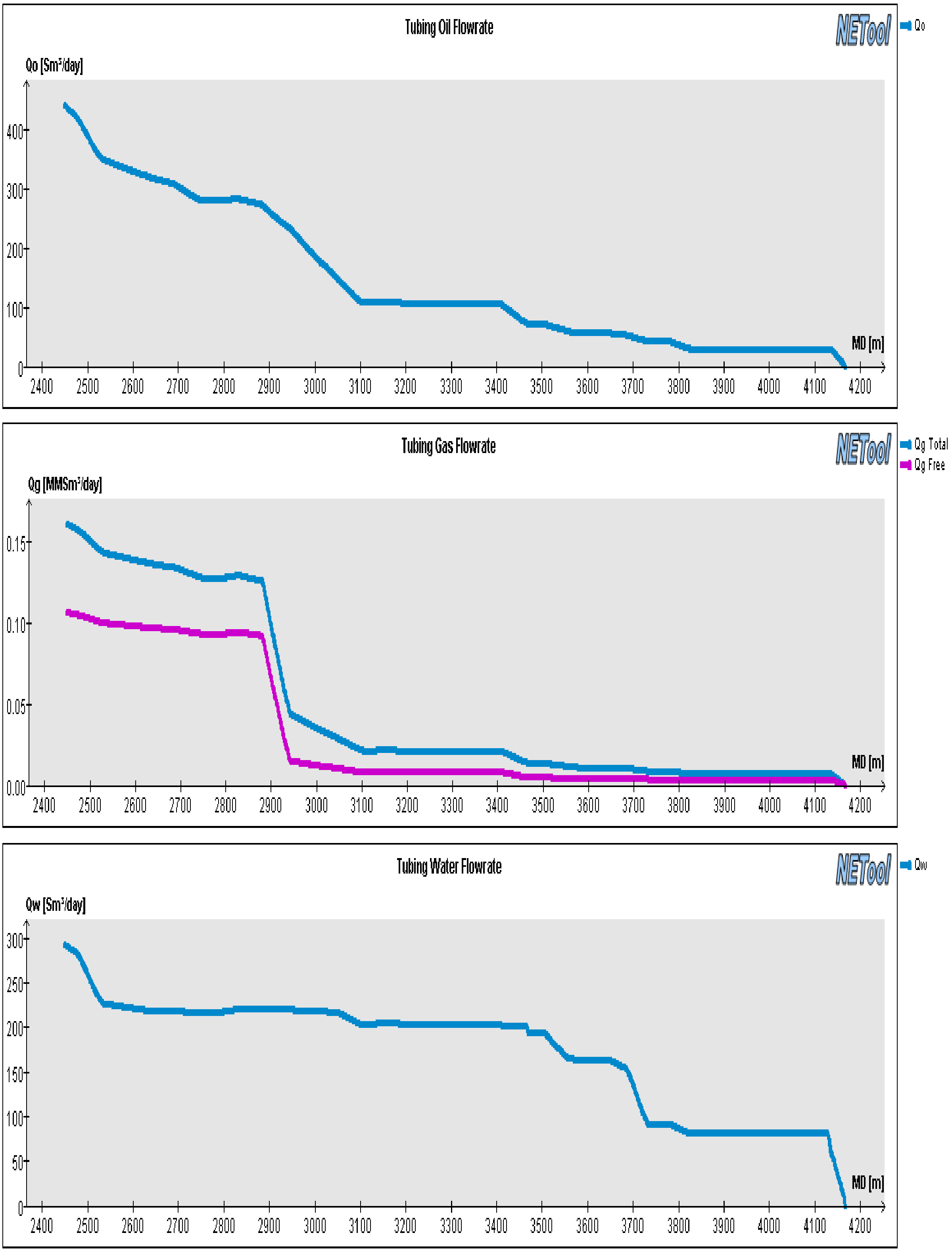
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



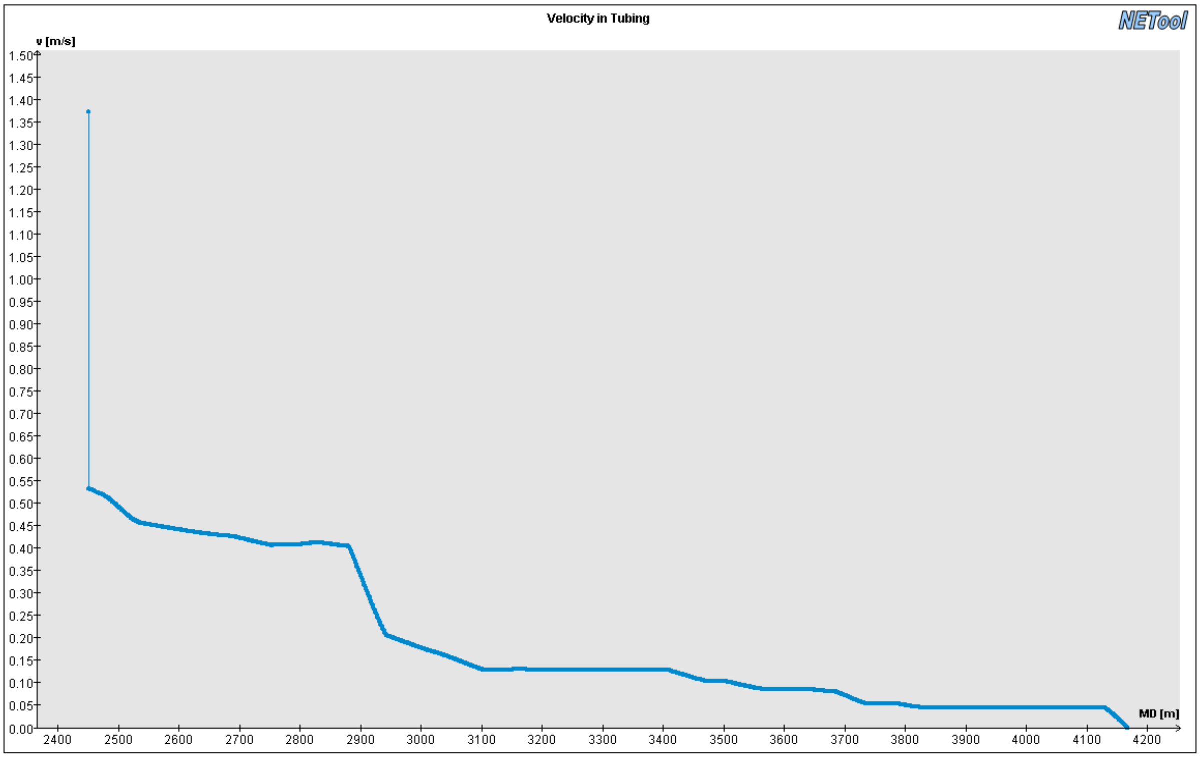
Influx of oil, gas and water from the reservoir and into the well along the wellbore



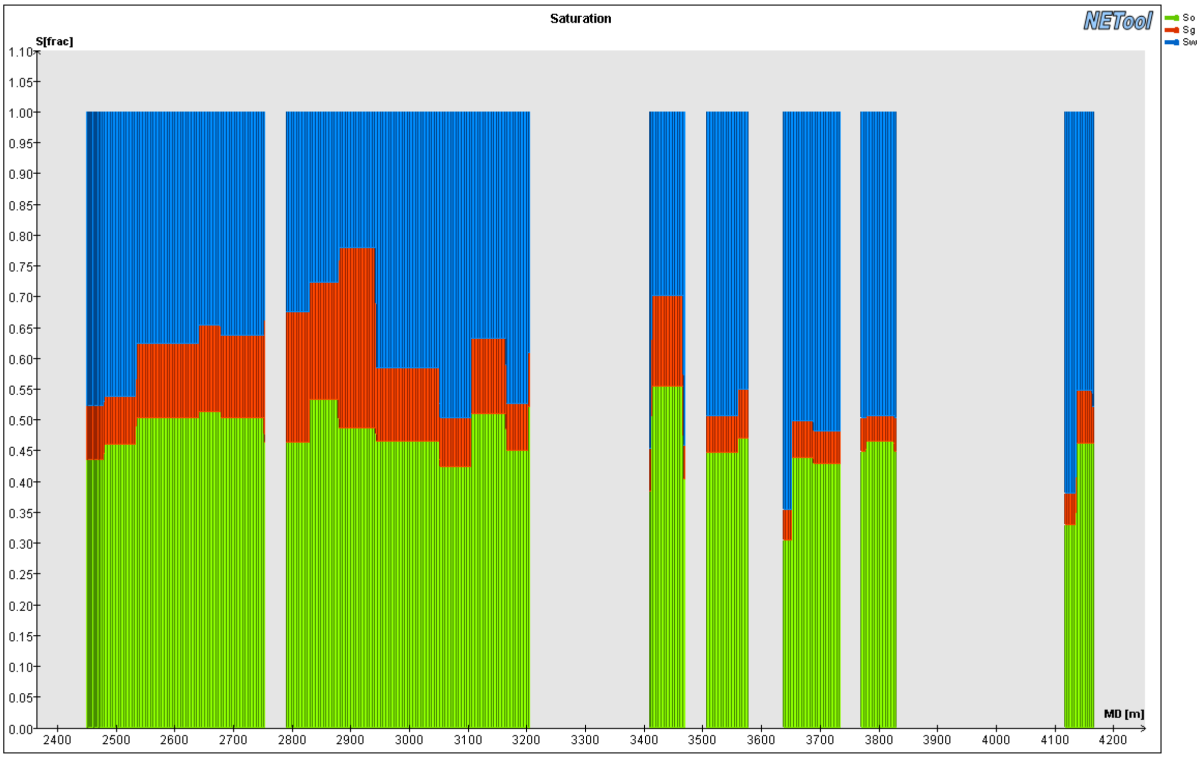
Permeability plot, horizontal, vertical and K_v/K_h



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing

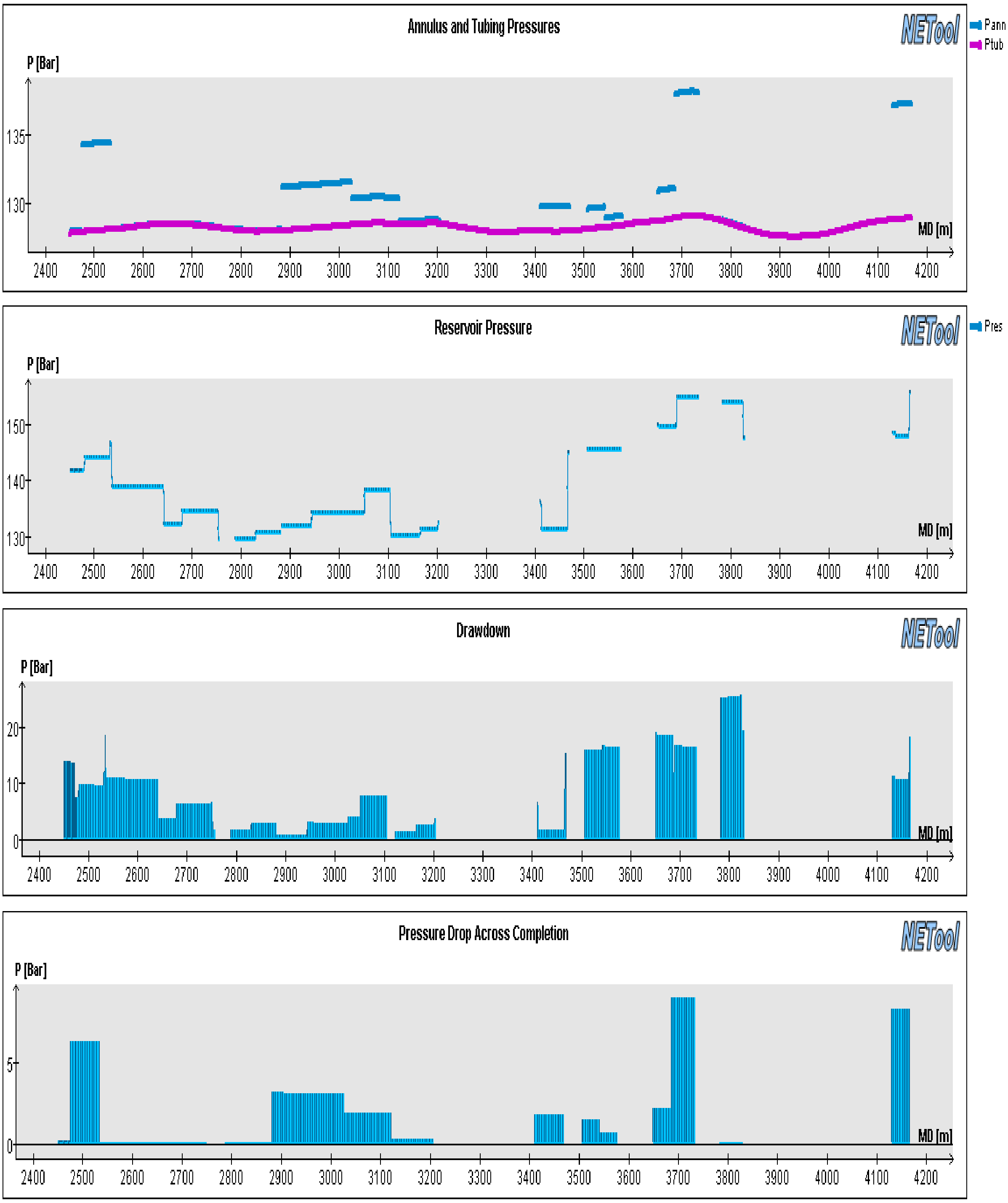


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

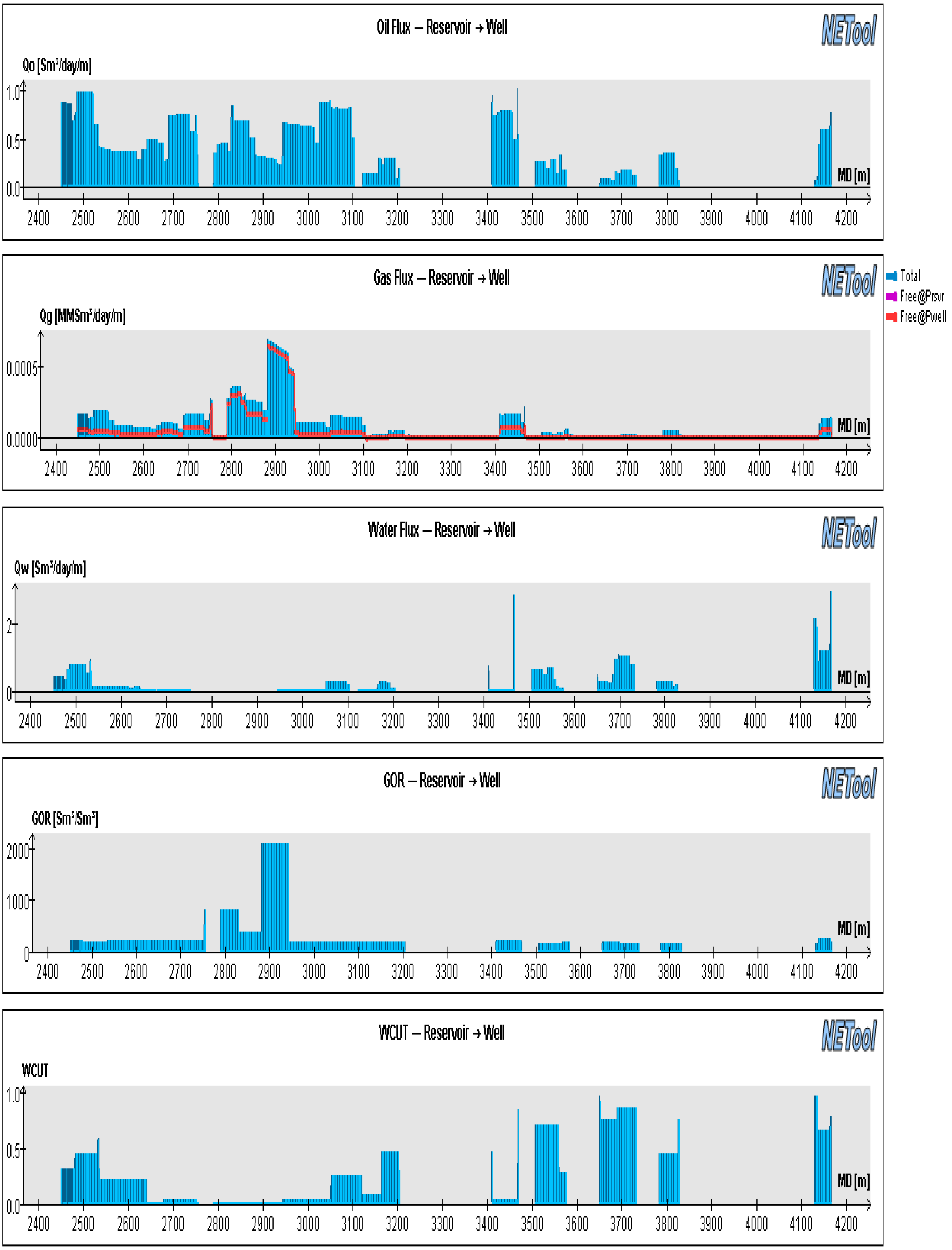
Skin factor plot for the well and given time step

A.47 Plots for well KP9, 2556 days, Tailored ICD design with+50% in K_h

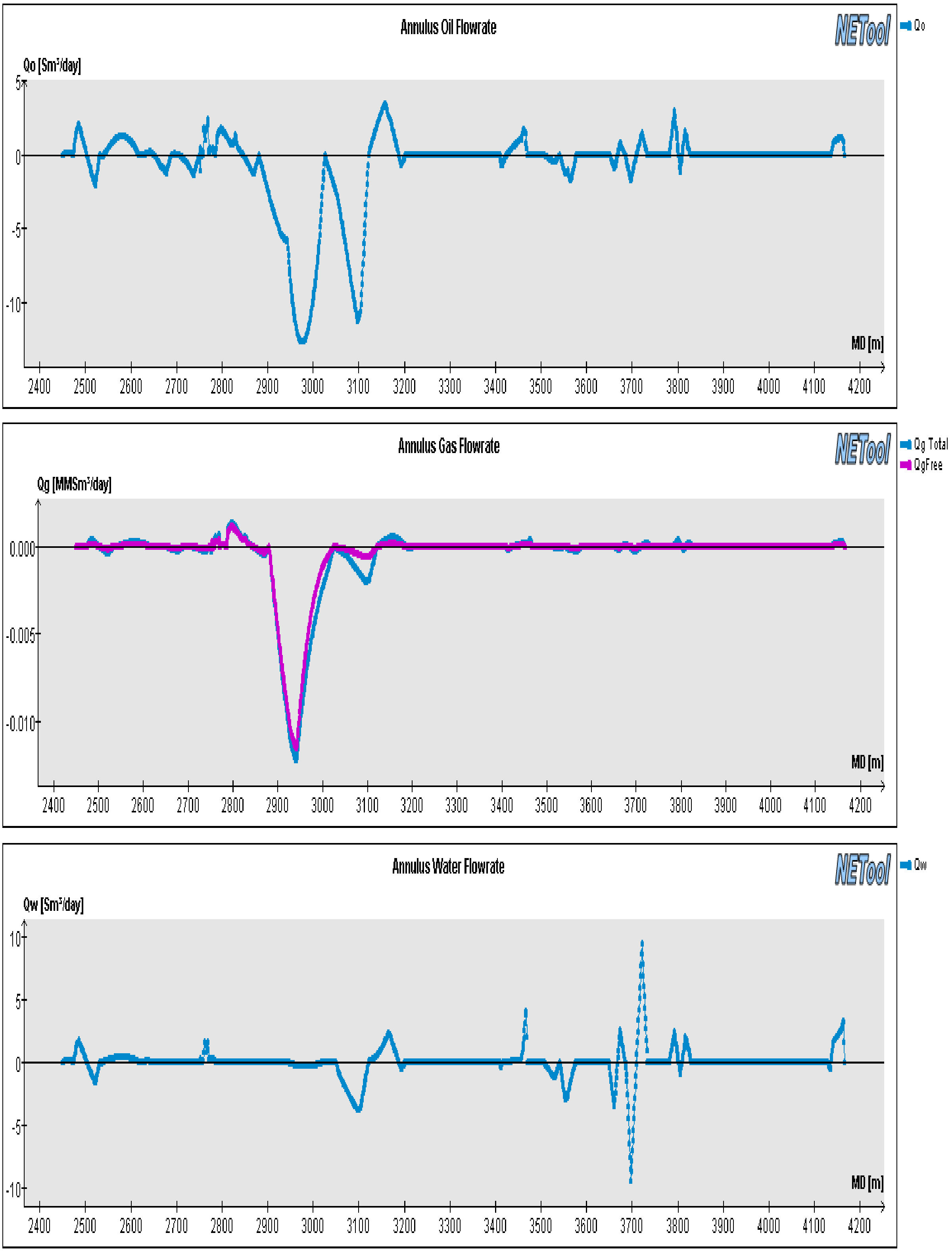
Tailored ICD set up run with 50% increase in K_h. Completion set up can be found in Appendix A… Permeability profile the same as in A….



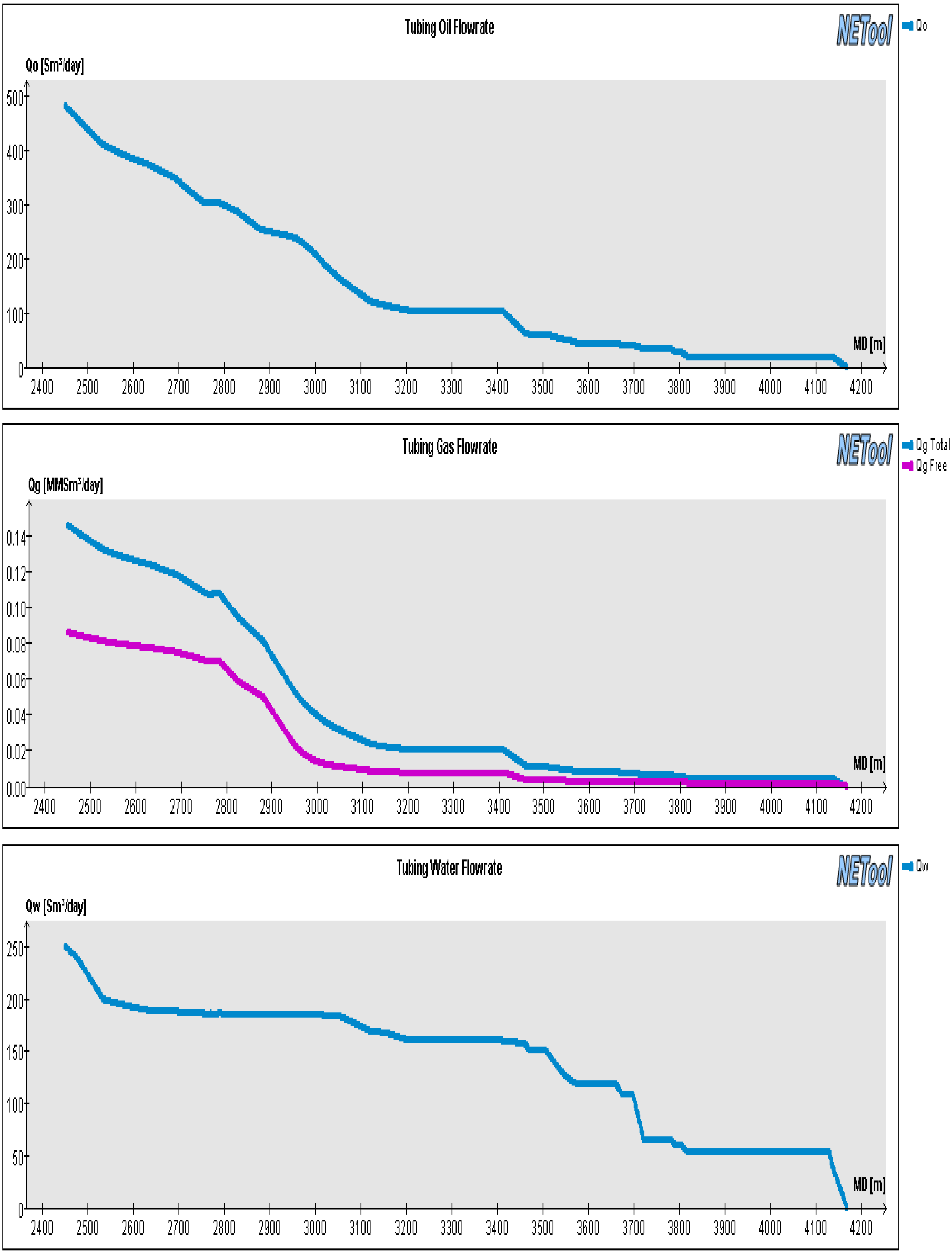
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



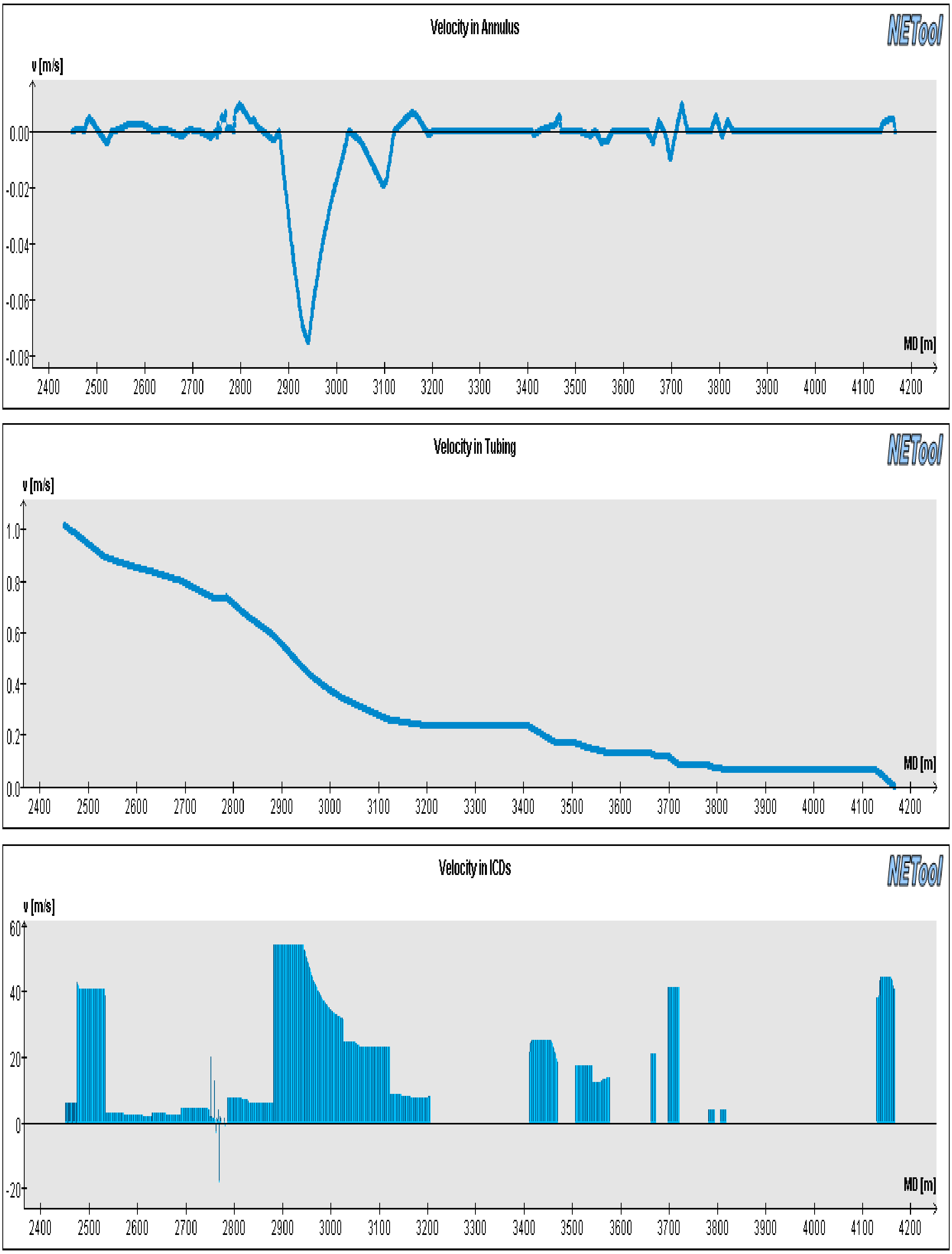
Influx of oil, gas and water from the reservoir and into the well along the wellbore



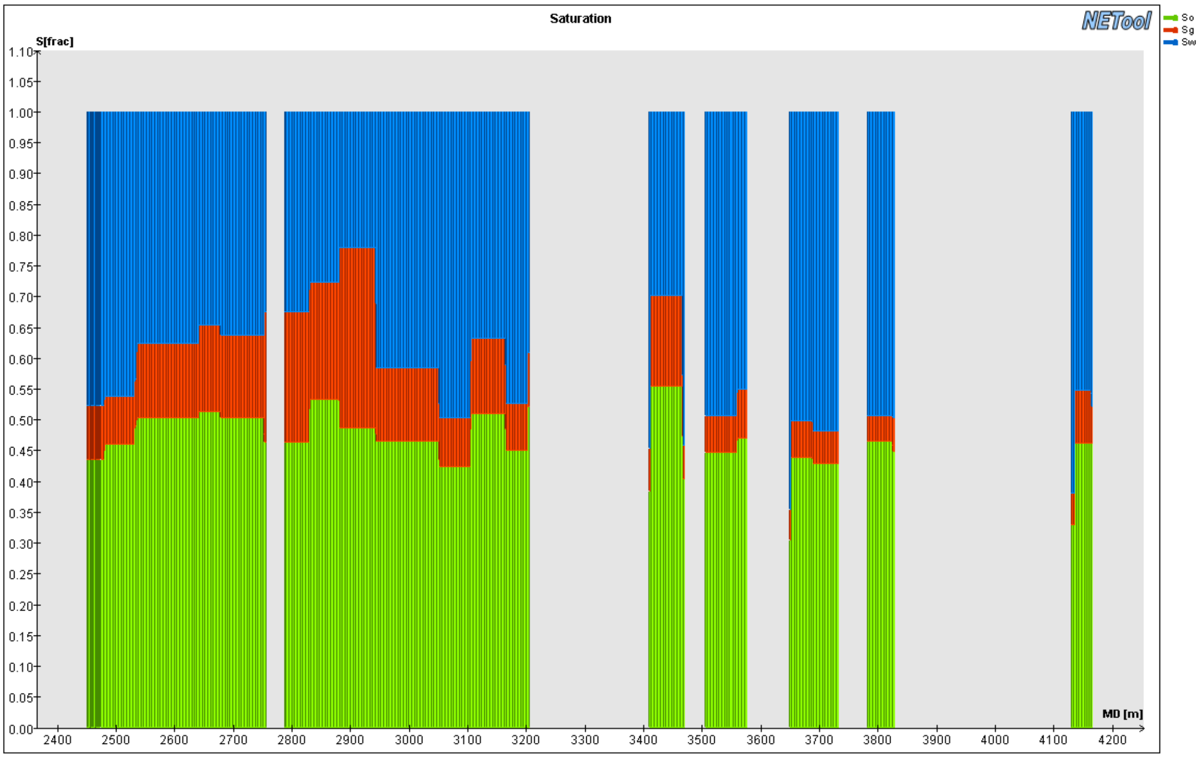
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs

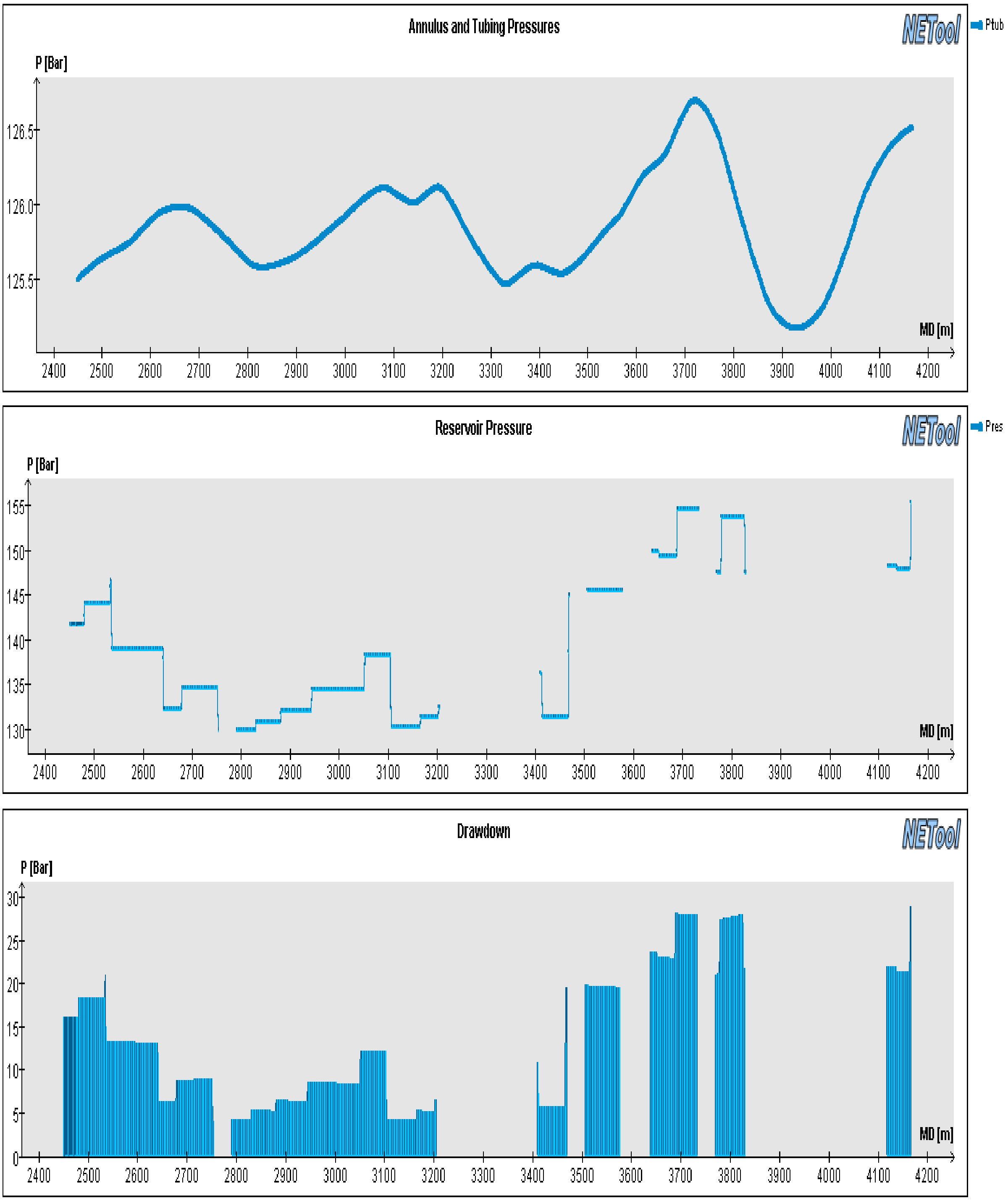


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

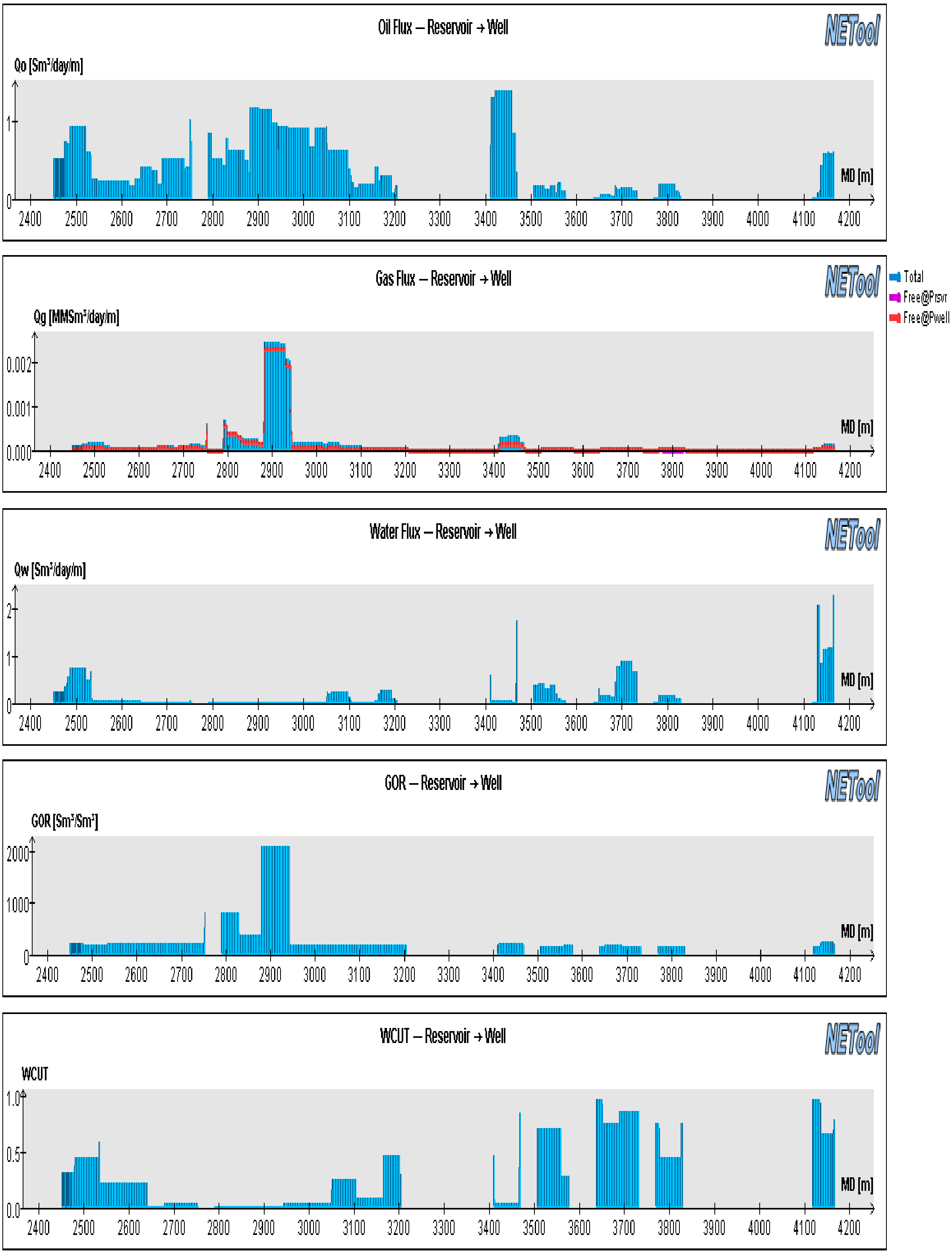
Skin factor plot for the well and given time step

A.48 Plots for well KP9, 2556 days, OH-25% in K_h

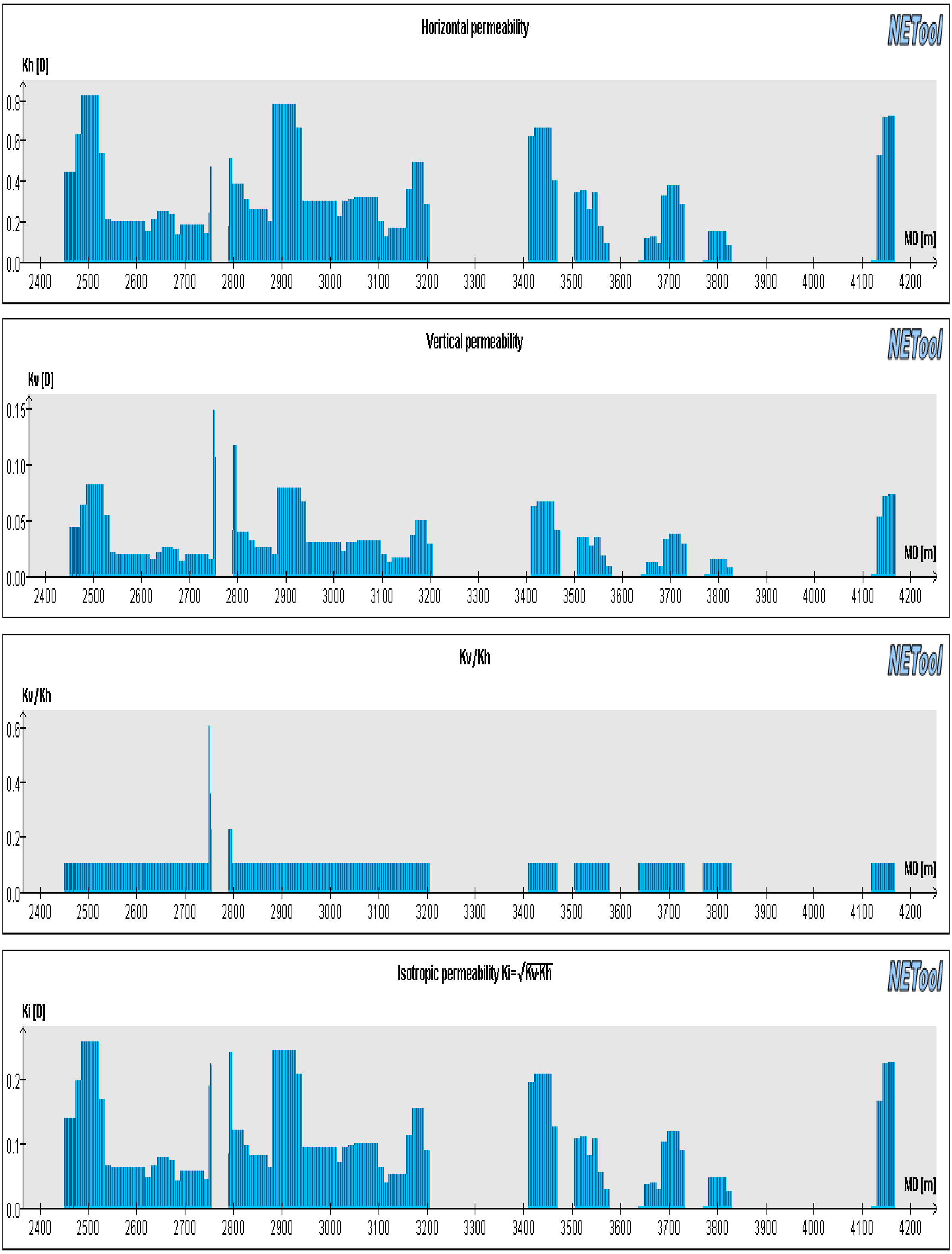
Reference case for -25% change in K_h. Completion set up can be found in Appendix A…



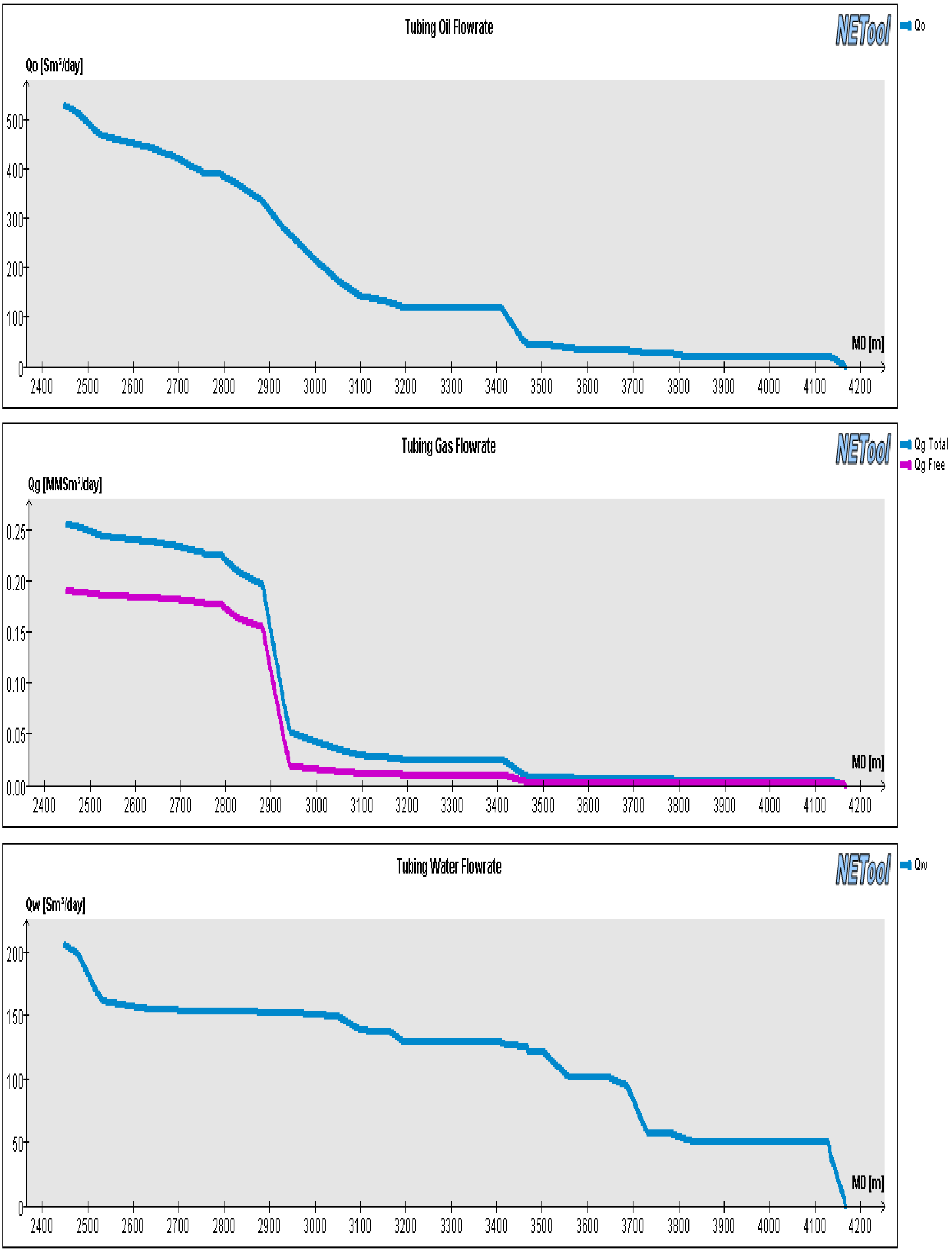
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



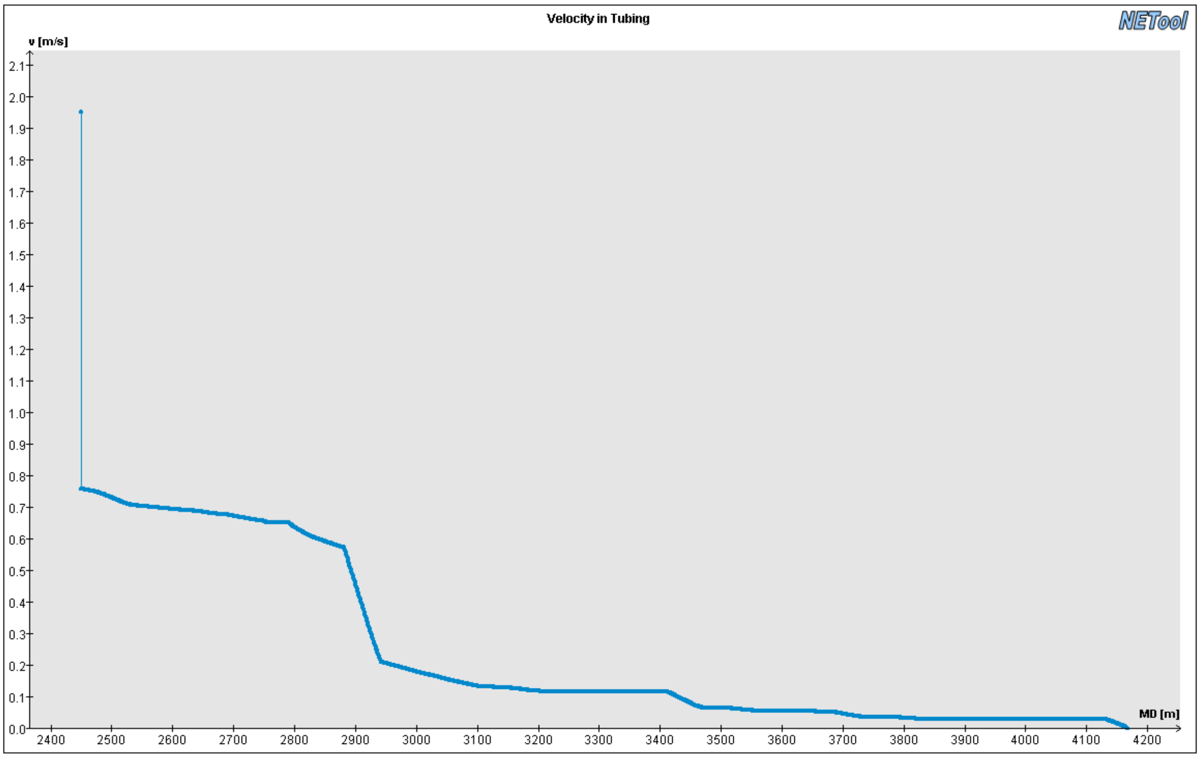
Influx of oil, gas and water from the reservoir and into the well along the wellbore



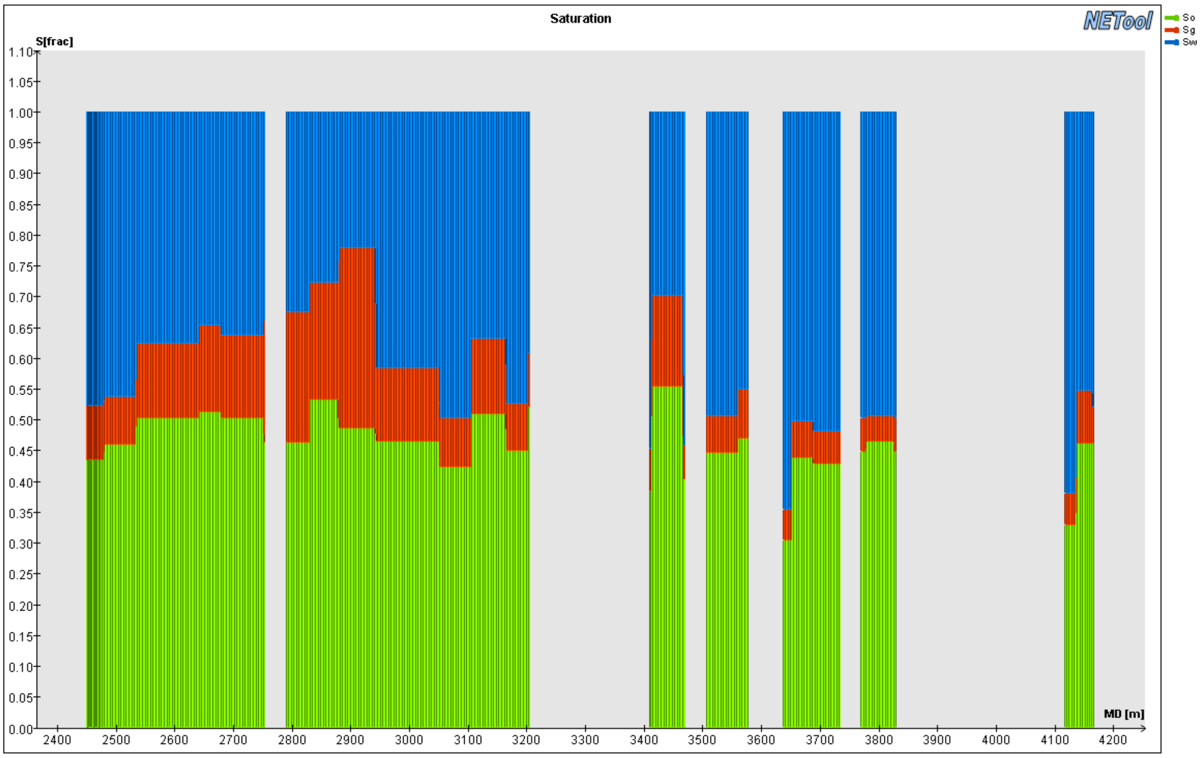
Permeability plot, horizontal, vertical and K_v/K_h



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing

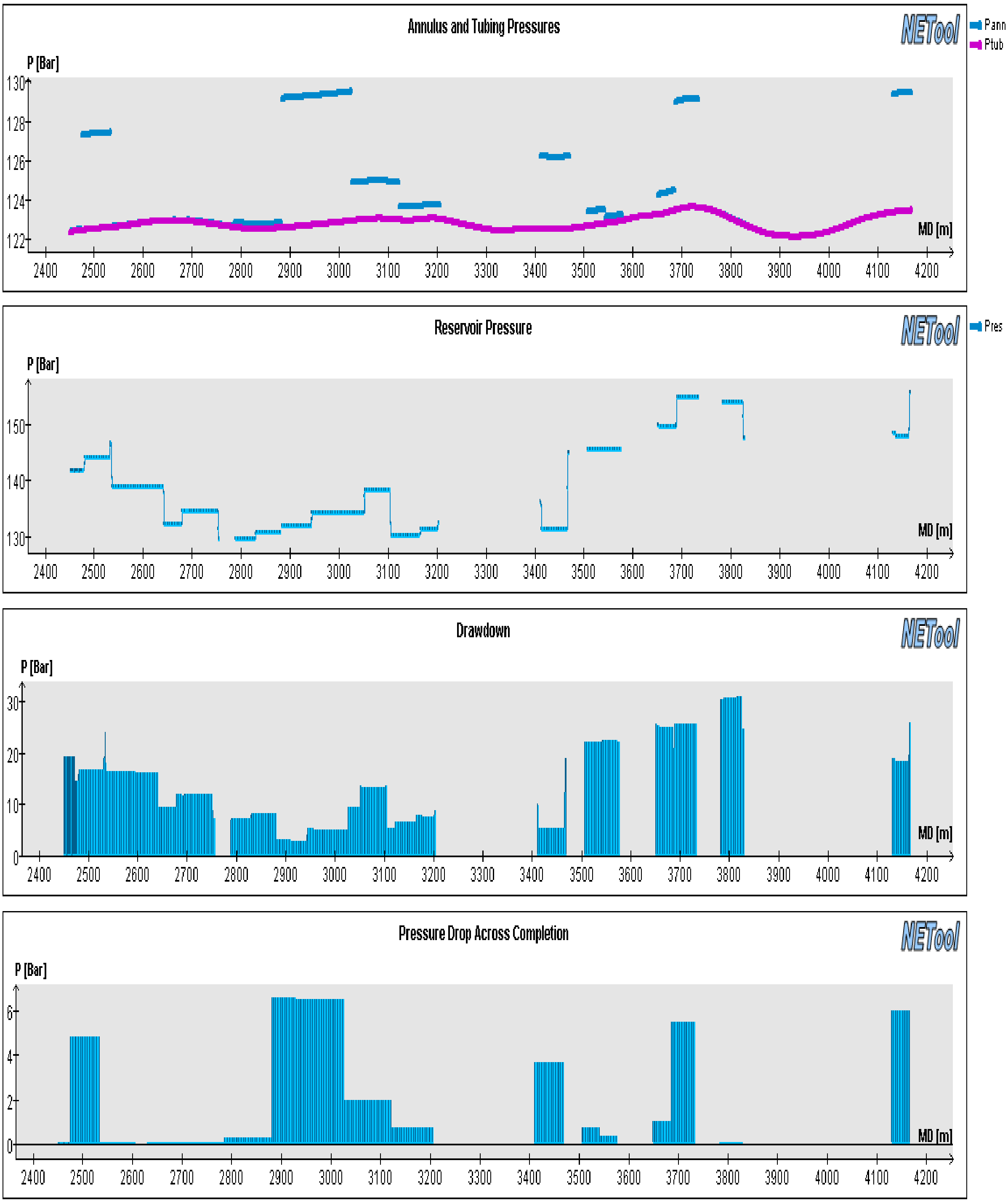


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

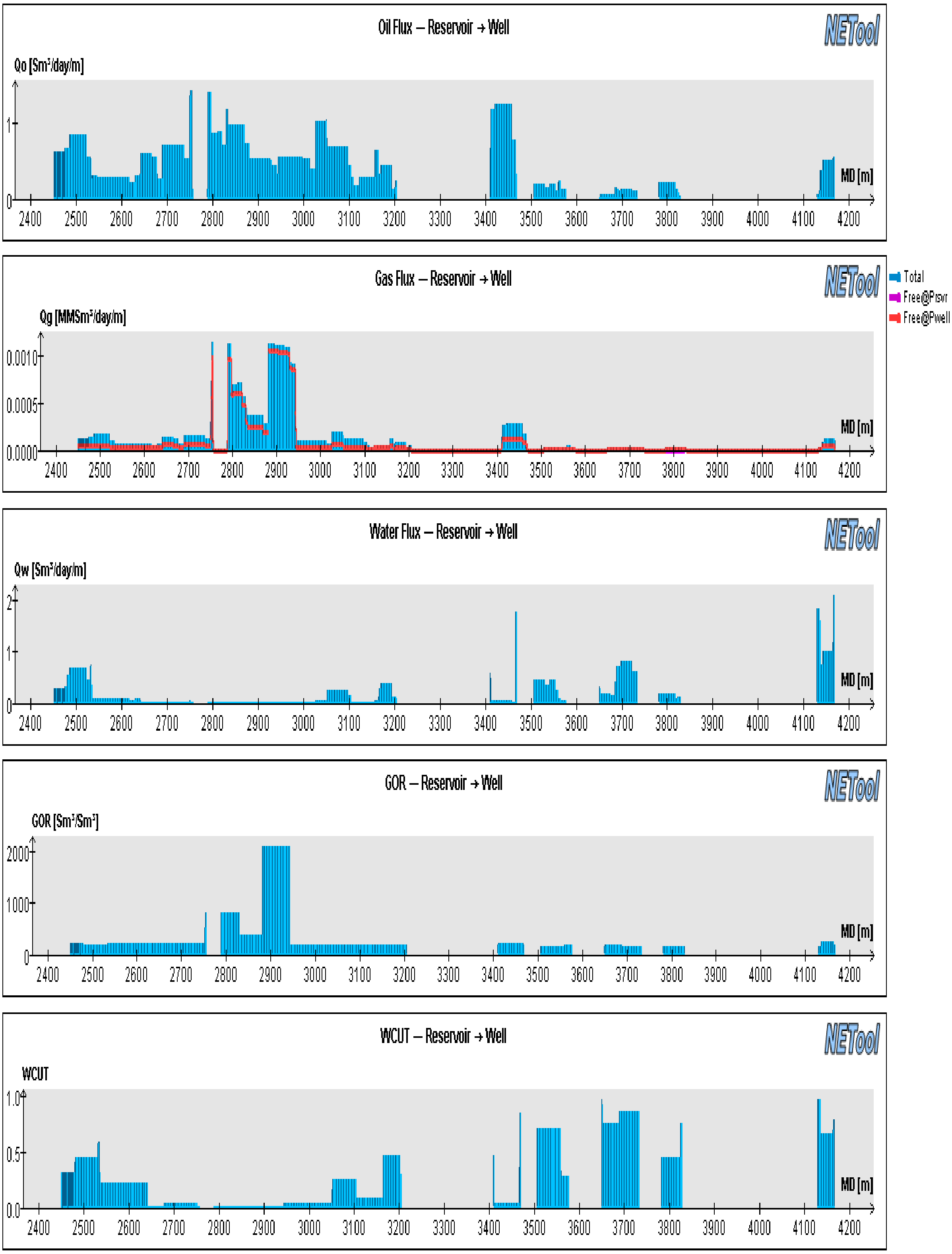
Skin factor plot for the well and given time step

A.49 Plots for well KP9, 2556 days, Tailored ICD design run with-25% in Kh

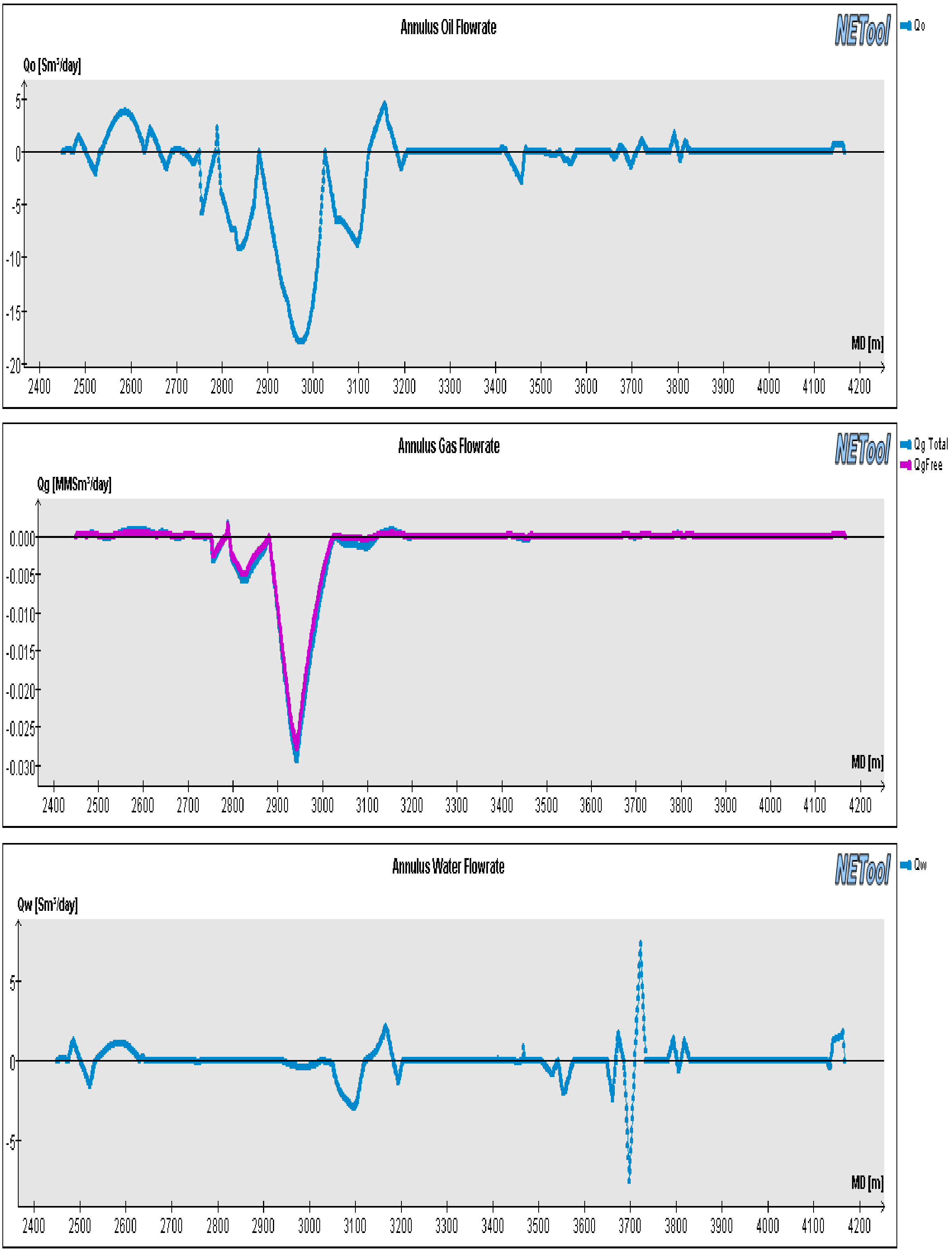
Recommended ICD set up run with 25% decreae in K_h. Completion set up can be found in Appendix A… Permeability profile the same as in A….



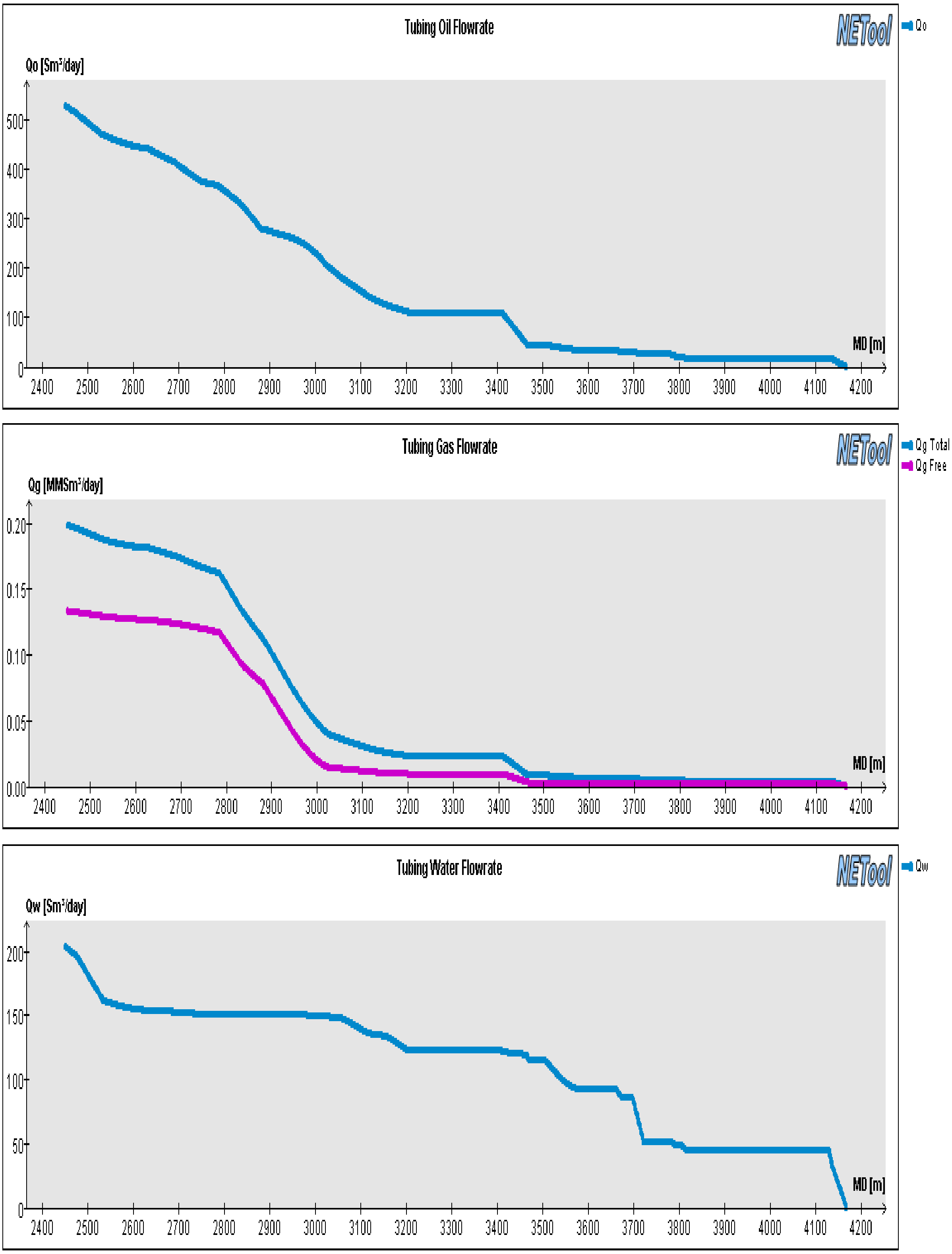
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



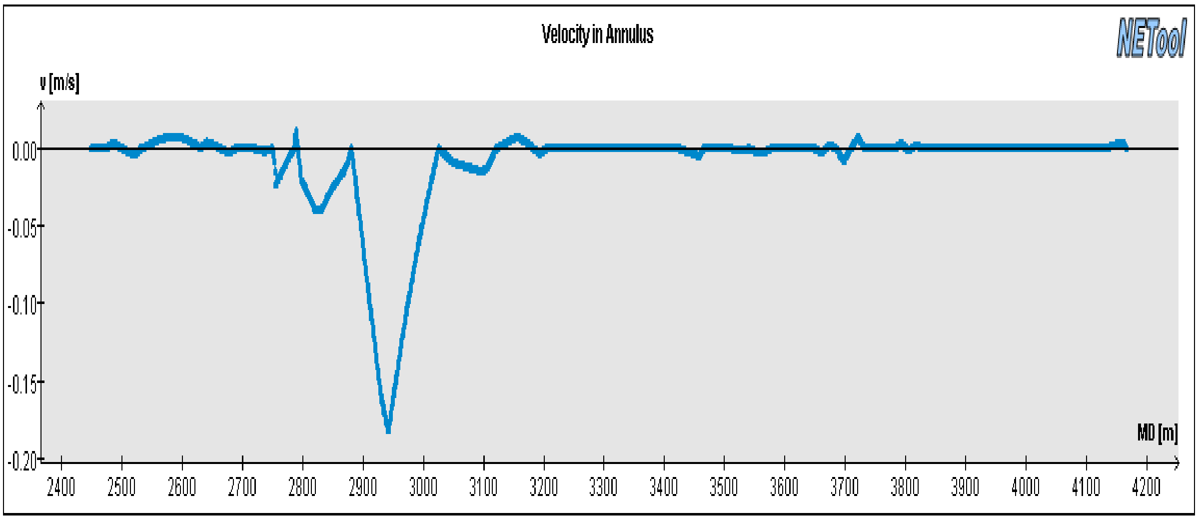
Influx of oil, gas and water from the reservoir and into the well along the wellbore

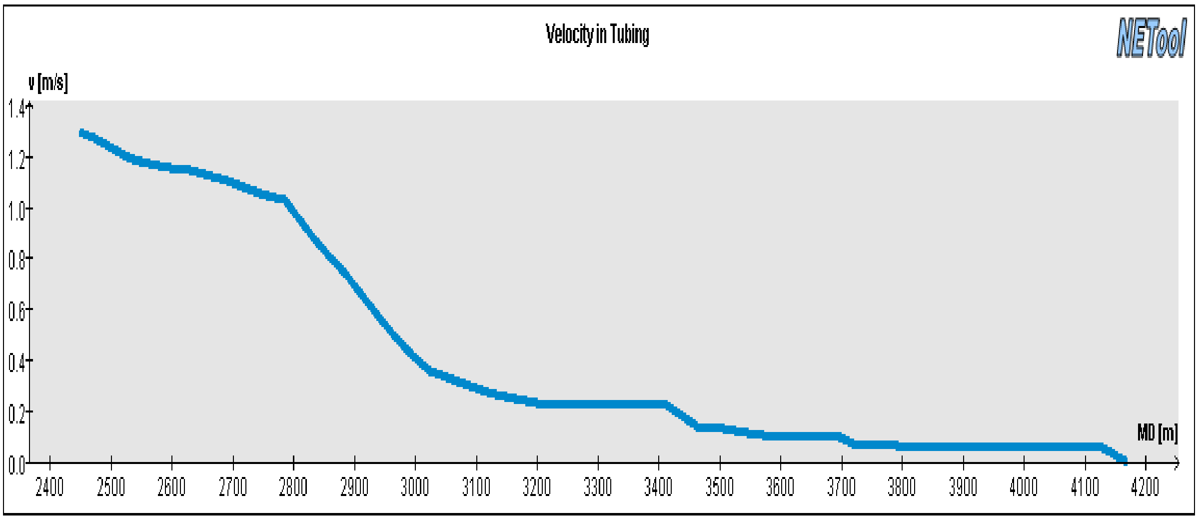


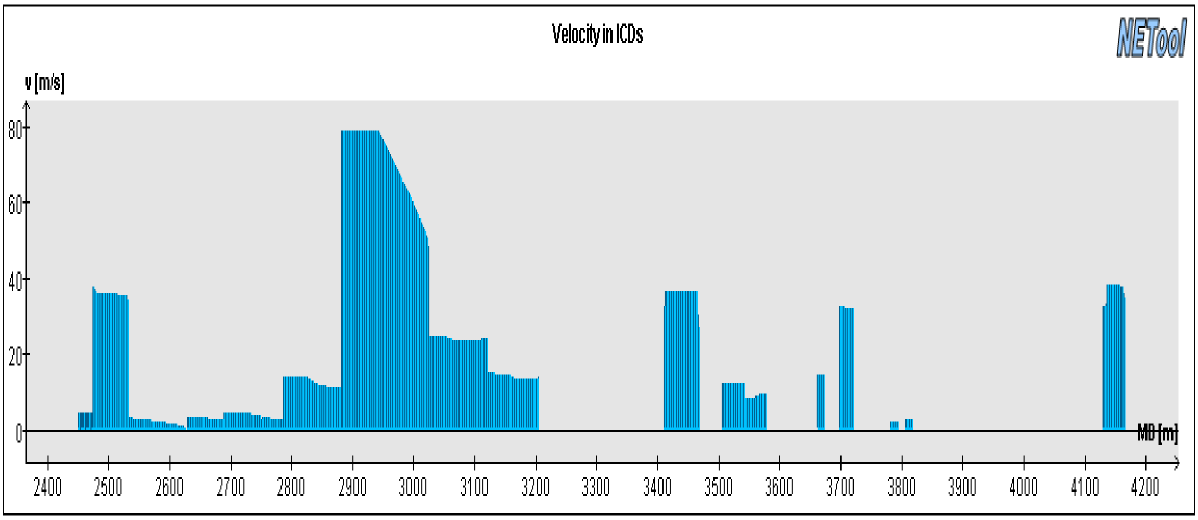
Annulus oil, gas and water flow rate along the wellbore



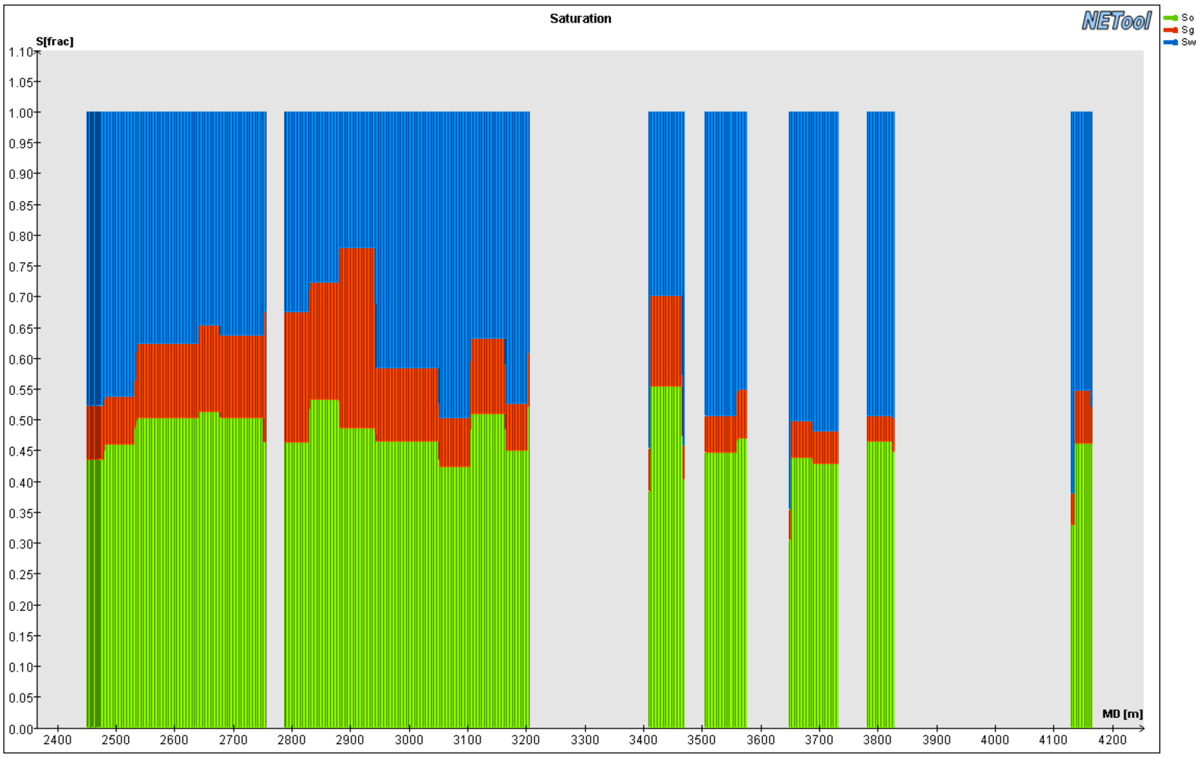
Tubing flow of oil, gas and water along the wellbore







Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

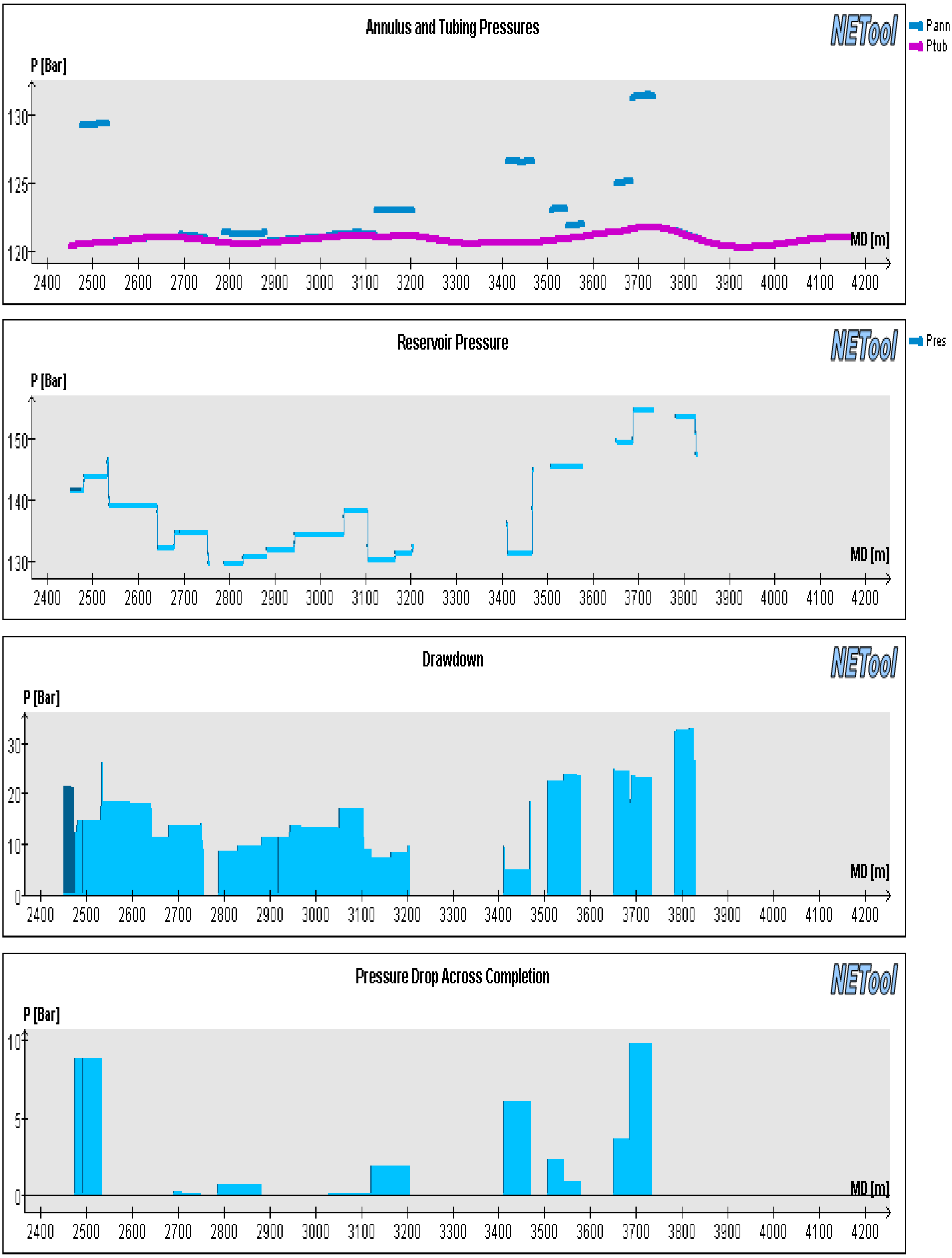
A.50 Plots for well KP9, 2556 days, Tailored ICD design with 250m shorter wellbore.

Completion overview for the case:

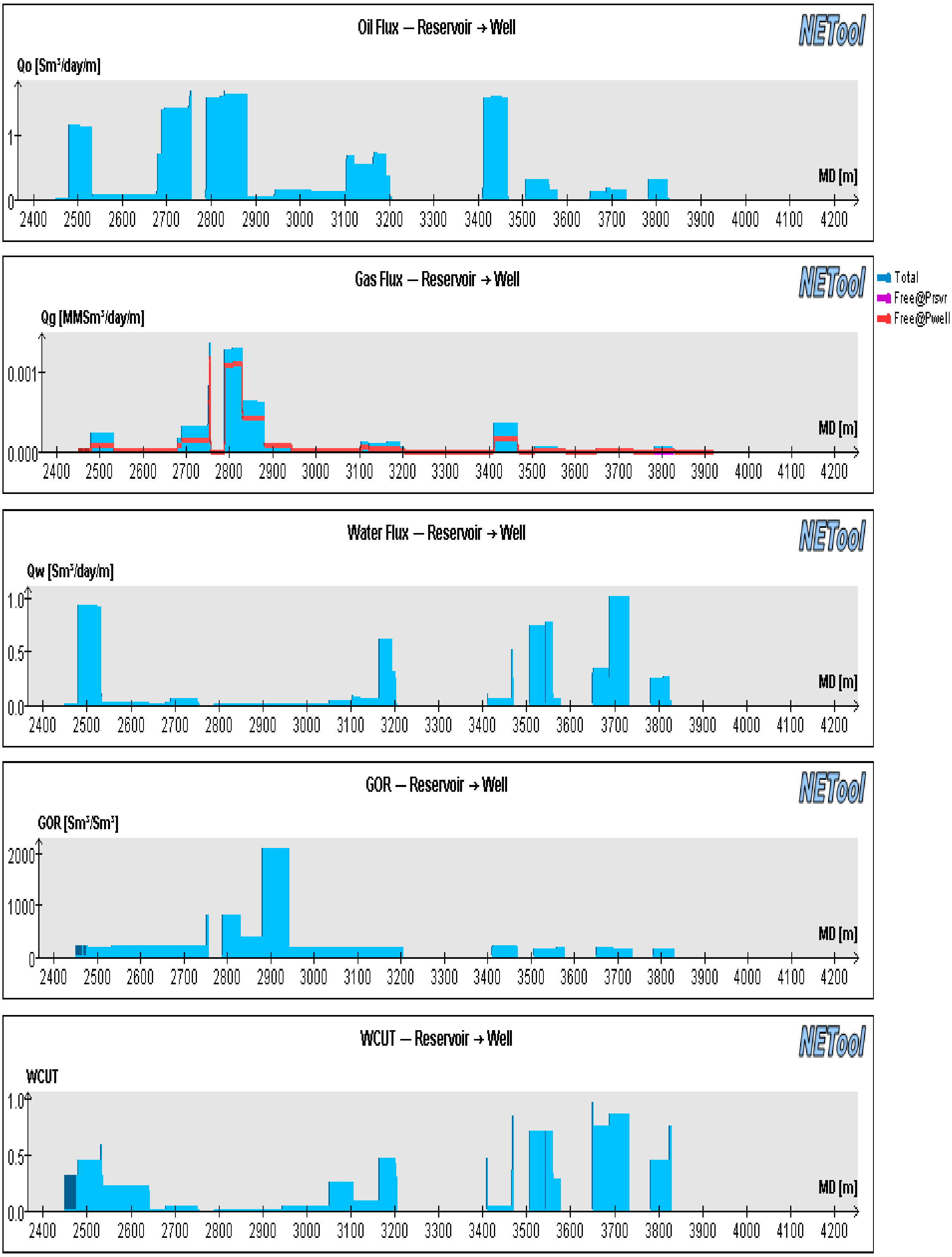
Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	-	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

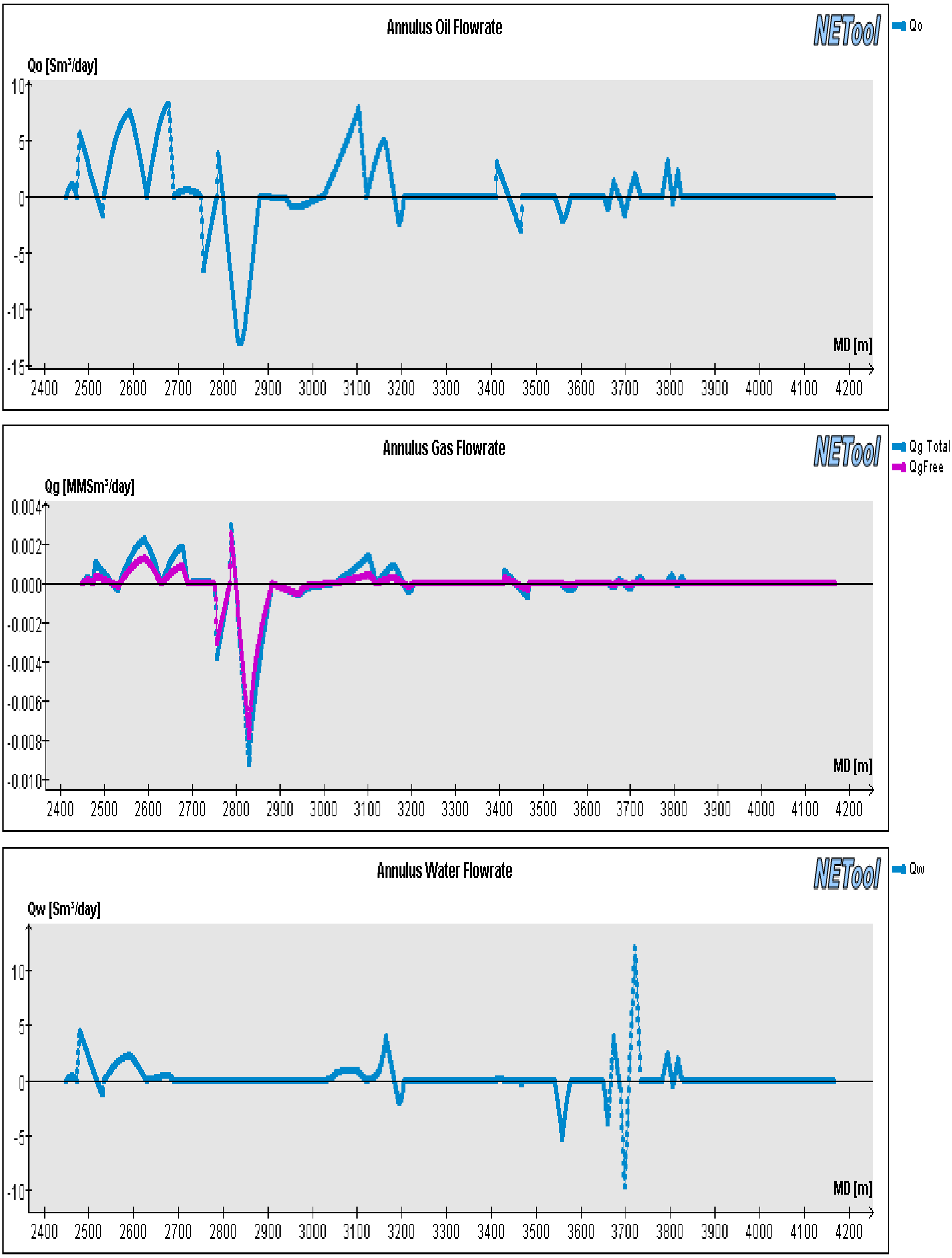
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	119	3674,0	11,7	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	120	3685,7	0,3	Packer	-	-	No	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	121	3686,0	12,0	Blank pipe	-	-	Yes	No	No
74	3206	12,0	Blank pipe	-	-	Yes	No	No	122	3698,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	123	3710,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A
76	3230	12,0	Blank pipe	-	-	Yes	No	No	124	3722,0	11,7	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	125	3733,7	0,3	Packer	-	-	No	No	N/A
78	3254	12,0	Blank pipe	-	-	Yes	No	No	126	3734,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	127	3746,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	128	3758,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	129	3770,0	11,7	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	130	3781,7	0,3	Packer	-	-	No	No	N/A
83	3314	12,0	Blank pipe	-	-	Yes	No	No	131	3782,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
84	3326	12,0	Blank pipe	-	-	Yes	No	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	133	3806,0	12,0	Nozzle ICD	4	4	Yes	No	N/A
86	3350	12,0	Blank pipe	-	-	Yes	No	No	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
87	3362	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
88	3374	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
92	3410	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
93	3422	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
94	3434	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
95	3446	12,0	Nozzle ICD	2	2,5	Yes	No	N/A	143	3914,0	12,0	Blank pipe	-	-	Yes	No	No
96	3458	11,7	Nozzle ICD	2	2,5	Yes	No	N/A	144	3926,0	12,0	Blank pipe	-	-	No	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	145	3938,0	12,0	Blank pipe	-	-	No	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	146	3950,0	12,0	Blank pipe	-	-	No	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	147	3962,0	12,0	Blank pipe	-	-	No	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	148	3974,0	12,0	Blank pipe	-	-	No	No	No
101	3505,7	0,3	Packer	-	-	No	No	N/A	149	3986,0	12,0	Blank pipe	-	-	No	No	No
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	150	3998,0	12,0	Blank pipe	-	-	No	No	No
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	151	4010,0	12,0	Blank pipe	-	-	No	No	No
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	152	4022,0	12,0	Blank pipe	-	-	No	No	No
105	3541,7	0,3	Packer	-	-	No	No	N/A	153	4034,0	12,0	Blank pipe	-	-	No	No	No
106	3542,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	154	4046,0	12,0	Blank pipe	-	-	No	No	No
107	3554,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A	155	4058,0	12,0	Blank pipe	-	-	No	No	No
108	3566,0	11,7	Nozzle ICD	4	1,6	Yes	No	N/A	156	4070,0	12,0	Blank pipe	-	-	No	No	No
109	3577,7	0,3	Packer	-	-	No	No	N/A	157	4082,0	12,0	Blank pipe	-	-	No	No	No
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	158	4094,0	12,0	Blank pipe	-	-	No	No	No
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	159	4106,0	12,0	Blank pipe	-	-	No	No	No
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	160	4118,0	11,7	Blank pipe	-	-	No	No	No
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	161	4129,7	0,3	Packer	-	-	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	162	4130,0	12,0	Nozzle ICD	4	1,6	No	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	163	4142,0	12,0	Nozzle ICD	4	1,6	No	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	164	4154,0	13,3	Nozzle ICD	4	1,6	No	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	TOE	4167,3	-	-	-	-	-	-	-
118	3662,0	12,0	Nozzle ICD	4	1,6	Yes	No	N/A									



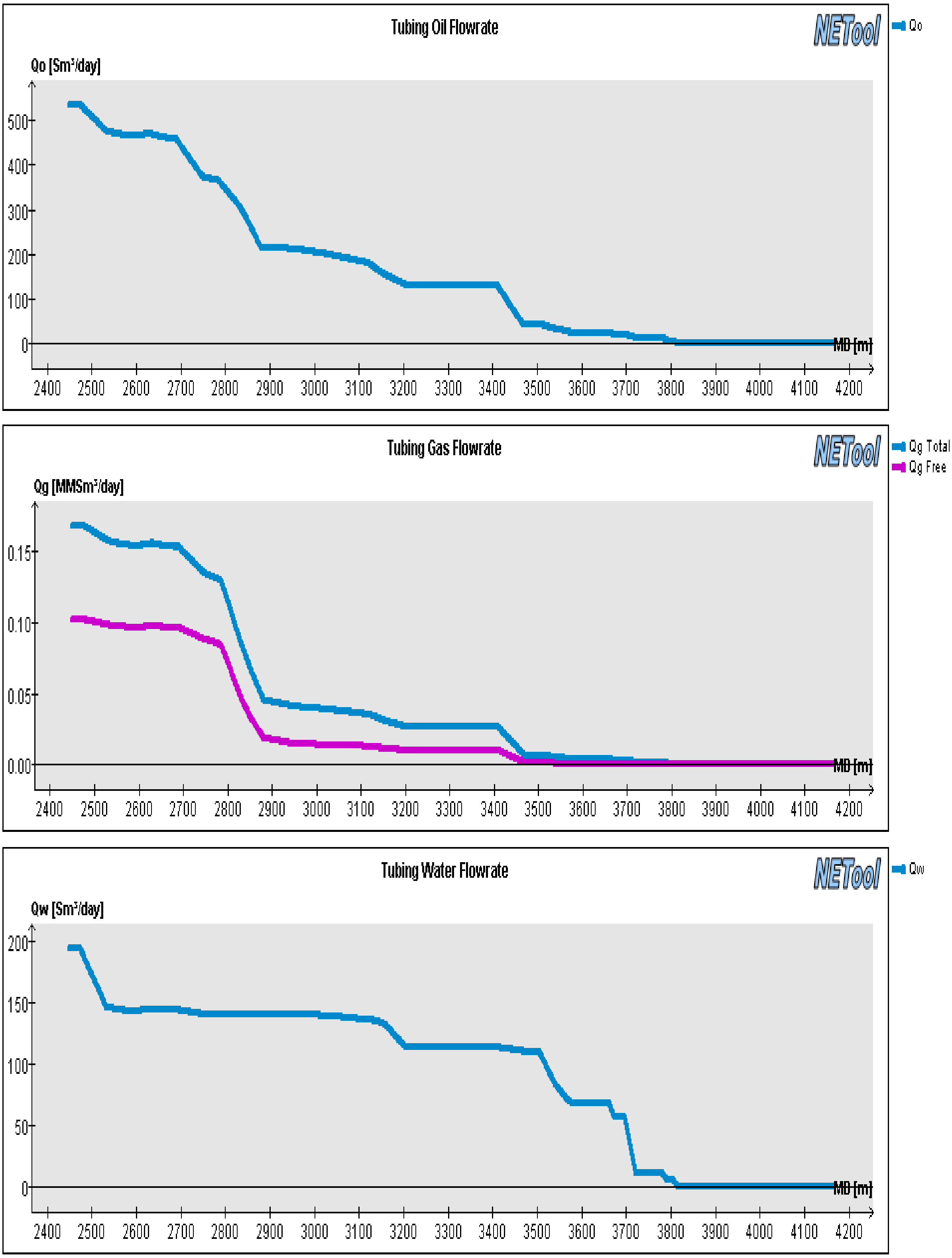
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



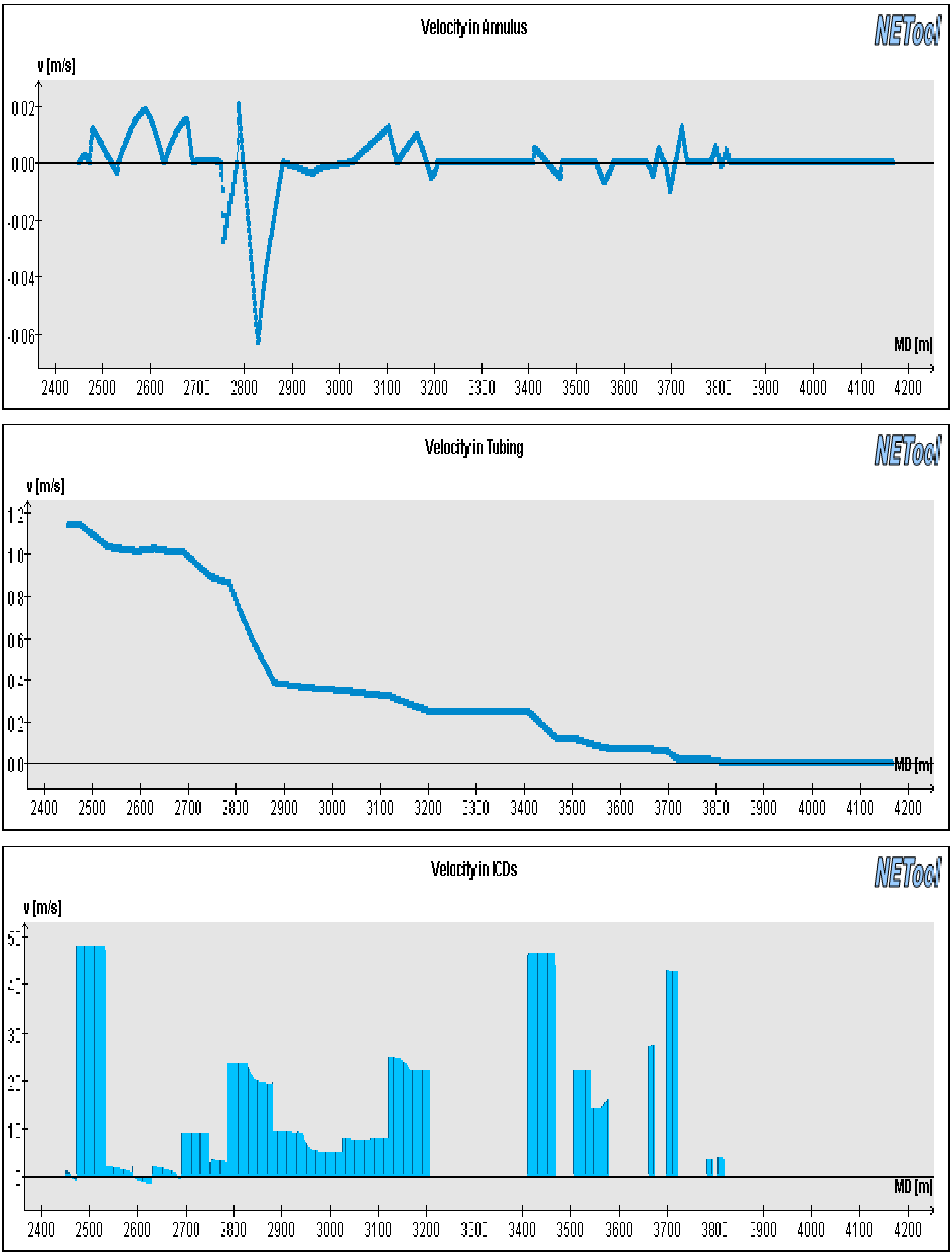
Influx of oil, gas and water from the reservoir and into the well along the wellbore



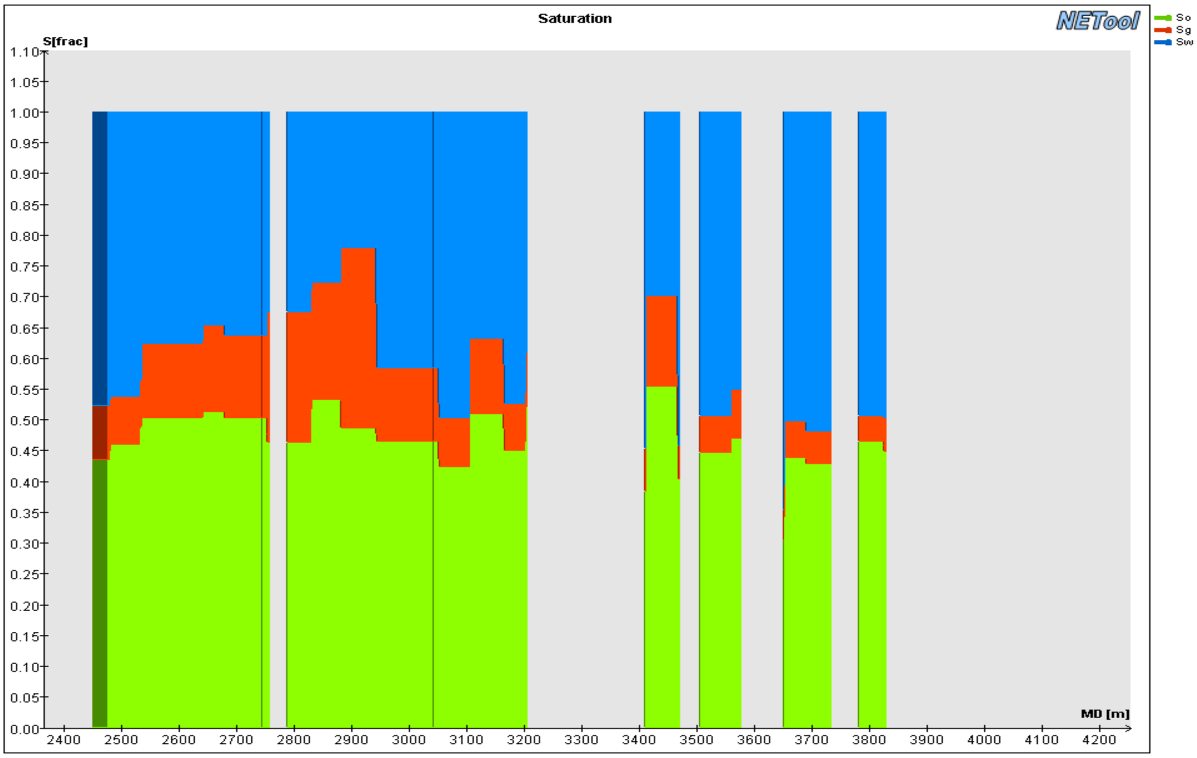
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

A.51 Plots for well KP9, 2556 days, Tailored ICD design with 250m longer wellbore.

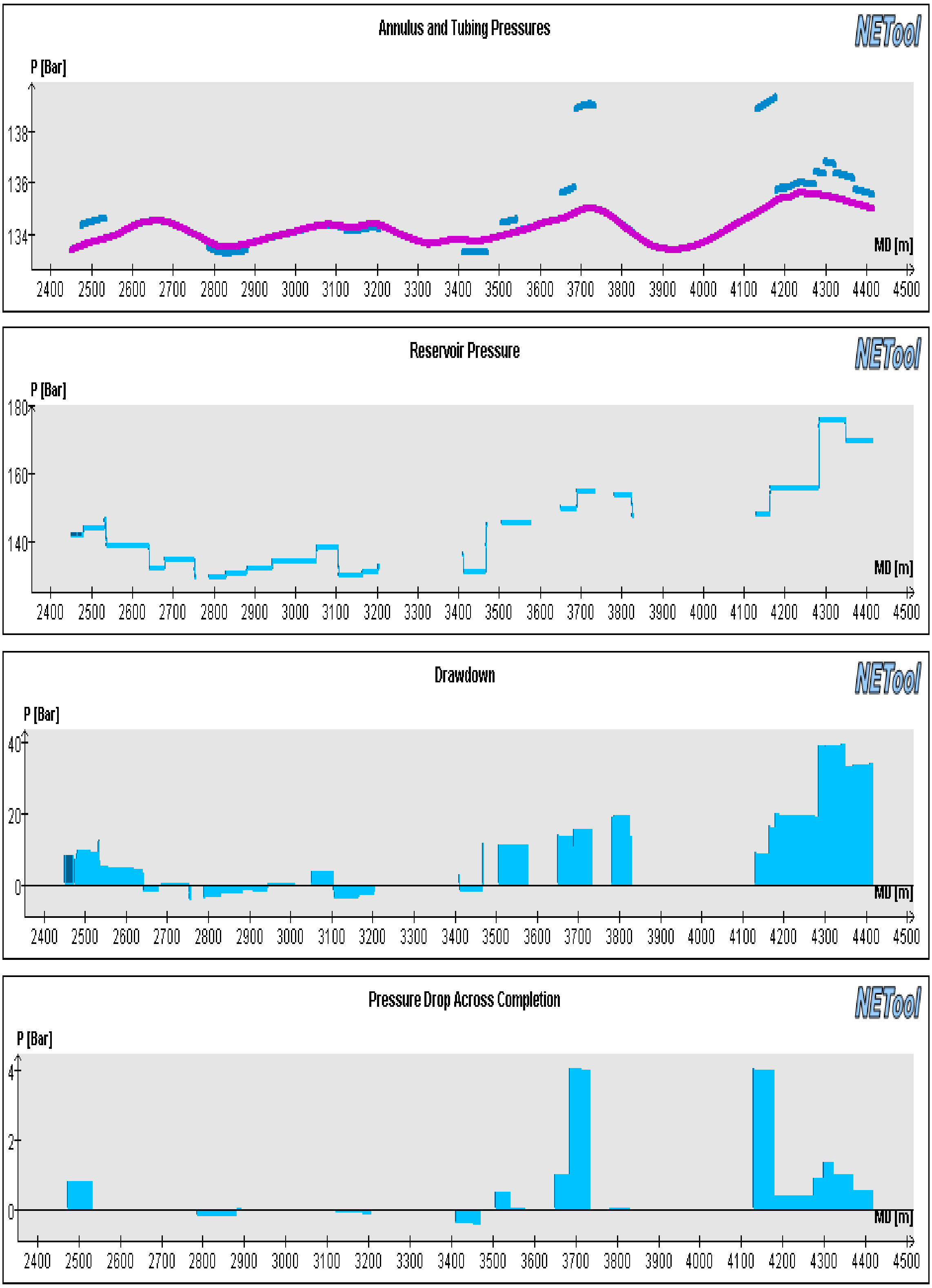
Completion overview for the case:

Reservoir section OD	8 ½”
Completion OD	6 5/8”
Completion ID	5,927”
Nozzle coefficient	0,953

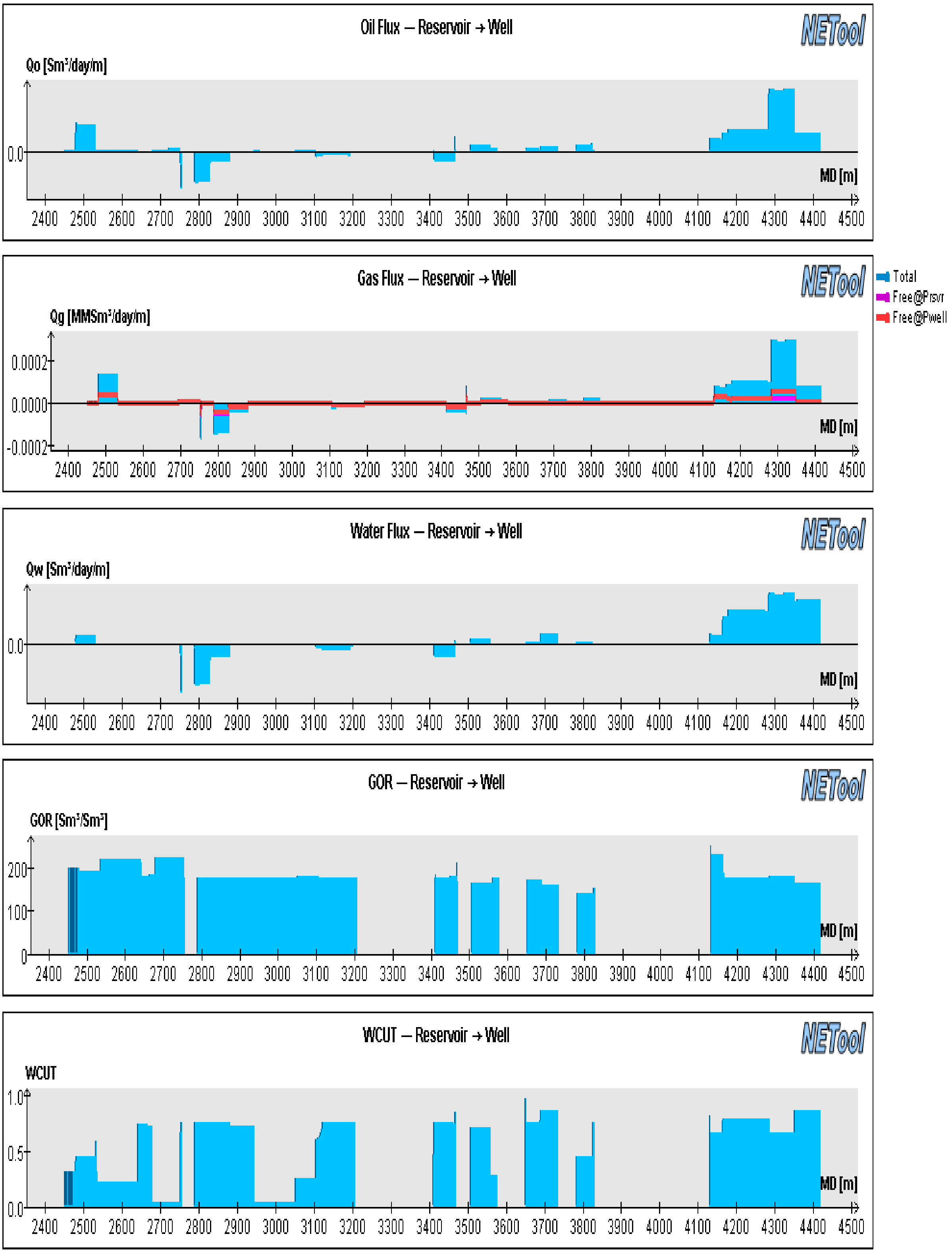
Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
1	2450	0,3	Cemented bp	-	-	No	No	N/A	36	2798	12,0	Nozzle ICD	4	4	Yes	Yes	No
2	2450,3	23,7	Nozzle ICD	4	-	Yes	Yes	No	37	2810	12,0	Nozzle ICD	4	4	Yes	Yes	No
3	2474	0,3	Packer	-	-	No	No	N/A	38	2822,0	12,0	Nozzle ICD	4	4	Yes	Yes	No
4	2474,3	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	39	2834	12,0	Nozzle ICD	4	4	Yes	Yes	No
5	2486	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	40	2846	12,0	Nozzle ICD	4	4	Yes	Yes	No
6	2498	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	41	2858	12,0	Nozzle ICD	4	4	Yes	Yes	No
7	2510	12,0	Nozzle ICD	4	1,6	Yes	Yes	No	42	2870	11,7	Nozzle ICD	4	4	Yes	Yes	No
8	2522	11,7	Nozzle ICD	4	1,6	Yes	Yes	No	43	2881,7	0,3	Packer	-	-	No	No	N/A
9	2533,7	0,3	Packer	-	-	No	No	N/A	44	2882	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
10	2534	12,0	Nozzle ICD	4	4	Yes	Yes	No	45	2894	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
11	2546	12,0	Nozzle ICD	4	4	Yes	Yes	No	46	2906	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
12	2558	12,0	Nozzle ICD	4	4	Yes	Yes	No	47	2918	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
13	2570	12,0	Nozzle ICD	4	4	Yes	Yes	No	48	2930	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
14	2582	12,0	Nozzle ICD	4	4	Yes	Yes	No	49	2942	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
15	2594	12,0	Nozzle ICD	4	4	Yes	Yes	No	50	2954	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
16	2606	12,0	Nozzle ICD	4	4	Yes	Yes	No	51	2966	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
17	2618	11,7	Nozzle ICD	4	4	Yes	Yes	No	52	2978	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
18	2629,7	0,3	Packer	-	-	No	No	N/A	53	2990	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
19	2630	12,0	Nozzle ICD	4	4	Yes	Yes	No	54	3002	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
20	2642	12,0	Nozzle ICD	4	4	Yes	Yes	No	55	3014	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
21	2654	12,0	Nozzle ICD	4	4	Yes	Yes	No	56	3025,7	0,3	Packer	-	-	No	No	N/A
22	2666	12,0	Nozzle ICD	4	4	Yes	Yes	No	57	3026	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
23	2678	11,7	Nozzle ICD	4	4	Yes	Yes	No	58	3038	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
24	2689,7	0,3	Packer	-	-	No	No	N/A	59	3050	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
25	2690	12,0	Nozzle ICD	4	4	Yes	Yes	No	60	3062	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
26	2702	12,0	Nozzle ICD	4	4	Yes	Yes	No	61	3074	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
27	2714	12,0	Nozzle ICD	4	4	Yes	Yes	No	62	3086	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
28	2726	12,0	Nozzle ICD	4	4	Yes	Yes	No	63	3098	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
29	2738	11,7	Nozzle ICD	4	4	Yes	Yes	No	64	3110	11,7	Nozzle ICD	4	1,6	Yes	Yes	No
30	2749,7	0,3	Packer	-	-	No	No	N/A	65	3121,7	0,3	Packer	-	-	No	No	N/A
31	2750	12,0	Nozzle ICD	4	4	Yes	Yes	No	66	3122	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
32	2762	12,0	Nozzle ICD	4	4	Yes	Yes	No	67	3134	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
33	2774	11,7	Nozzle ICD	4	4	Yes	Yes	No	68	3146	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
34	2785,7	0,3	Packer	-	-	No	No	N/A	69	3158	12,0	Nozzle ICD	4	1,6	Yes	Yes	No
35	2786	12,0	Nozzle ICD	4	4	Yes	Yes	No	70	3170	12,0	Nozzle ICD	4	1,6	Yes	Yes	No

Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed	Seg	Segment Top MD	Segment Length	Segment Type	Nozzles	Diameter	Connected to Reservoir	Has Annulus	Annulus Collapsed
#	[m]	[m]		#	[mm]				#	[m]	[m]	-	#	[mm]	-	-	-
71	3182,0	12,0	Nozzle ICD	4	4,0	Yes	Yes	No	132	3794,0	12,0	Blank pipe	-	-	Yes	No	No
72	3194	11,7	Nozzle ICD	4	4,0	Yes	Yes	No	133	3806,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A
73	3205,7	0,3	Packer	-	-	No	No	N/A	134	3818,0	11,7	Blank pipe	-	-	Yes	No	N/A
74	3206	12,0	Blank pipe	-	-	Yes	No	No	135	3829,7	0,3	Packer	-	-	No	No	N/A
75	3218	12,0	Blank pipe	-	-	Yes	No	No	136	3830,0	12,0	Blank pipe	-	-	Yes	No	No
76	3230	12,0	Blank pipe	-	-	Yes	No	No	137	3842,0	12,0	Blank pipe	-	-	Yes	No	No
77	3242	12,0	Blank pipe	-	-	Yes	No	No	138	3854,0	12,0	Blank pipe	-	-	Yes	No	No
78	3254	12,0	Blank pipe	-	-	Yes	No	No	139	3866,0	12,0	Blank pipe	-	-	Yes	No	No
79	3266	12,0	Blank pipe	-	-	Yes	No	No	140	3878,0	12,0	Blank pipe	-	-	Yes	No	No
80	3278	12,0	Blank pipe	-	-	Yes	No	No	141	3890,0	12,0	Blank pipe	-	-	Yes	No	No
81	3290	12,0	Blank pipe	-	-	Yes	No	No	142	3902,0	12,0	Blank pipe	-	-	Yes	No	No
82	3302	12,0	Blank pipe	-	-	Yes	No	No	143	3914,0	3,0	Blank pipe	-	-	Yes	No	No
83	3314	12,0	Blank pipe	-	-	Yes	No	No	144	3917,0	12,0	Blank pipe	-	-	No	No	No
84	3326	12,0	Blank pipe	-	-	Yes	No	No	145	3929,0	12,0	Blank pipe	-	-	No	No	No
85	3338	12,0	Blank pipe	-	-	Yes	No	No	146	3941,0	12,0	Blank pipe	-	-	No	No	No
86	3350	12,0	Blank pipe	-	-	Yes	No	No	147	3953,0	12,0	Blank pipe	-	-	No	No	No
87	3362	12,0	Blank pipe	-	-	Yes	No	No	148	3965,0	12,0	Blank pipe	-	-	No	No	No
88	3374	12,0	Blank pipe	-	-	Yes	No	No	149	3977,0	12,0	Blank pipe	-	-	No	No	No
89	3386	12,0	Blank pipe	-	-	Yes	No	No	150	3989,0	12,0	Blank pipe	-	-	No	No	No
90	3398	11,7	Blank pipe	-	-	Yes	No	No	151	4001,0	12,0	Blank pipe	-	-	No	No	No
91	3409,7	0,3	Packer	-	-	No	No	N/A	152	4013,0	12,0	Blank pipe	-	-	No	No	No
92	3410	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	153	4025,0	12,0	Blank pipe	-	-	No	No	No
93	3422	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	154	4037,0	12,0	Blank pipe	-	-	No	No	No
94	3434	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	155	4049,0	12,0	Blank pipe	-	-	No	No	No
95	3446	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	156	4061,0	12,0	Blank pipe	-	-	No	No	No
96	3458	11,7	Nozzle ICD	4	4,0	Yes	No	N/A	157	4073,0	12,0	Blank pipe	-	-	No	No	No
97	3469,7	0,3	Packer	-	-	No	No	N/A	158	4085,0	12,0	Blank pipe	-	-	No	No	No
98	3470	12,0	Blank pipe	-	-	Yes	No	No	159	4097,0	12,0	Blank pipe	-	-	No	No	No
99	3482	12,0	Blank pipe	-	-	Yes	No	No	160	4109,0	11,7	Blank pipe	-	-	No	No	No
100	3494	11,7	Blank pipe	-	-	Yes	No	No	161	4120,7	0,3	Packer	-	-	No	No	N/A
101	3505,7	0,3	Packer	-	-	No	No	N/A	162	4121,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
102	3506,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	163	4133,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
103	3518,0	12,0	Nozzle ICD	-	-	Yes	No	N/A	164	4145,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
104	3530,0	11,7	Nozzle ICD	-	-	Yes	No	N/A	165	4157,0	12	Nozzle ICD	4	4,0	No	No	N/A
105	3541,7	0,3	Packer	-	-	No	No	N/A	166	4169,0	0,3	Packer	-	-	No	No	N/A
106	3542,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	167	4169,3	11,7	Nozzle ICD	4	4,0	No	No	N/A
107	3554,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	168	4181,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
108	3566,0	11,7	Nozzle ICD	4	4,0	Yes	No	N/A	169	4193,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
109	3577,7	0,3	Packer	-	-	No	No	N/A	170	4205,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
110	3578,0	12,0	Blank pipe	-	-	Yes	No	No	171	4217,0	0,3	Packer	-	-	No	No	N/A
111	3590,0	12,0	Blank pipe	-	-	Yes	No	No	172	4217,3	11,7	Nozzle ICD	4	4,0	No	No	N/A
112	3602,0	12,0	Blank pipe	-	-	Yes	No	No	173	4229,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
113	3614,0	12,0	Blank pipe	-	-	Yes	No	No	174	4241,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
114	3626,0	12,0	Blank pipe	-	-	Yes	No	No	175	4253,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
115	3638,0	11,7	Blank pipe	-	-	Yes	No	No	176	4265,0	0,3	Packer	-	-	No	No	N/A
116	3649,7	0,3	Packer	-	-	No	No	N/A	177	4265,3	11,7	Nozzle ICD	4	4,0	No	No	N/A
117	3650,0	12,0	Blank pipe	-	-	Yes	No	No	178	4277,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
118	3662,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	179	4289,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
119	3674,0	11,7	Blank pipe	-	-	Yes	No	No	180	4301,0	12,0	Nozzle ICD	4	4,0	No	No	N/A
120	3685,7	0,3	Packer	-	-	No	No	N/A	181	4313,0	0,3	Packer	-	-	No	No	N/A
121	3686,0	12,0	Blank pipe	-	-	Yes	No	No	182	4313,3	11,7	Nozzle ICD	4	4,0	No	No	N/A
122	3698,0	12,0	Nozzle ICD	4	4,0	Yes	No	N/A	183	4325,0	12,0	Nozzle ICD	4	4,0	No	No	N/A

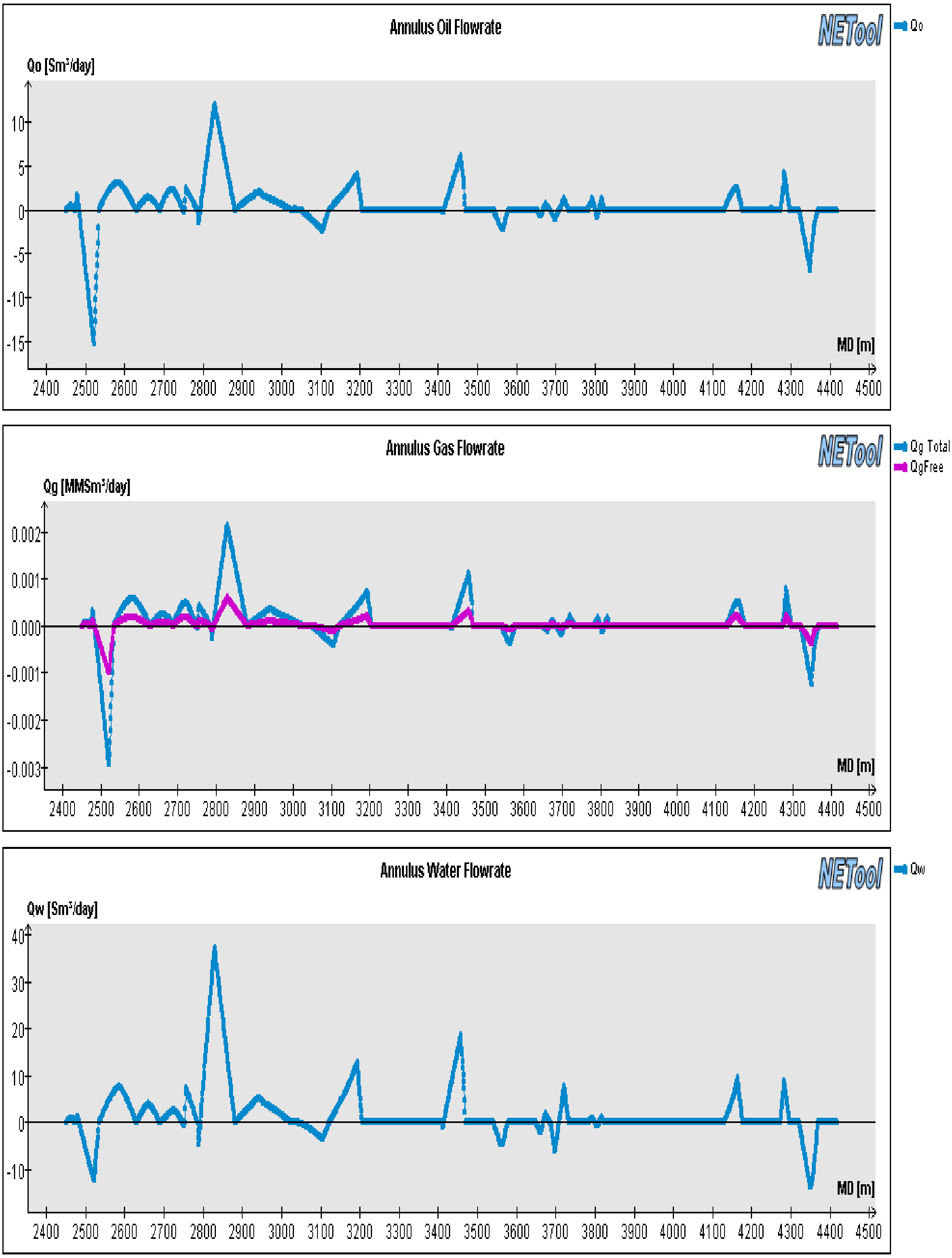
123	3710,0	12,0	**Nozzle ICD**	4	4,0	Yes	No	N/A	**184**	4337,0	12,0	**Nozzle ICD**	4	4,0	No	No	N/A
124	3722,0	11,7	**Blank pipe**	-	-	Yes	No	No	**185**	4349,0	12,0	**Nozzle ICD**	4	4,0	No	No	N/A
125	3733,7	0,3	**Packer**	-	-	No	No	N/A	**186**	4361,0	0,3	**Packer**	-	-	No	No	N/A
126	3734,0	12,0	**Blank pipe**	-	-	Yes	No	No	**187**	4361,3	11,7	**Nozzle ICD**	4	4,0	No	No	N/A
127	3746,0	12,0	**Blank pipe**	-	-	Yes	No	No	**188**	4373,0	12,0	**Nozzle ICD**	4	4,0	No	No	N/A
128	3758,0	12,0	**Blank pipe**	-	-	Yes	No	No	**189**	4385,0	12,0	**Nozzle ICD**	4	4,0	No	No	N/A
129	3770,0	11,7	**Blank pipe**	-	-	Yes	No	No	**190**	4397,0	12,0	**Nozzle ICD**	4	4,0	No	No	N/A
130	3781,7	0,3	**Packer**	-	-	No	No	N/A	**191**	4409,0	0,3	**Packer**	-	-	No	No	N/A
131	3782,0	12,0	**Nozzle ICD**	4	4,0	Yes	No	N/A	**192**	4409,3	10,0	**Nozzle ICD**	4	4,0	No	No	N/A
									TOE	4419,3	-	-	-	-	-	-	-



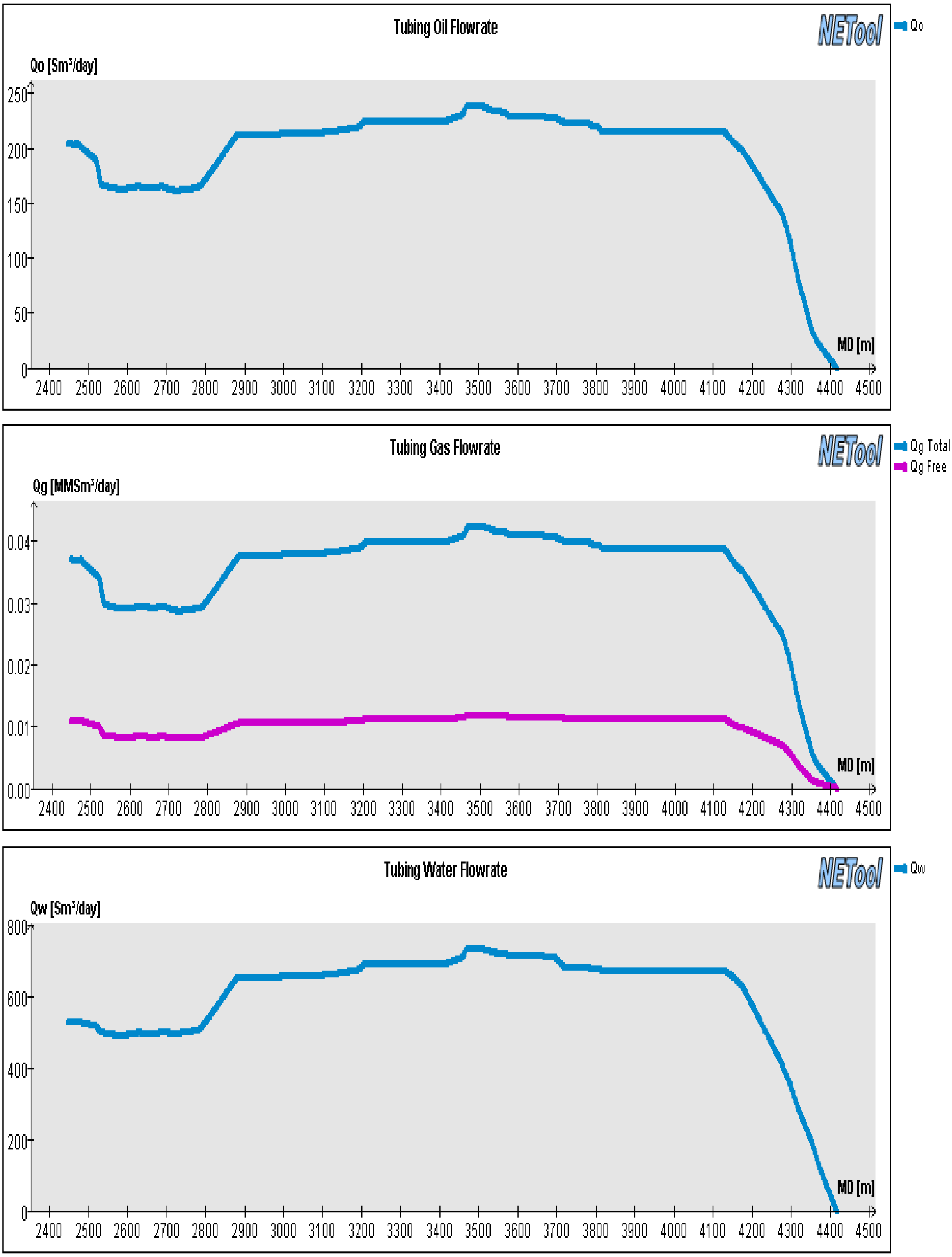
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



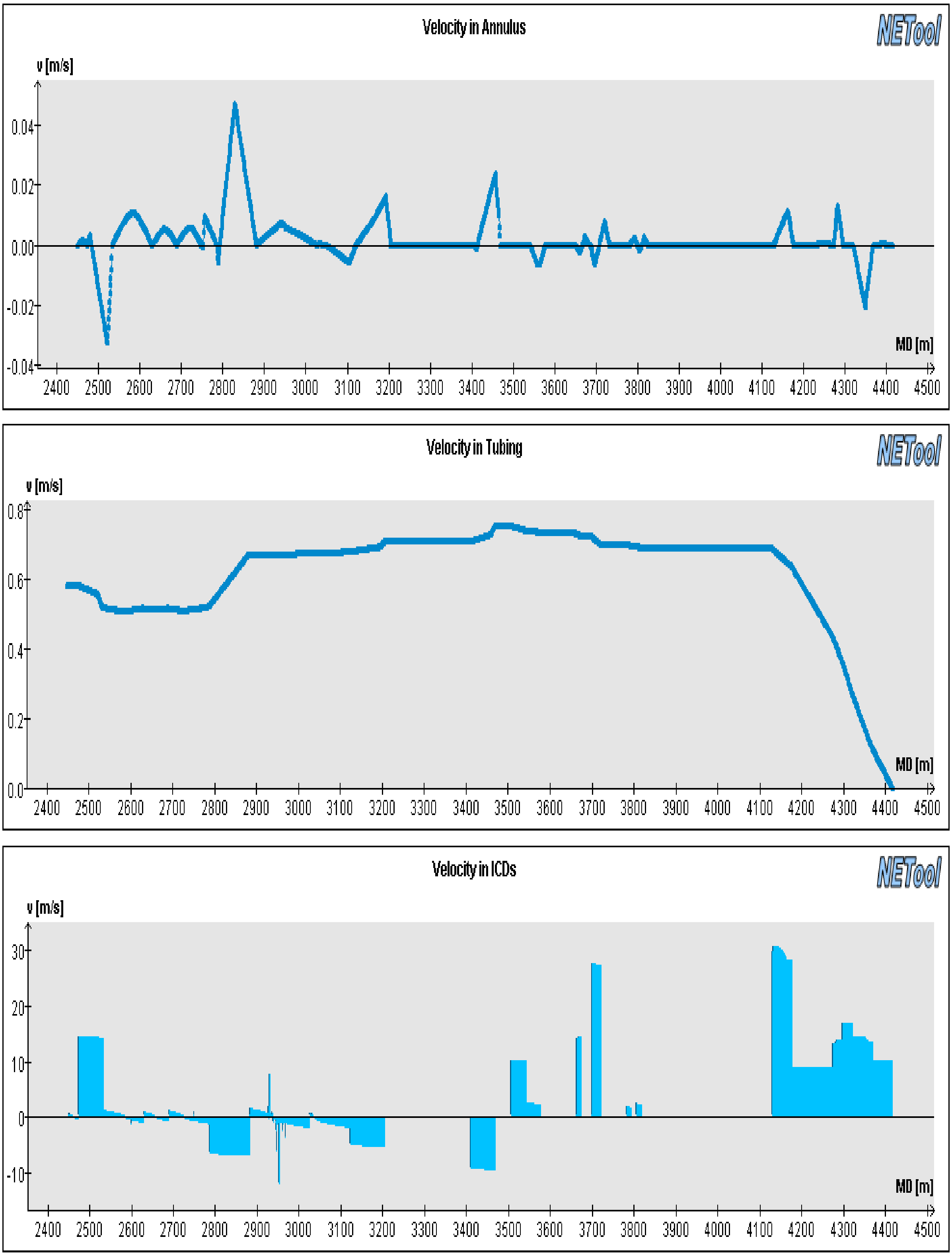
Influx of oil, gas and water from the reservoir and into the well along the wellbore



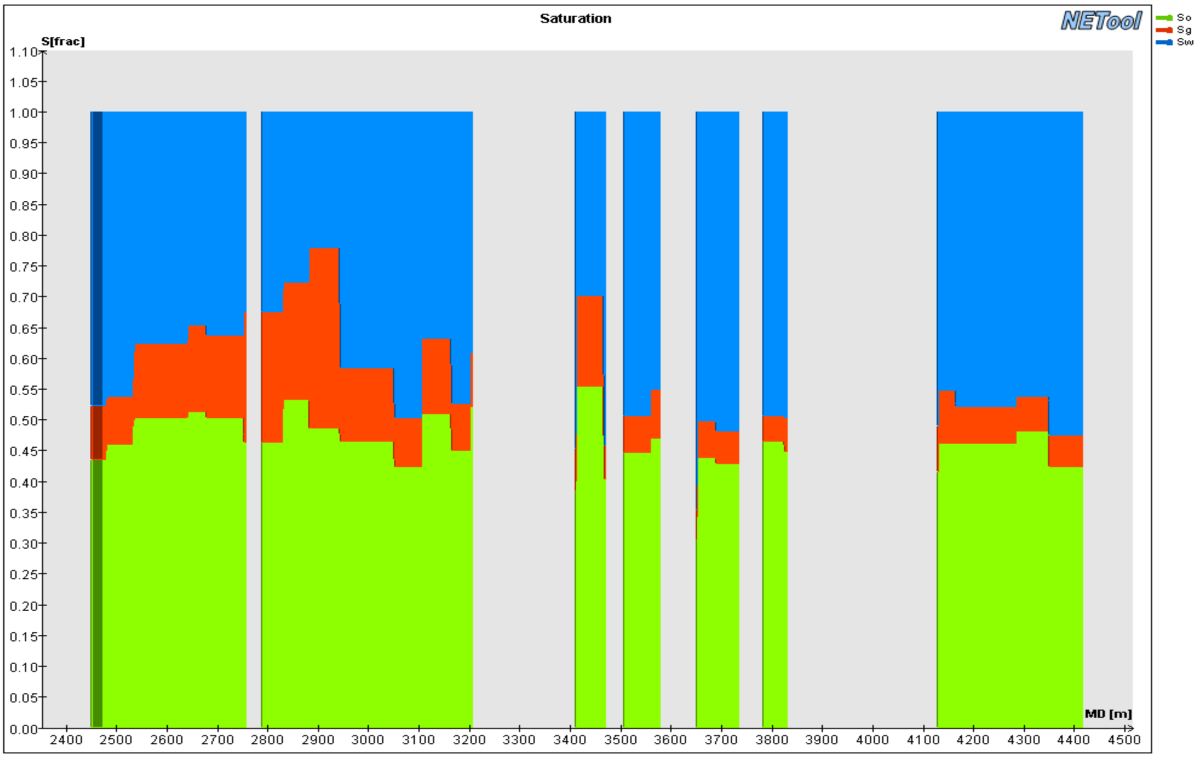
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs

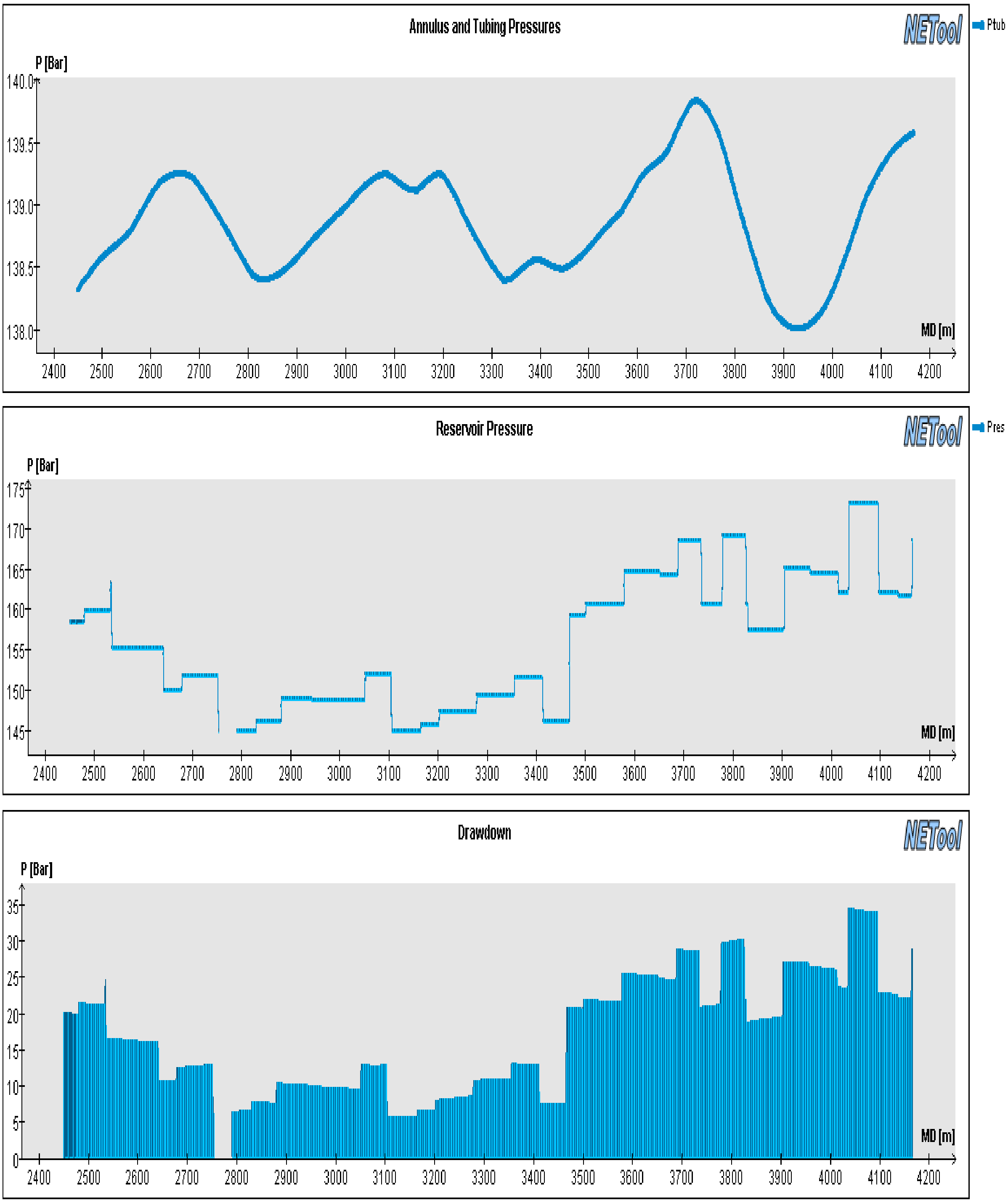


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

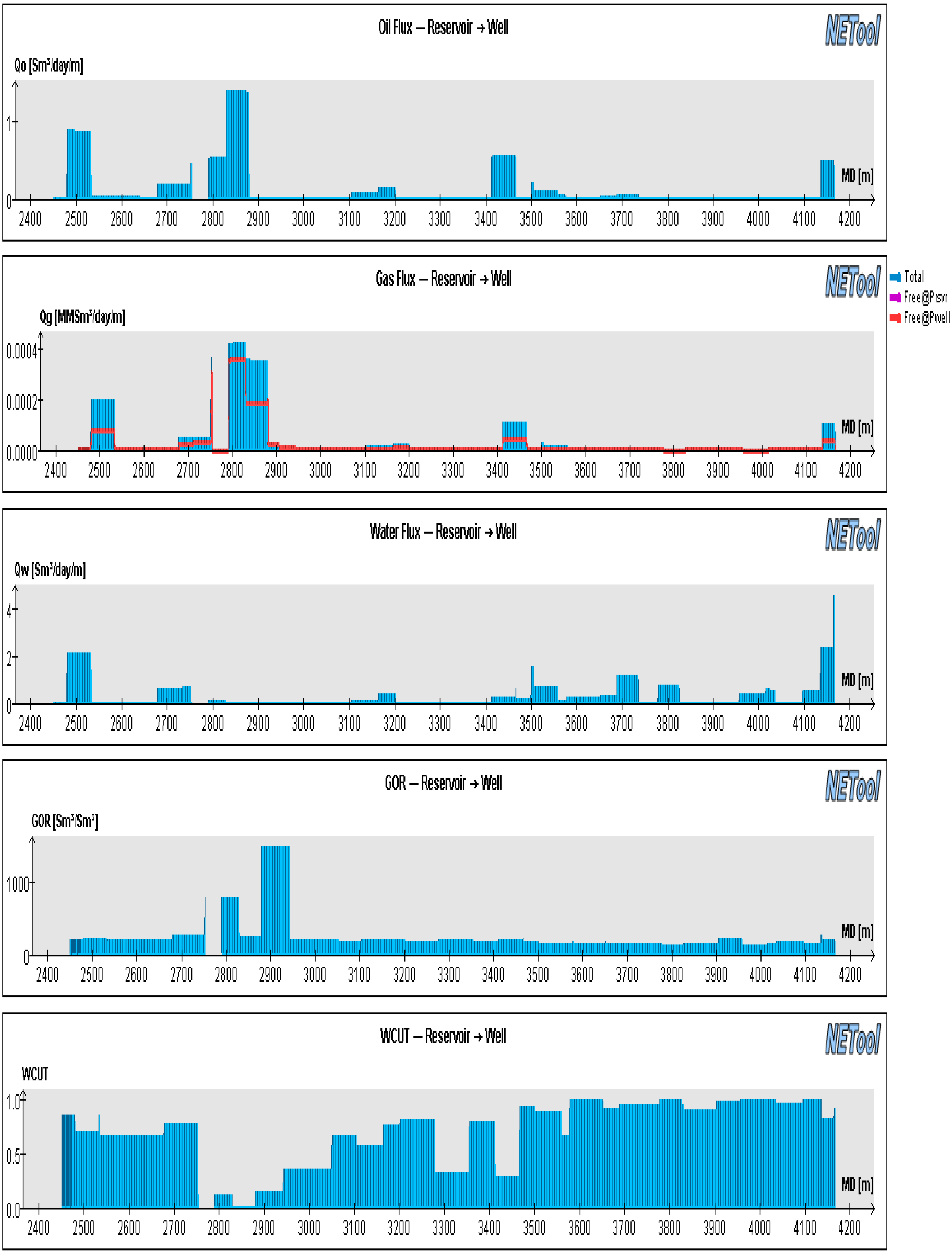
Skin factor plot for the well and given time step

A.52 Plots for well KP9, 4017 days, reference case with Open Hole

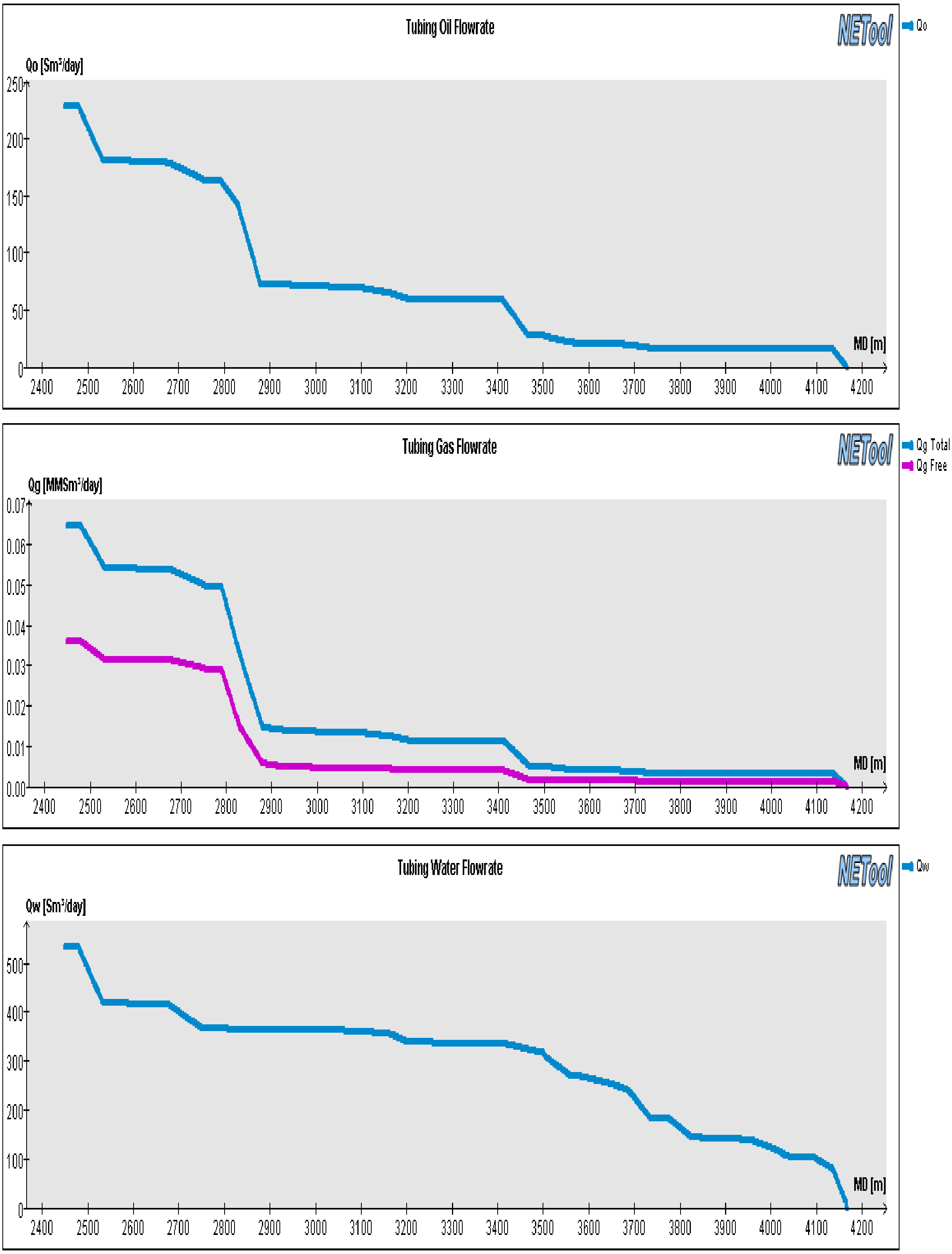
See appendix A… for completion set up.



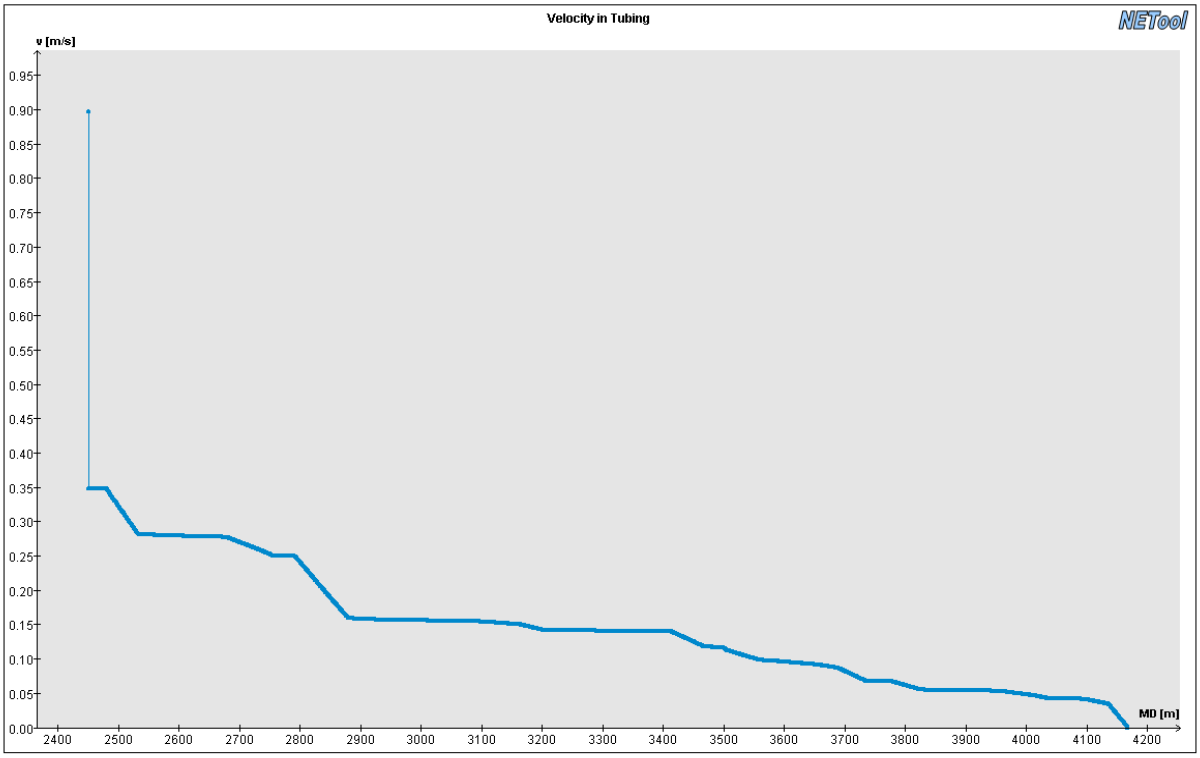
Annulus and tubing pressure, Reservoir pressure and Dradown along the wellbore.



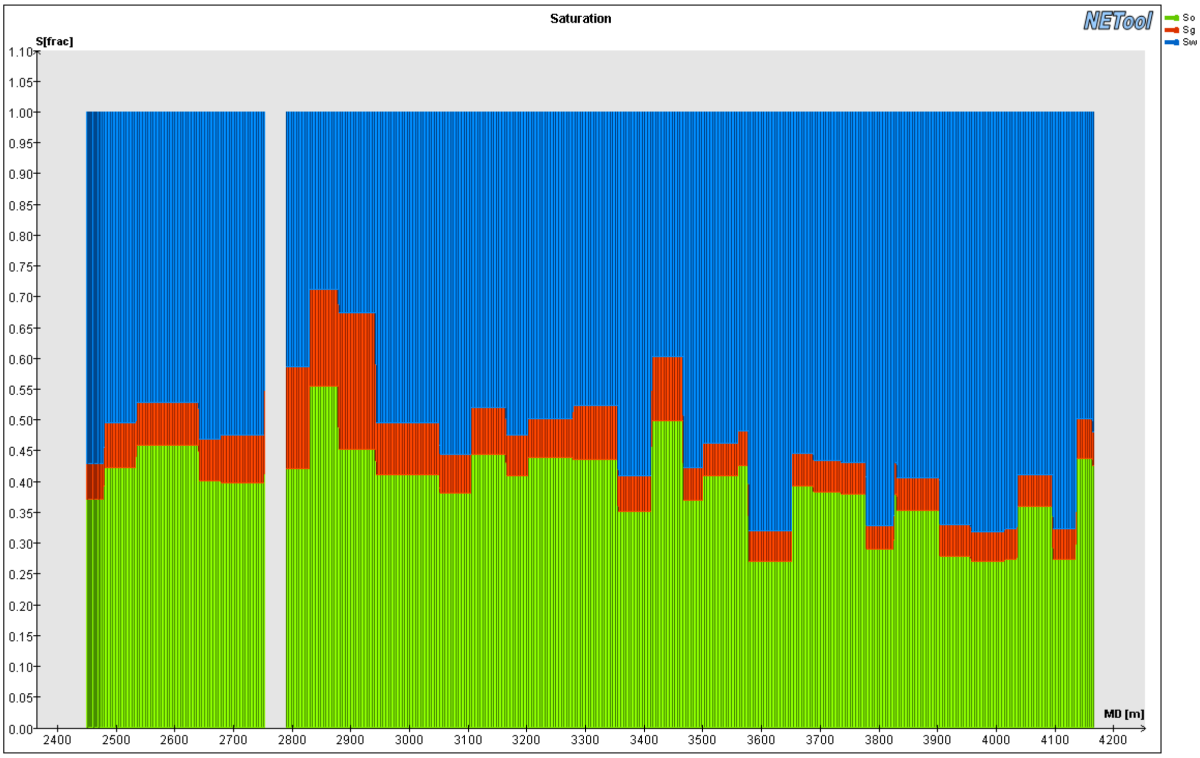
Influx of oil, gas and water from the reservoir and into the well along the wellbore.



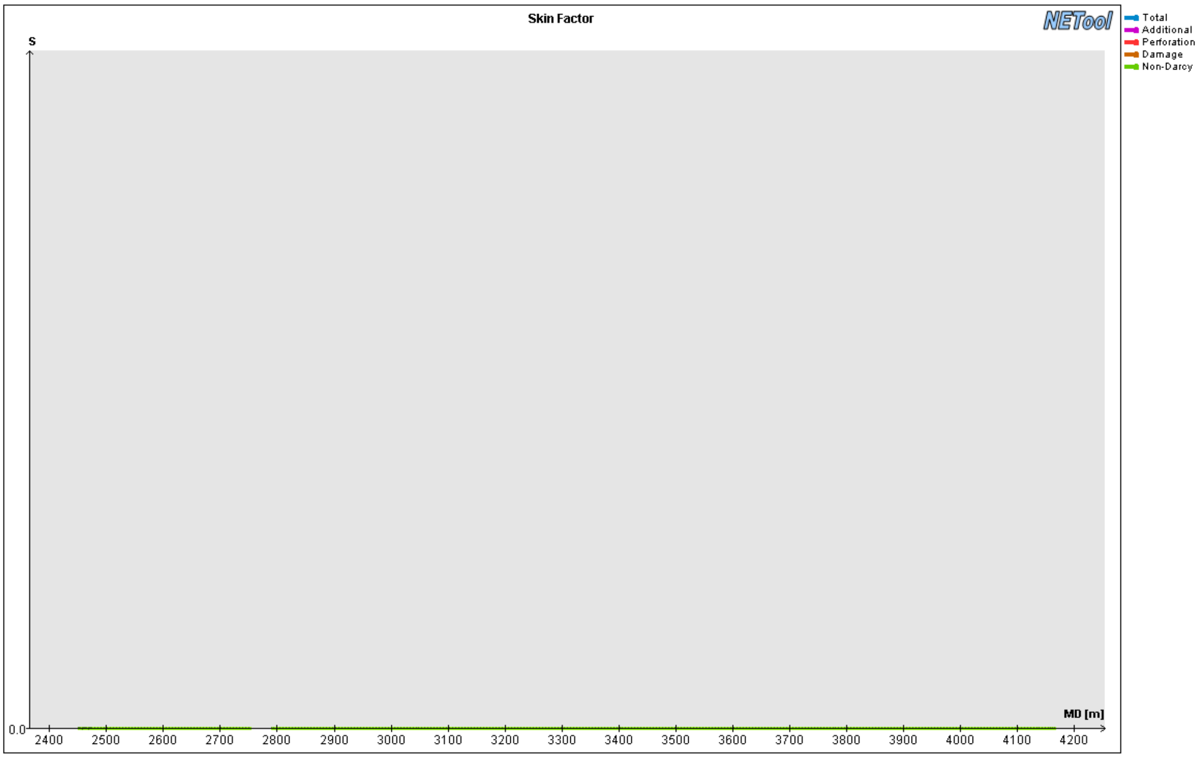
Tubing flow of oil, gas and water along the wellbore.



Velocity of the flow in the tubing along the wellbore.



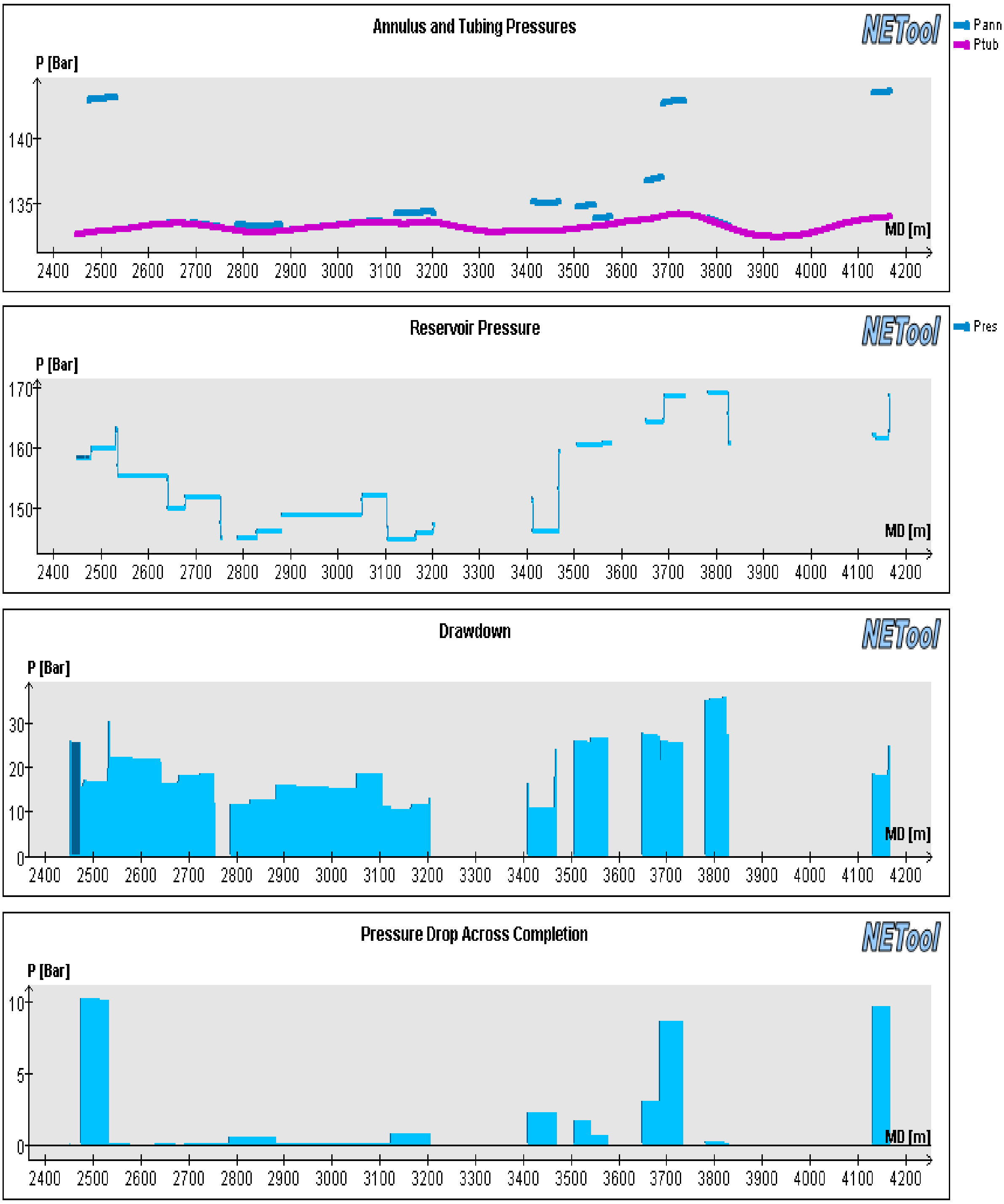
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations.



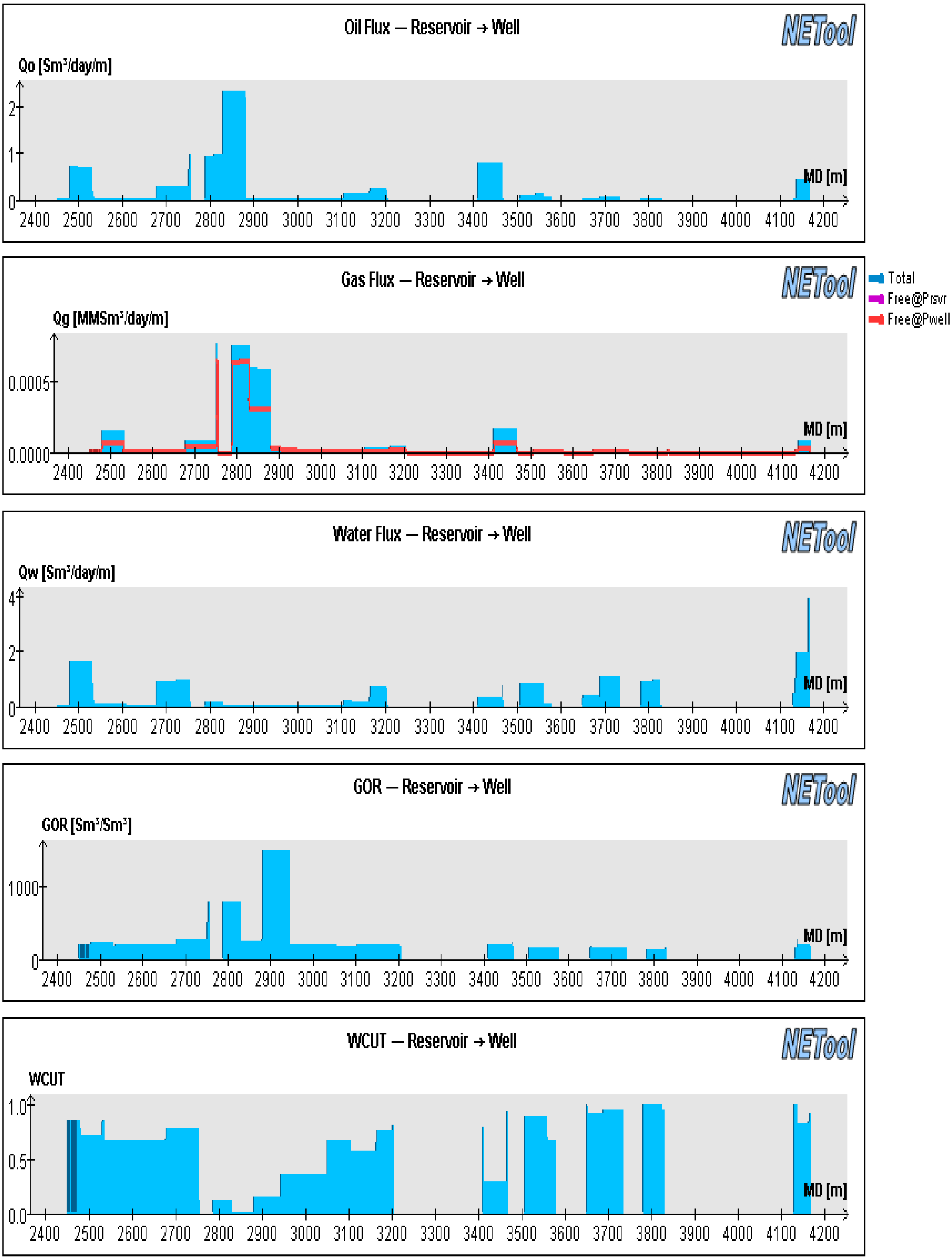
Skin factor plot for the well and given time step.

A.53 Plots for well KP9, 4017 days, Tailored solution ICD

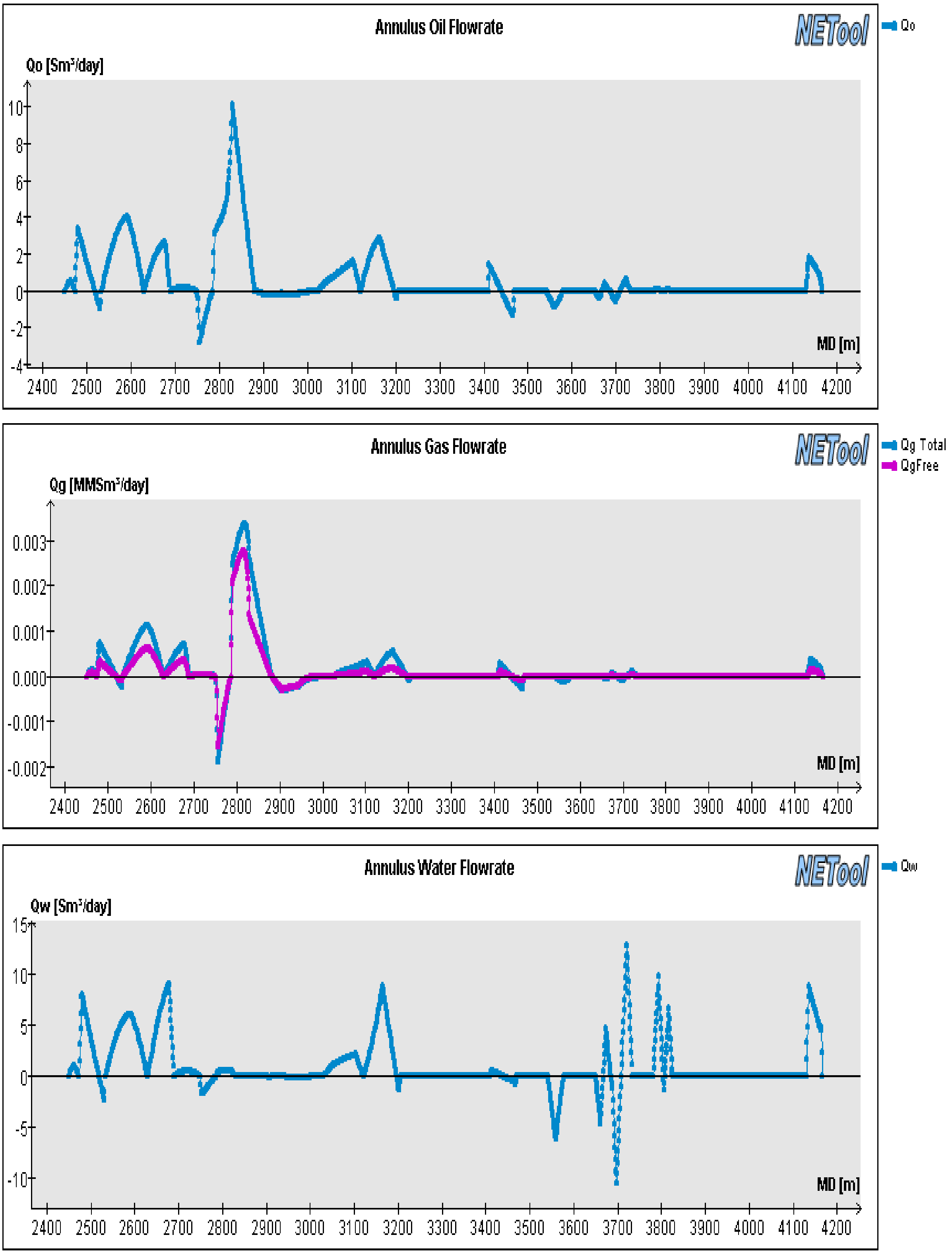
Completion overview for the case: see appendix A…



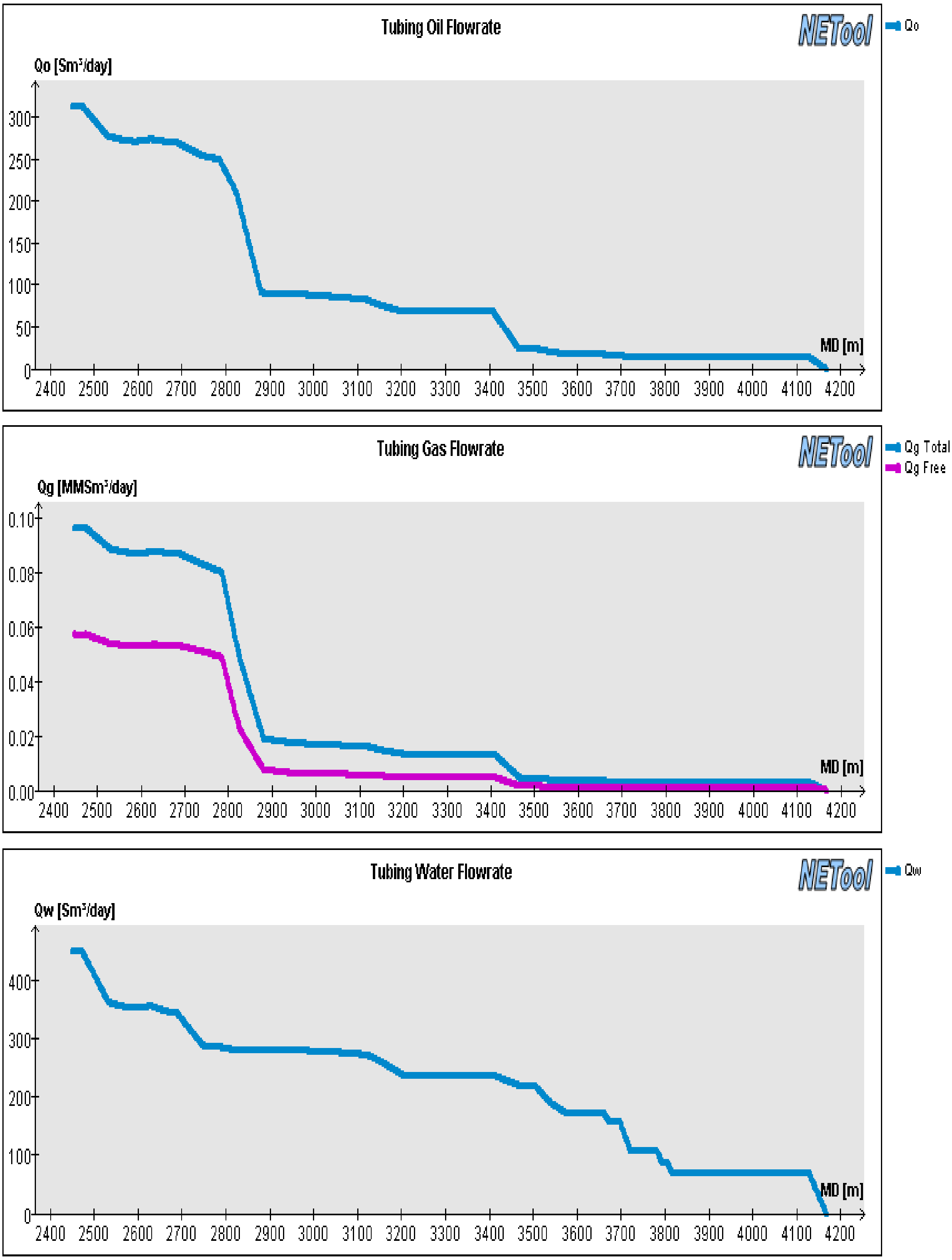
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



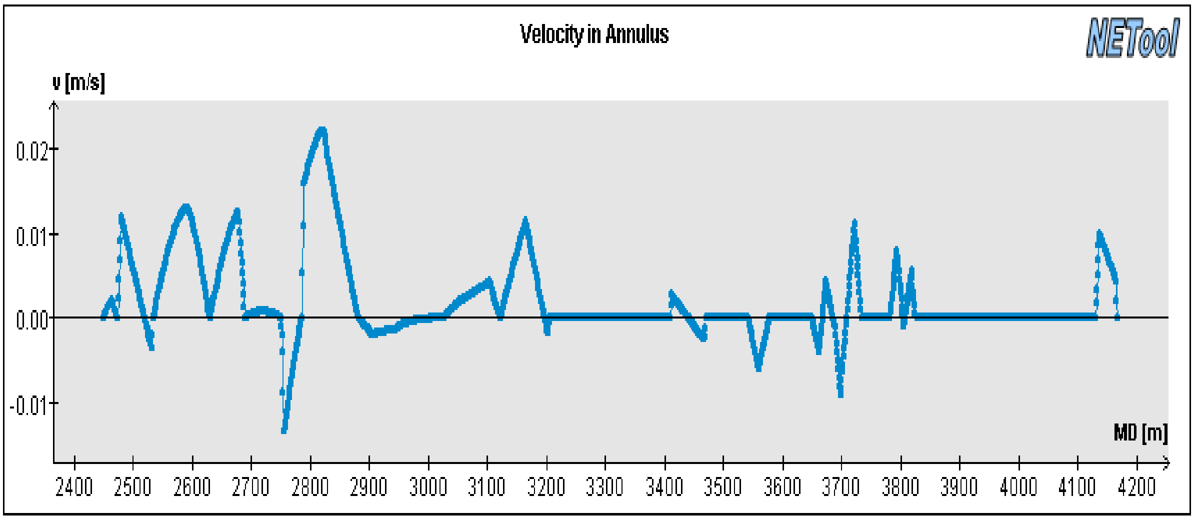
Influx of oil, gas and water from the reservoir and into the well along the wellbore

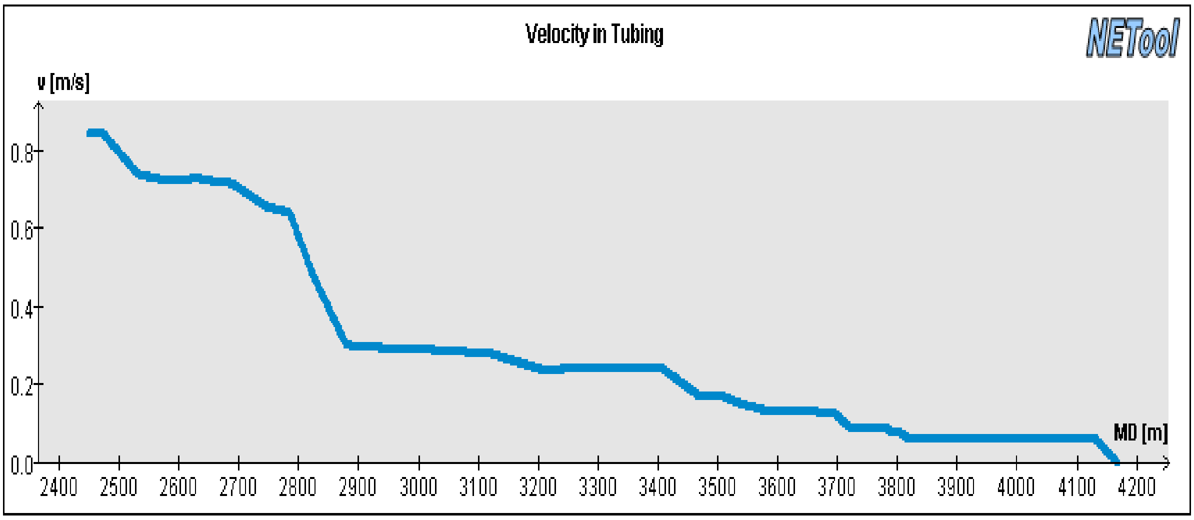


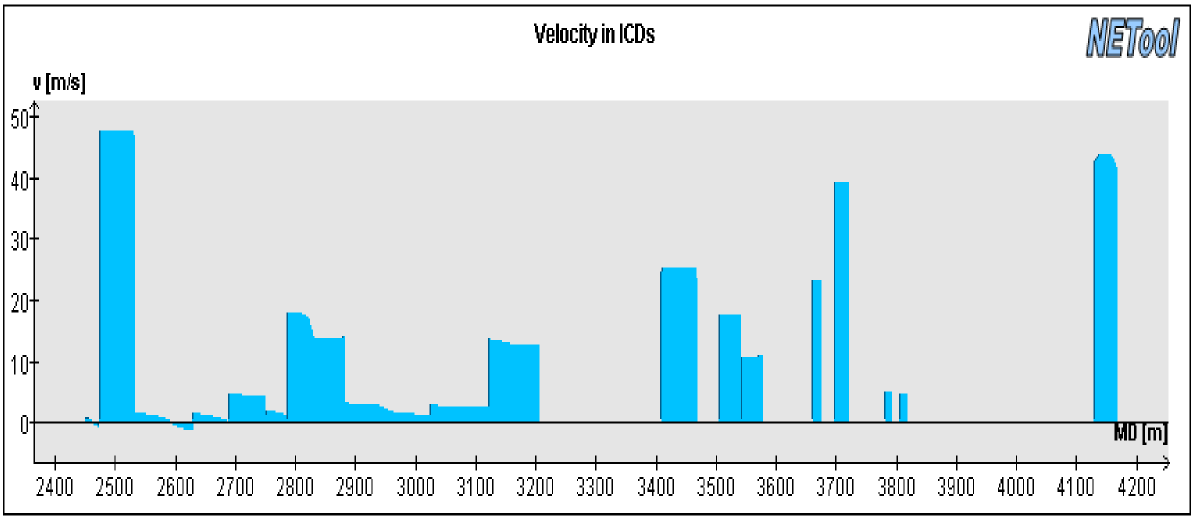
Annulus oil, gas and water flow rate along the wellbore



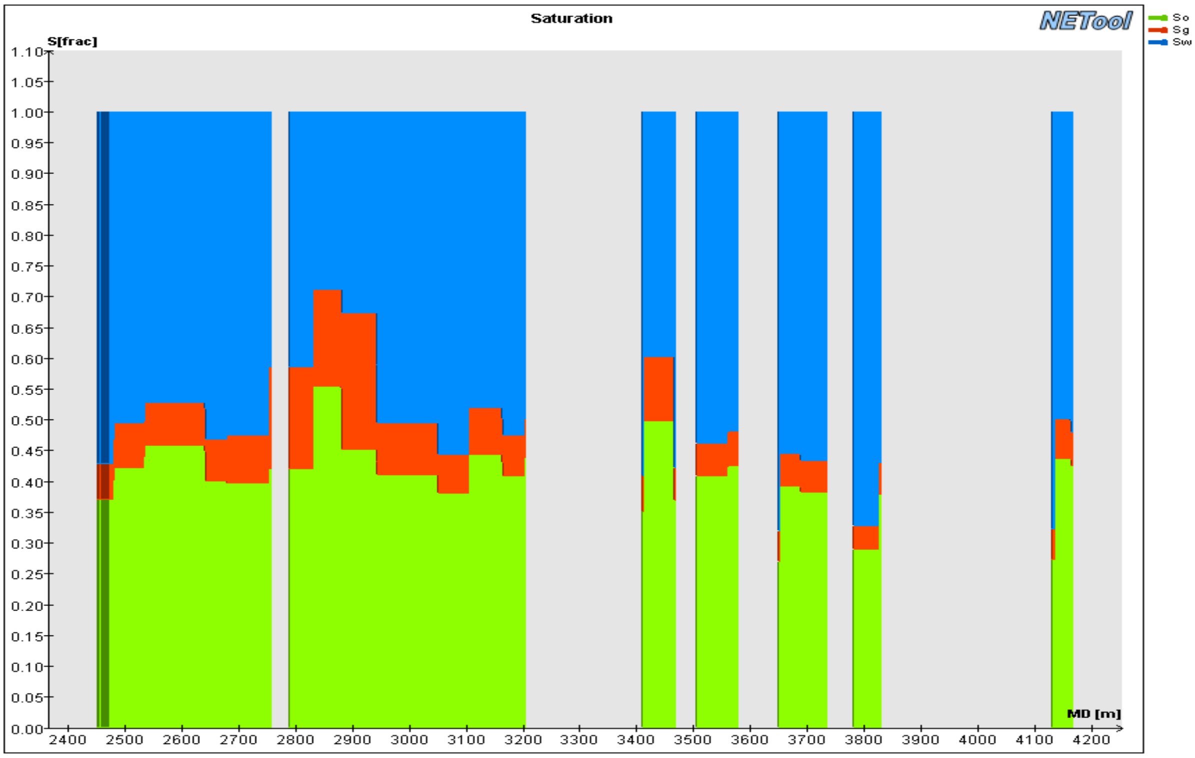
Tubing flow of oil, gas and water along the wellbore







Velocity of the flow in the Annulus, tubing and through the ICDs

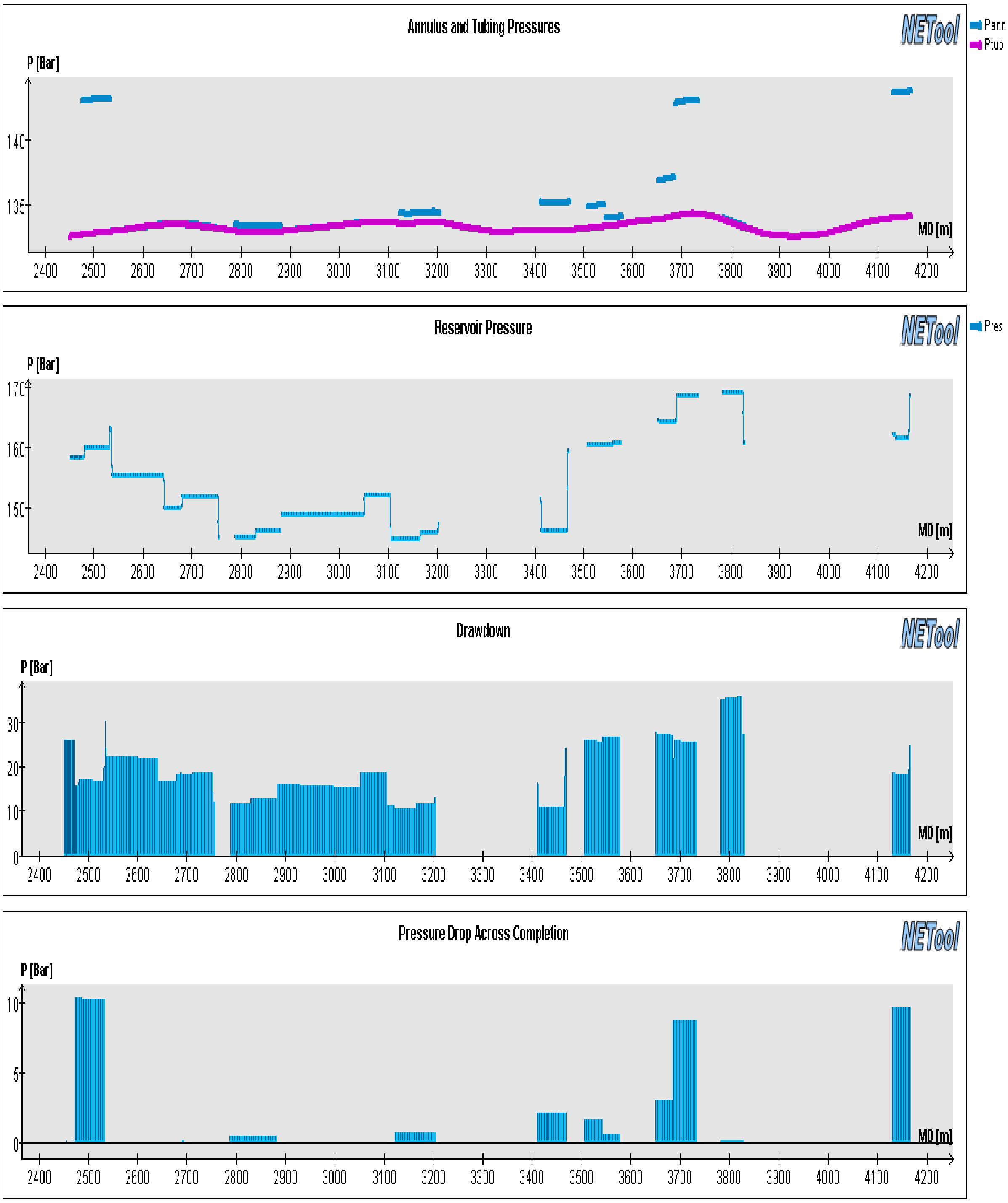


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

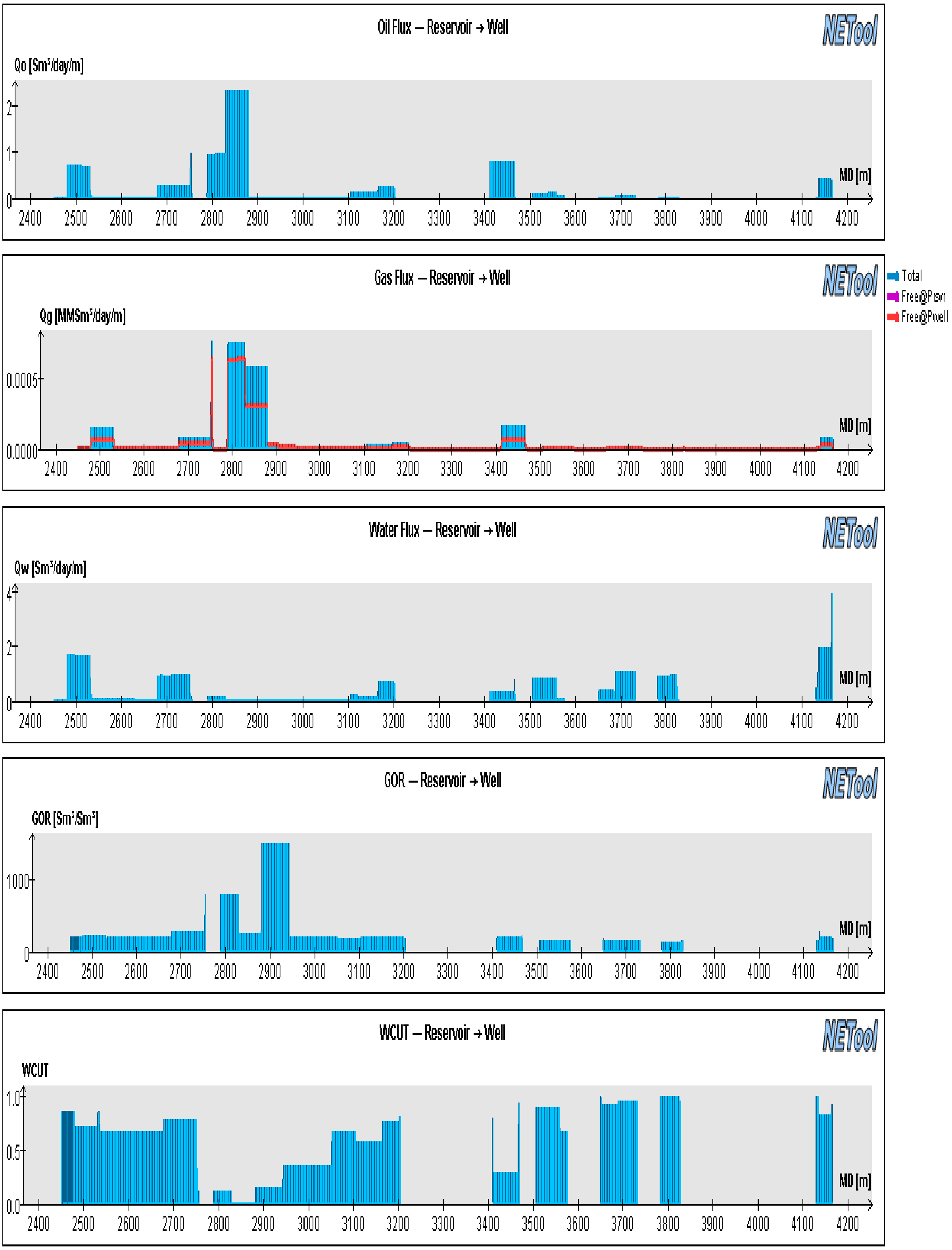
Skin factor plot for the well and given time step

A.54 Plots for well KP9, 4017 days, Tailored ICD design, 5 ½" Screen size

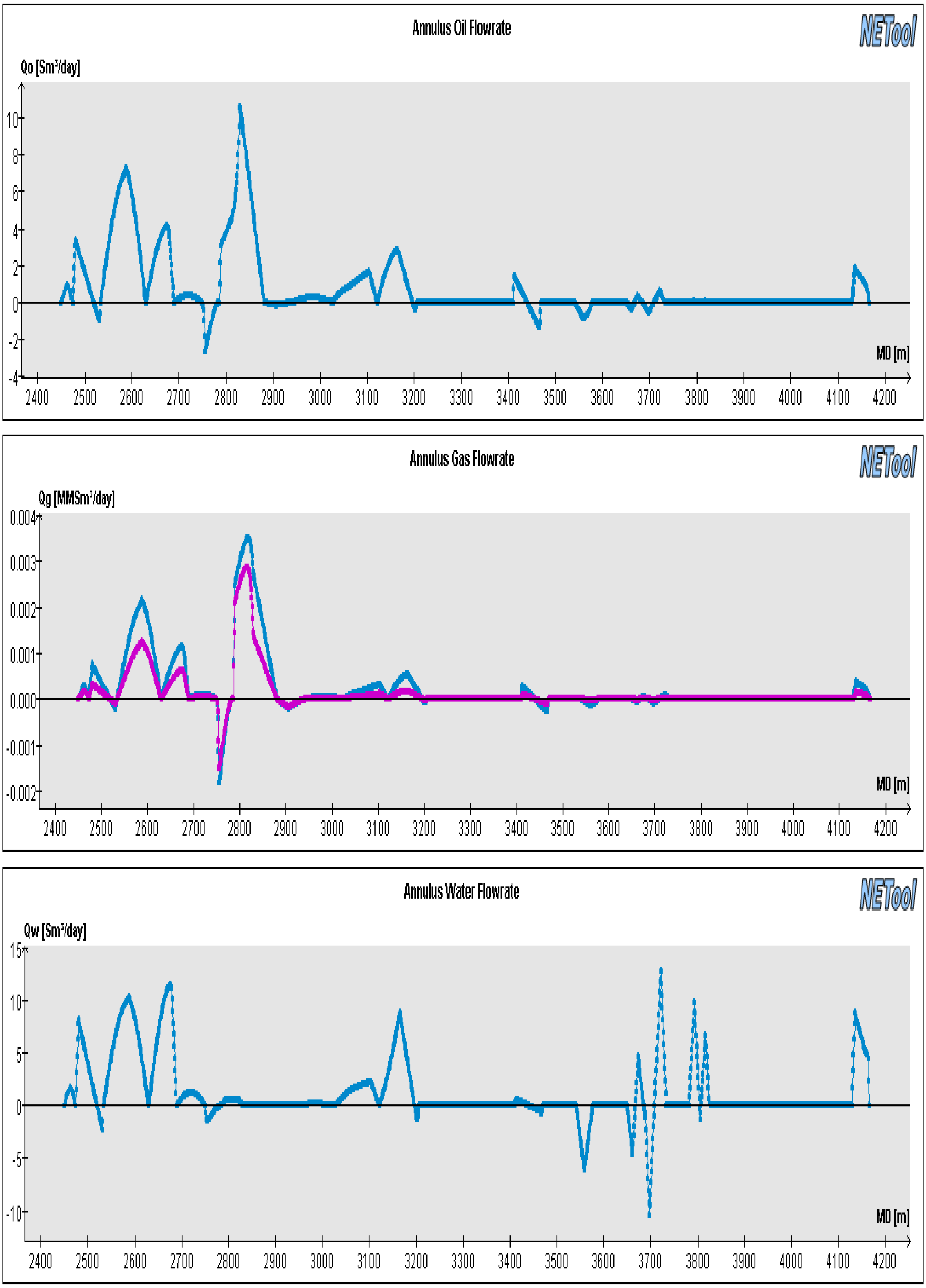
Completion overview for the case: see appendix A….



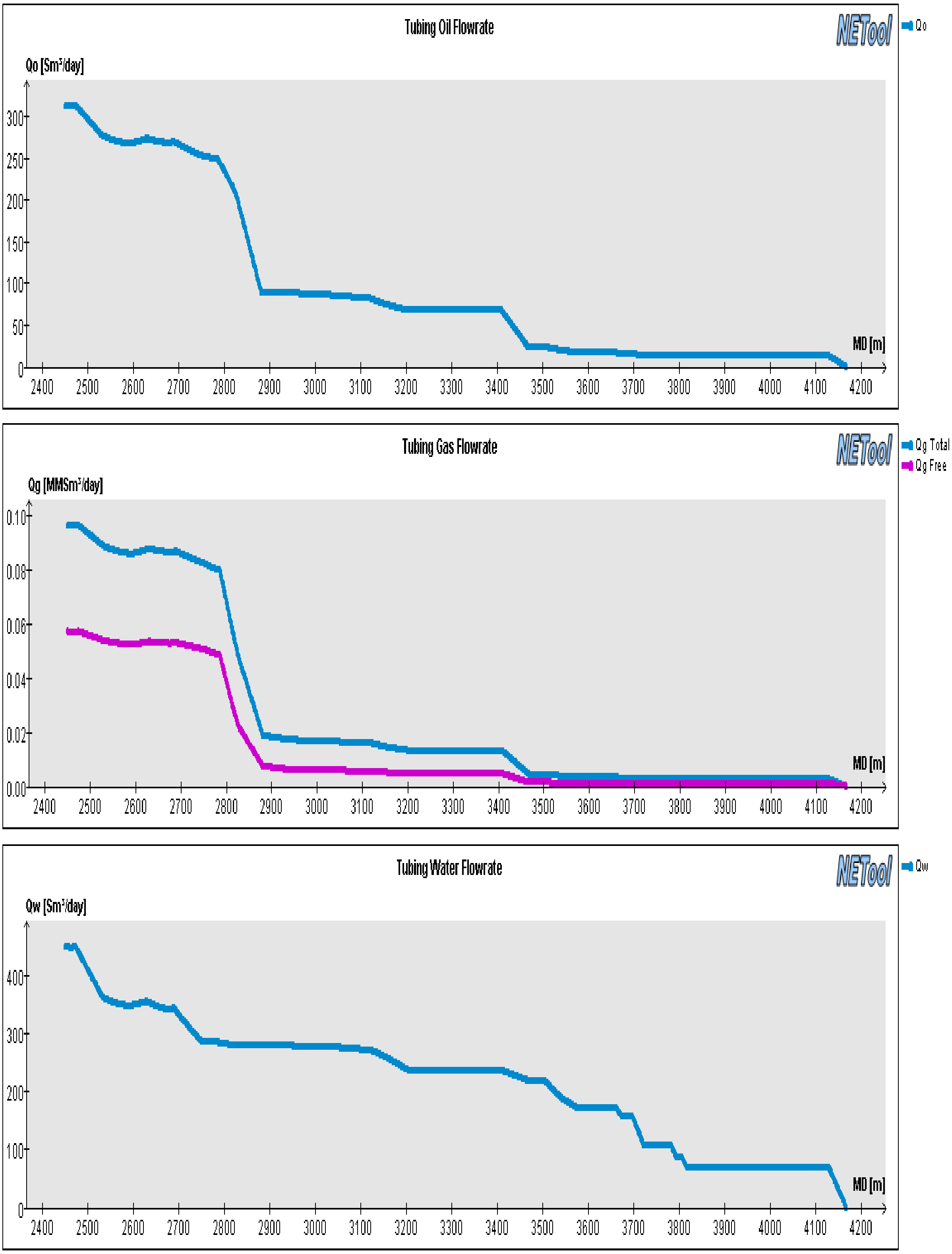
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



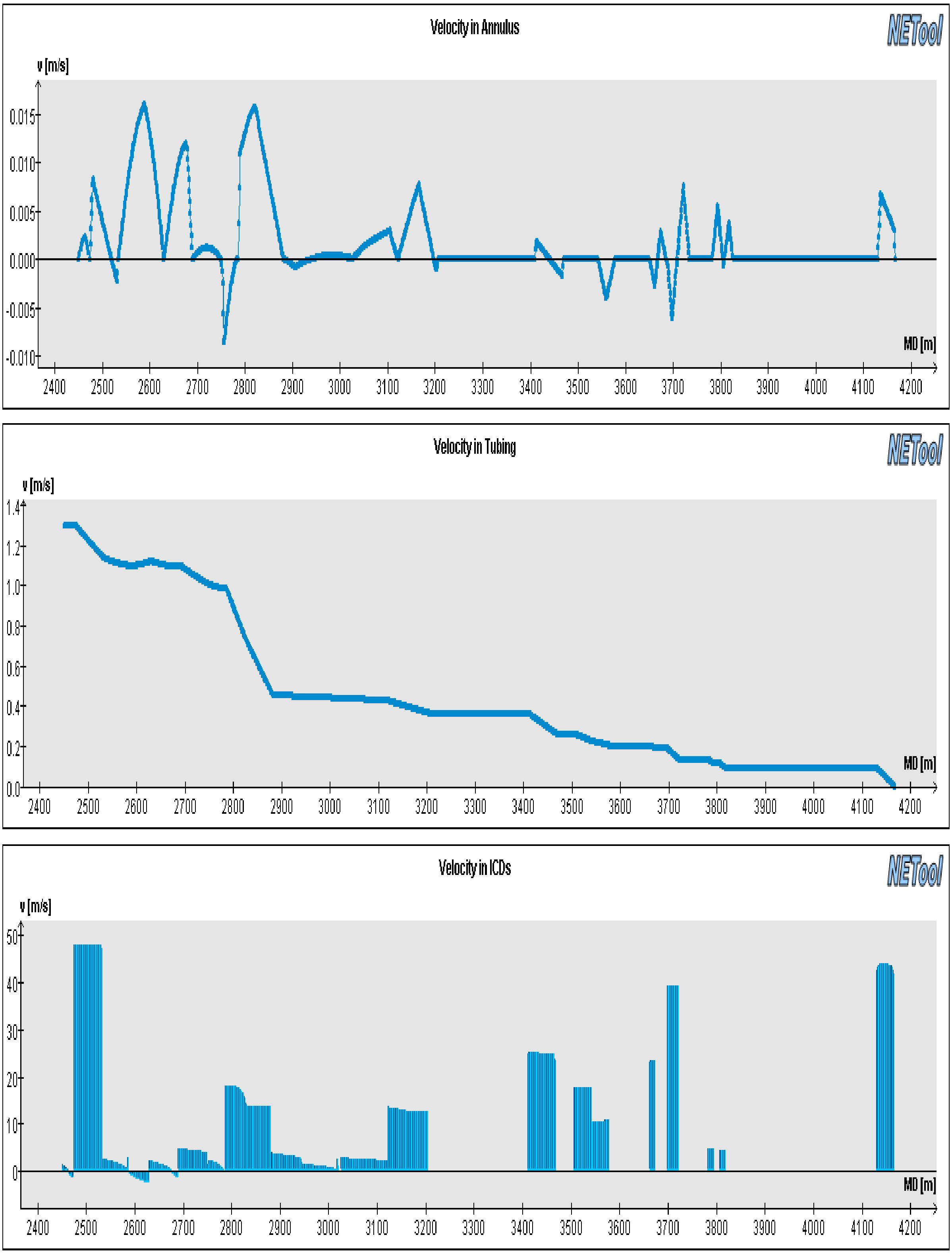
Influx of oil, gas and water from the reservoir and into the well along the wellbore



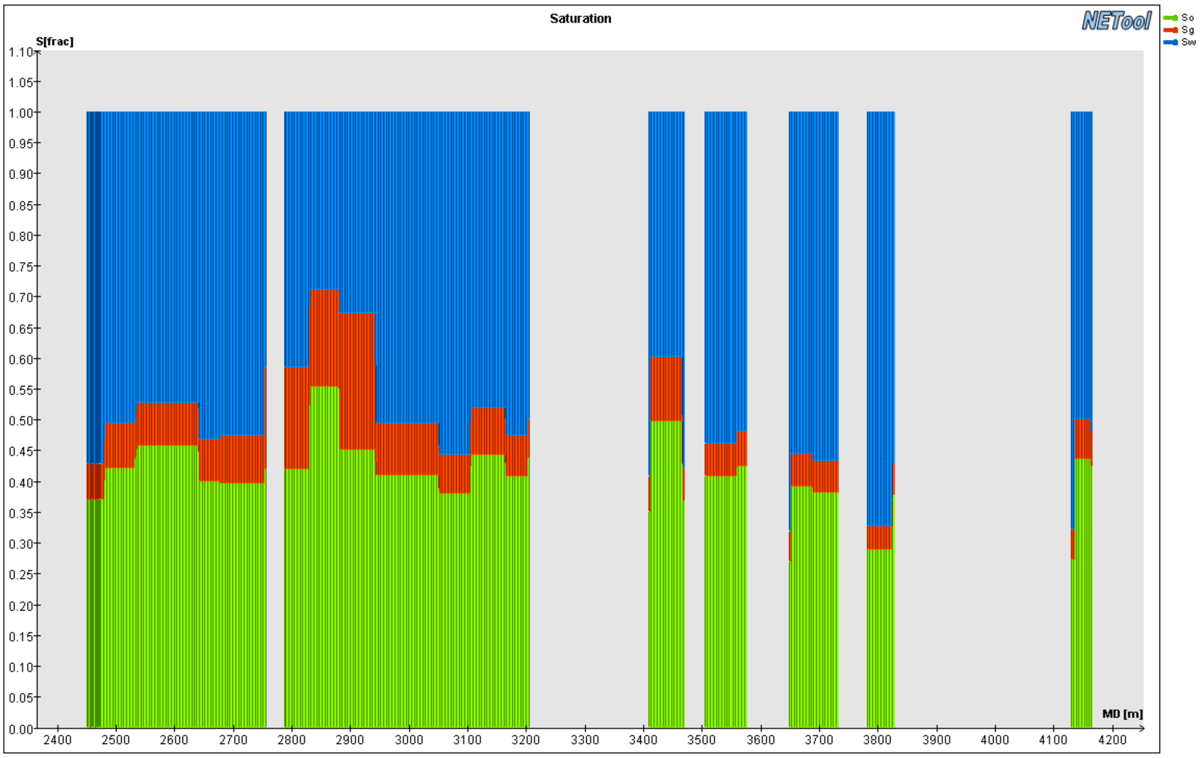
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs

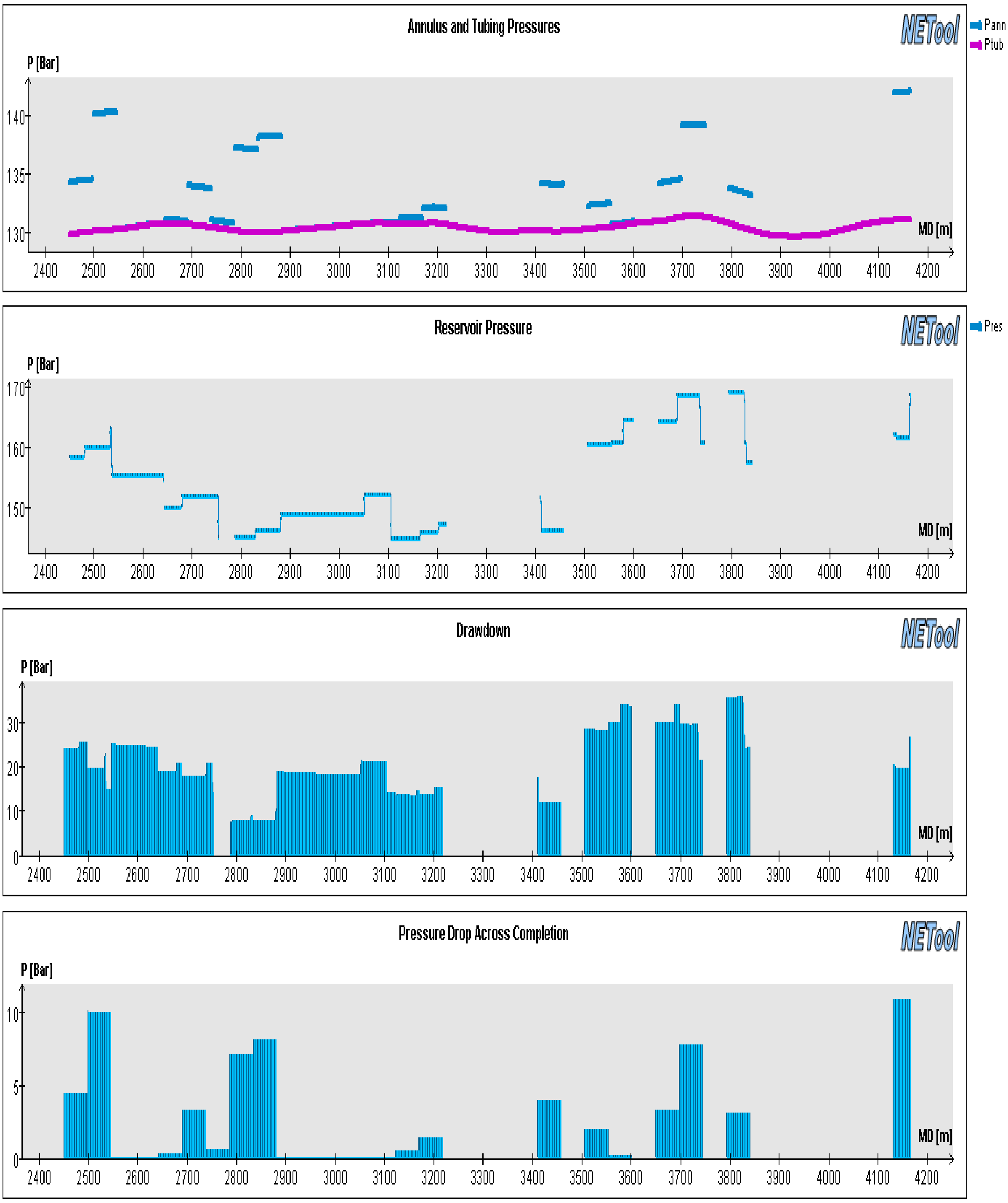


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

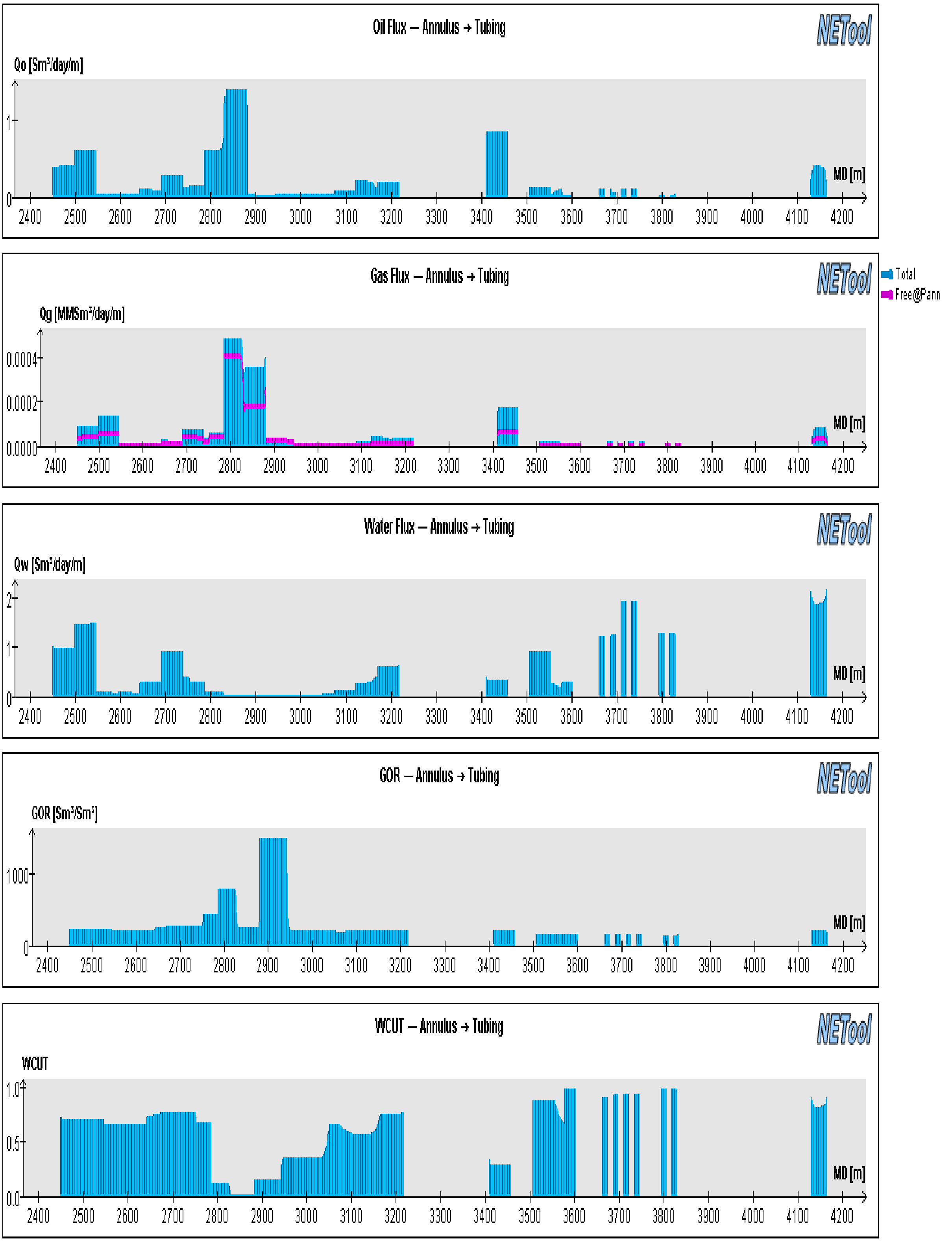
Skin factor plot for the well and given time step

A.55 Plots for well KP9, 4017 days, Practical ICD case, 4x4mm ICD and BP

Completion overview for the case: see appendix A….

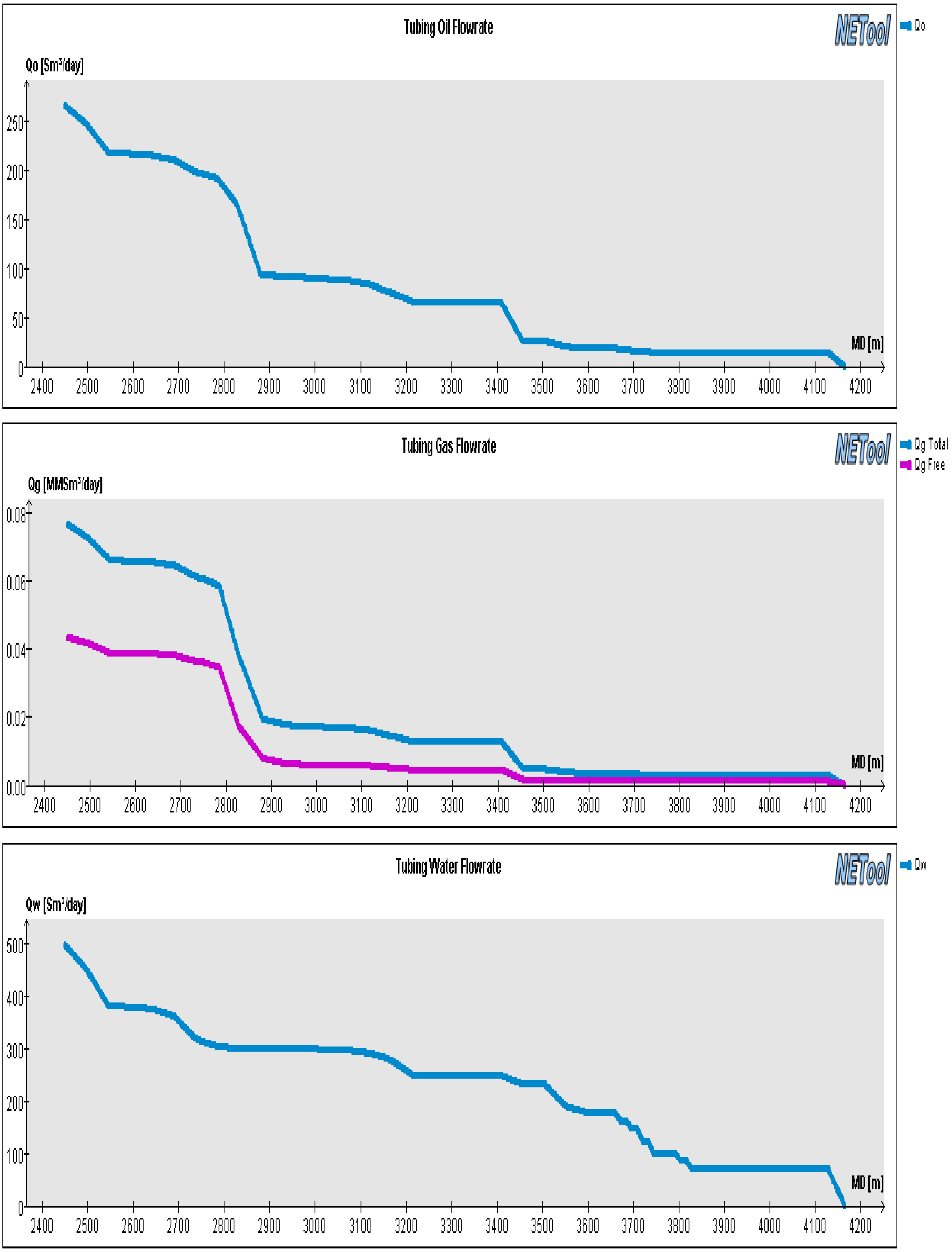


Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.

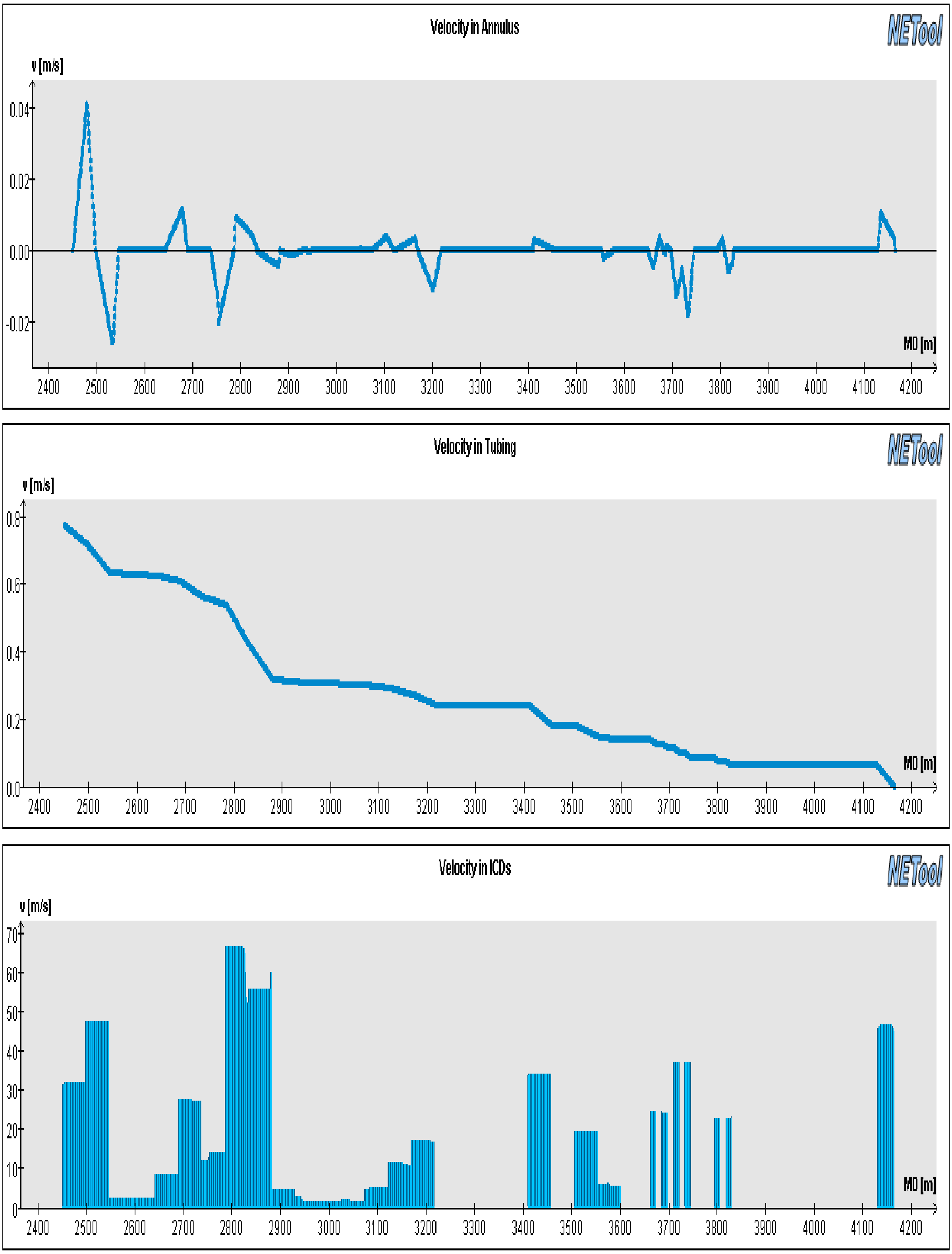


Influx of oil, gas and water from the reservoir and into the well along the wellbore

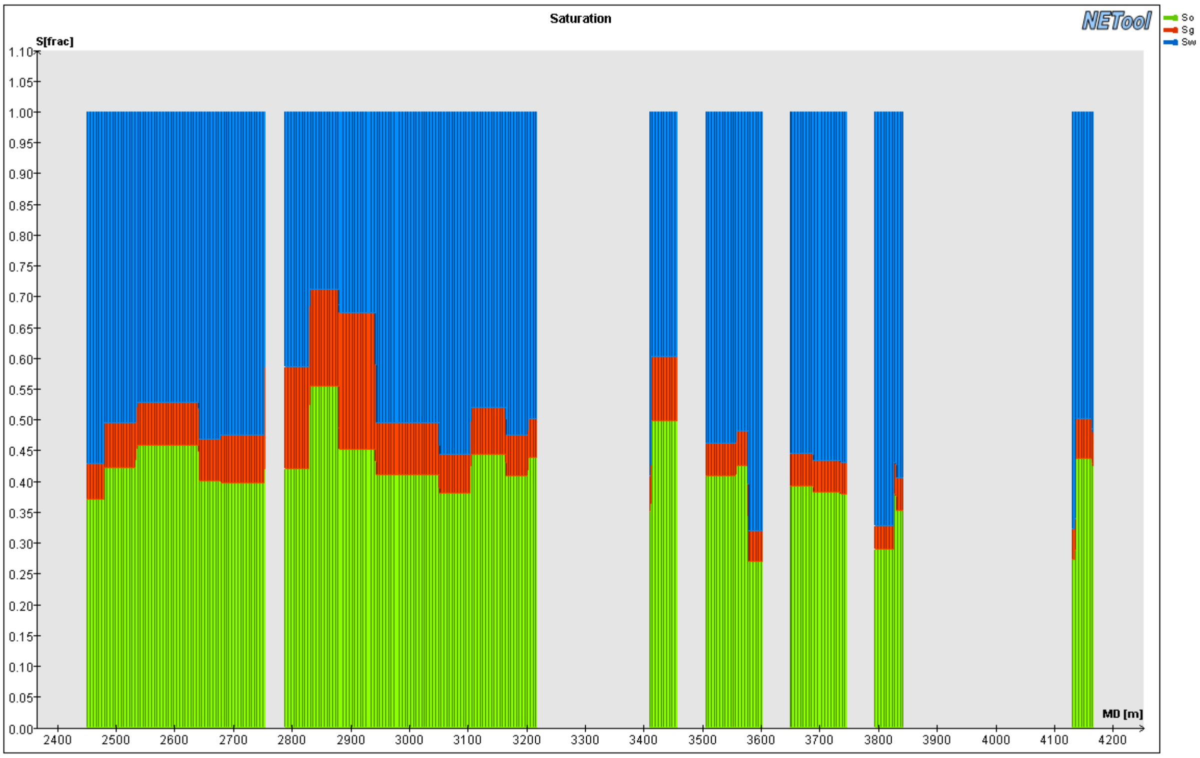
Annulus oil, gas and water flow rate along the wellbore



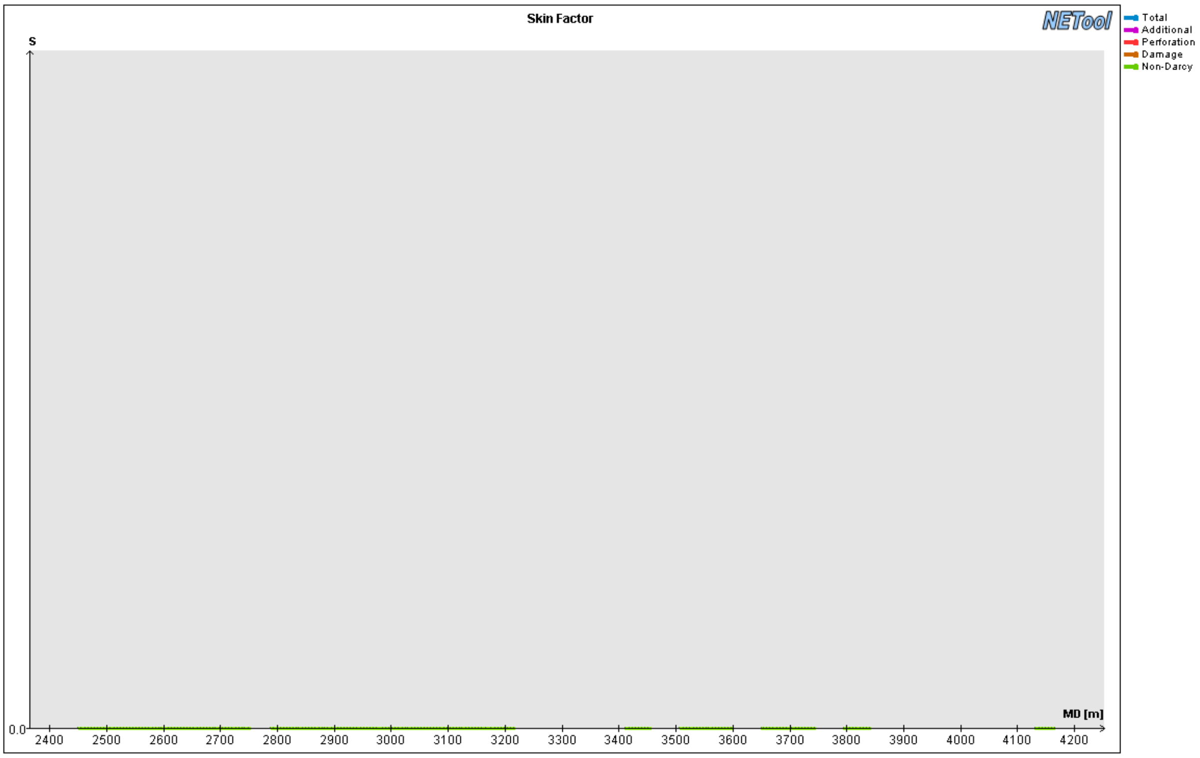
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



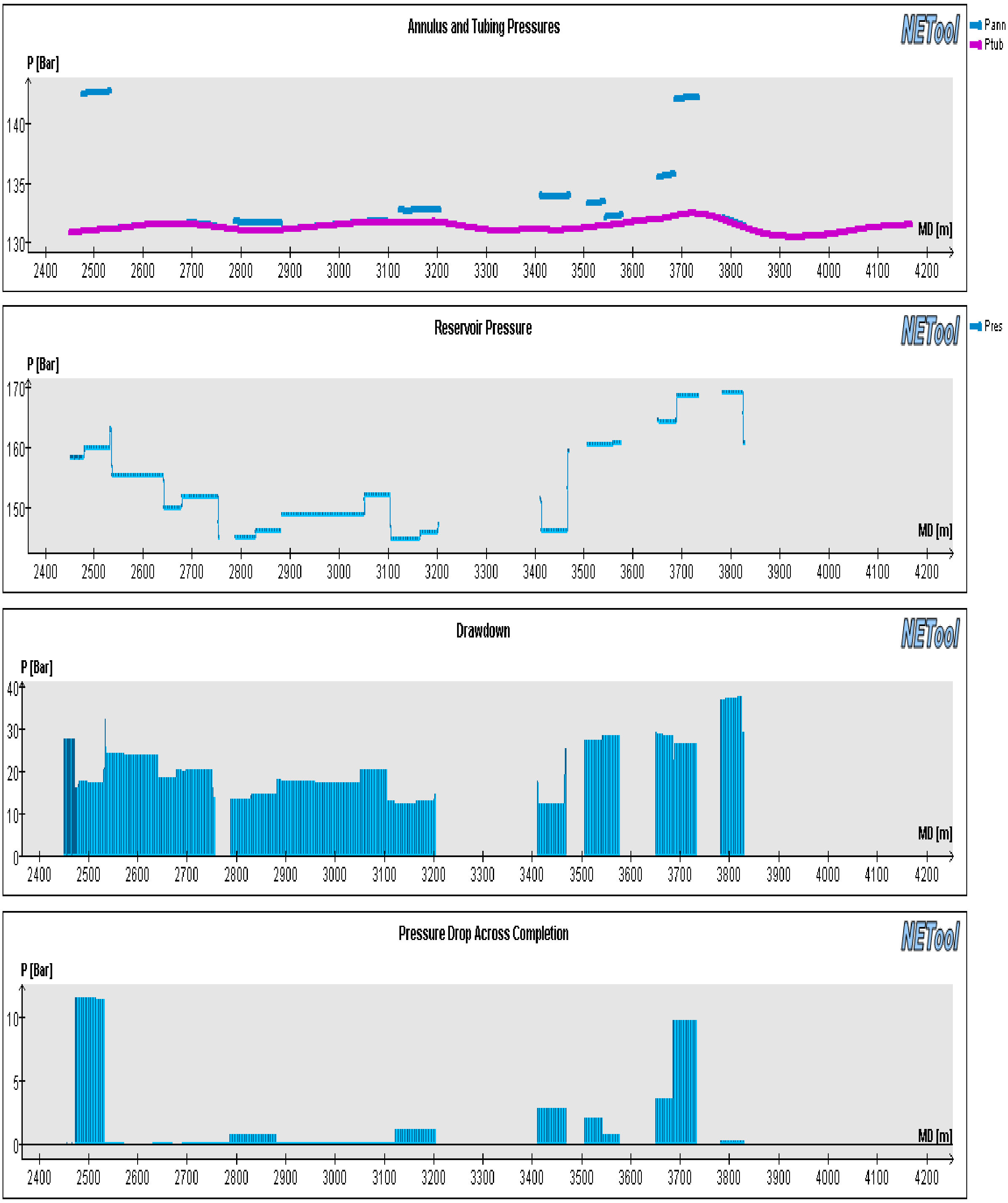
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



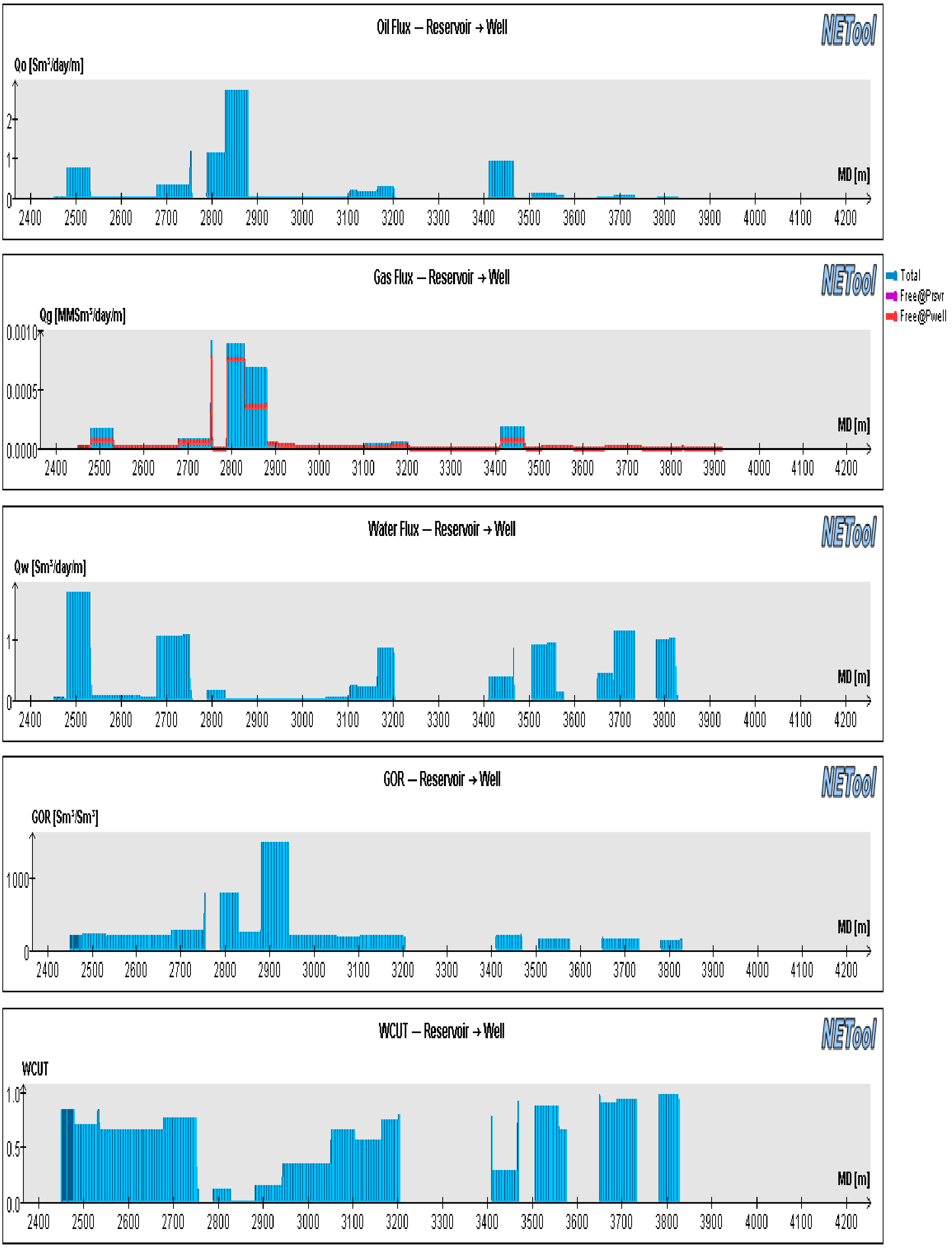
Skin factor plot for the well and given time step

A.56 Plots for well KP9, 4017 days, Tailored ICD setting run with 250m shorter wellbore

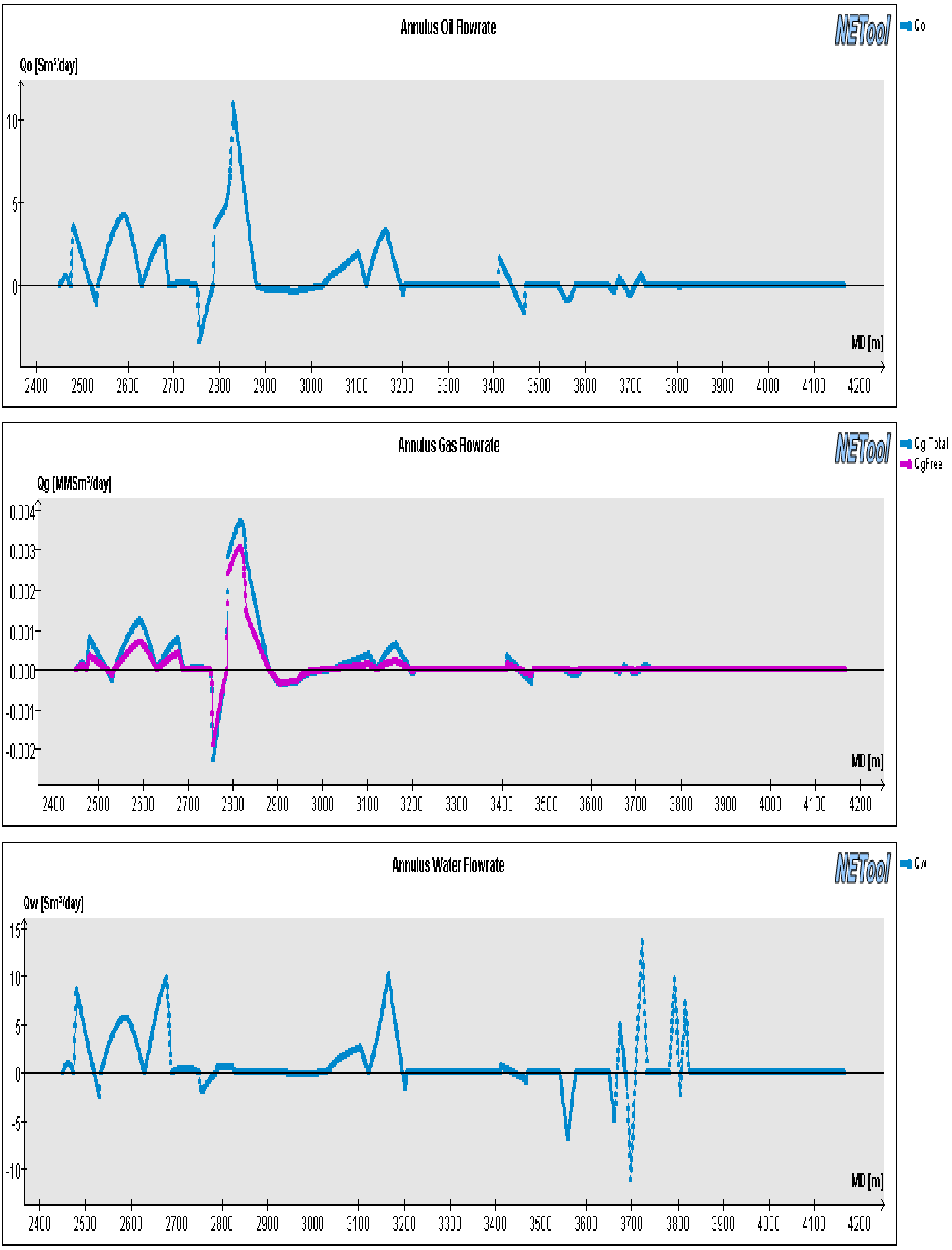
Completion overview for the case: see appendix A…



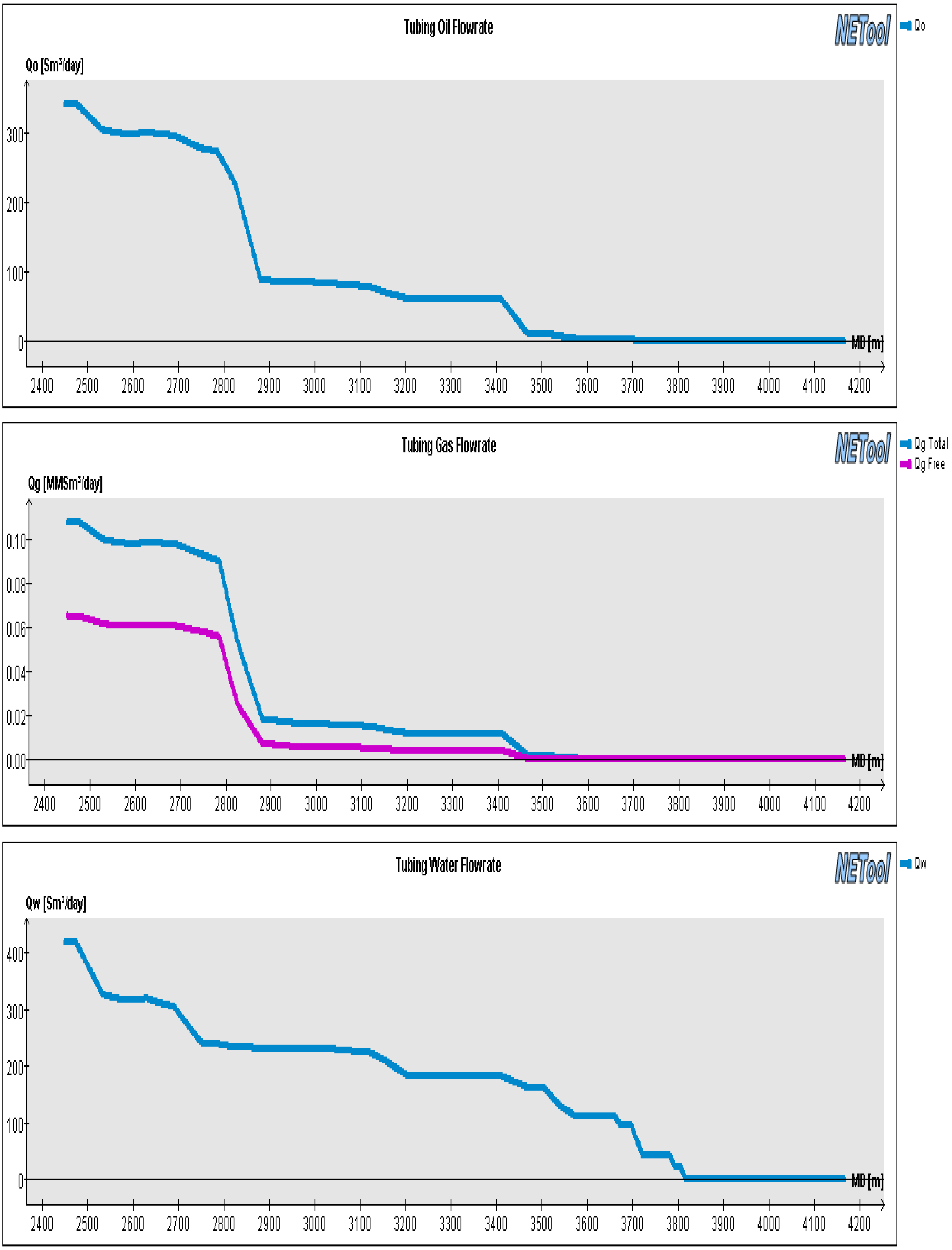
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



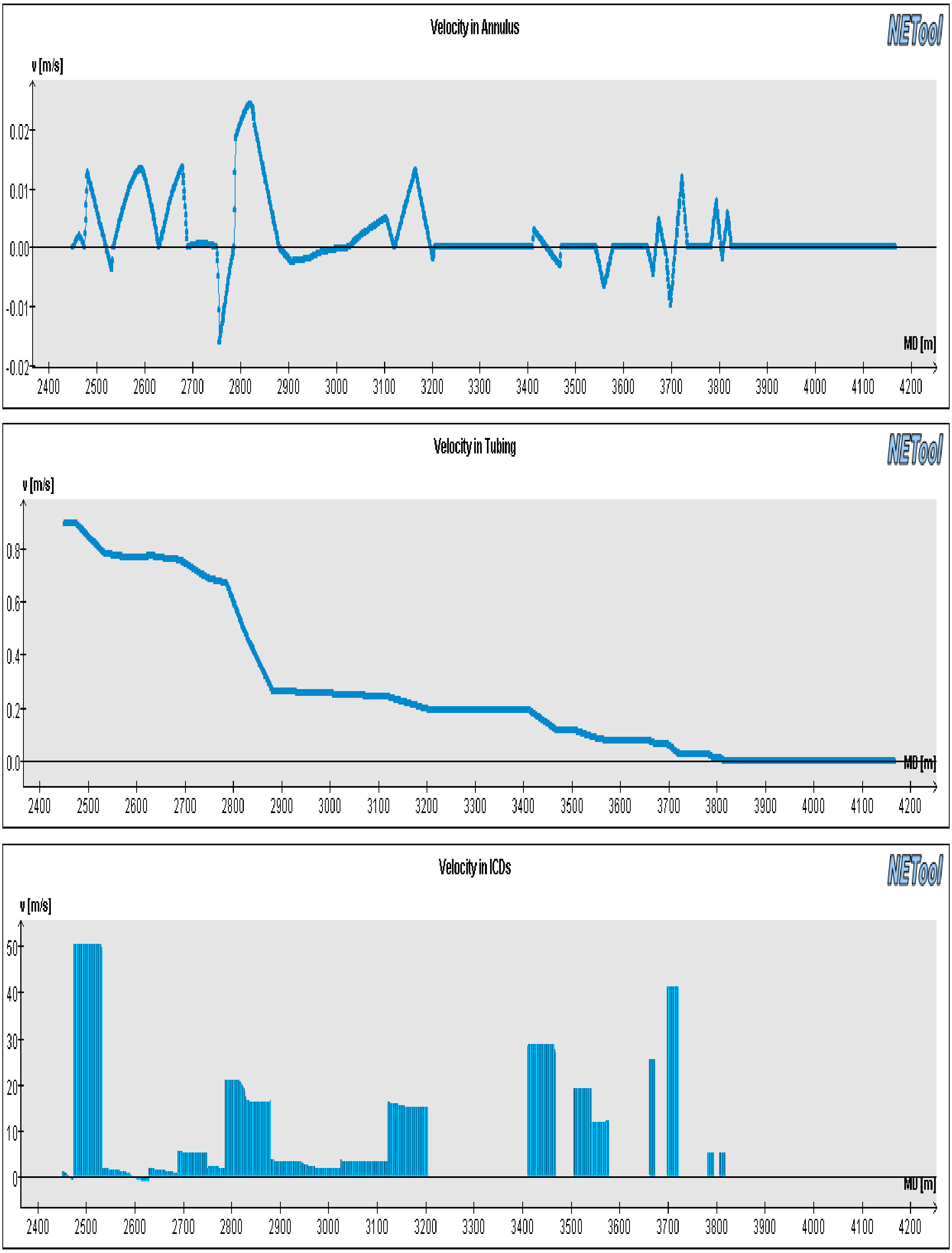
Influx of oil, gas and water from the reservoir and into the well along the wellbore



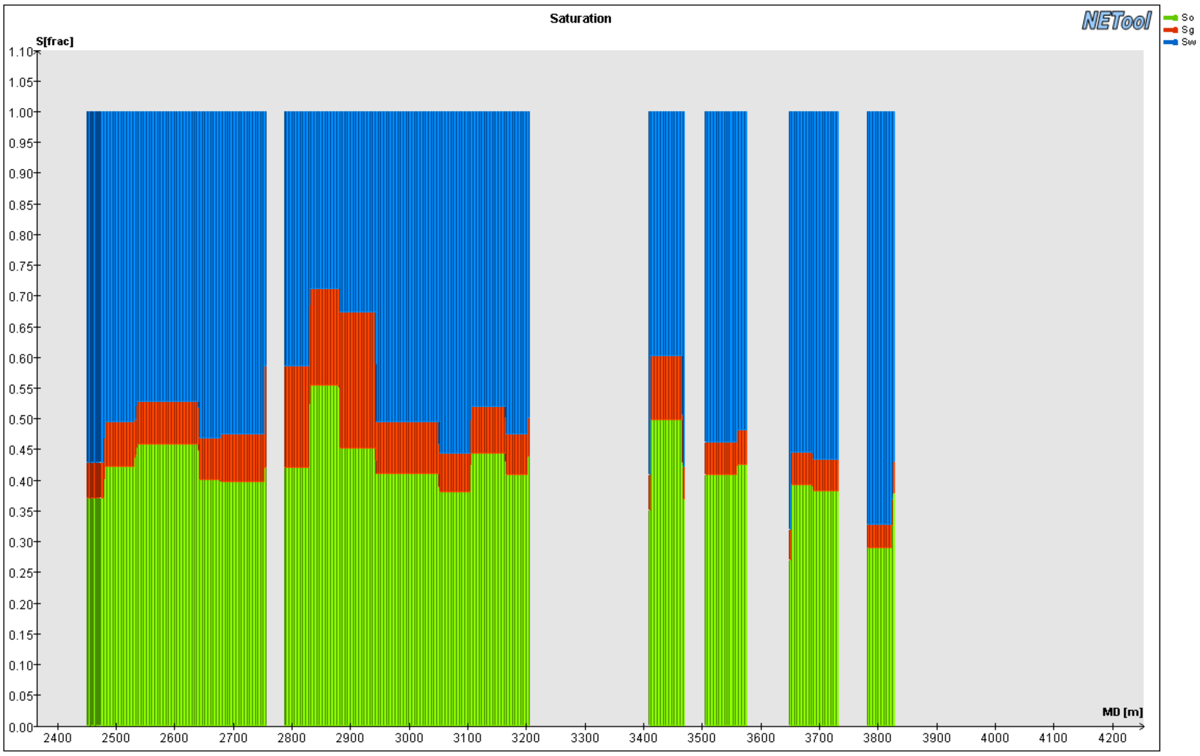
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs

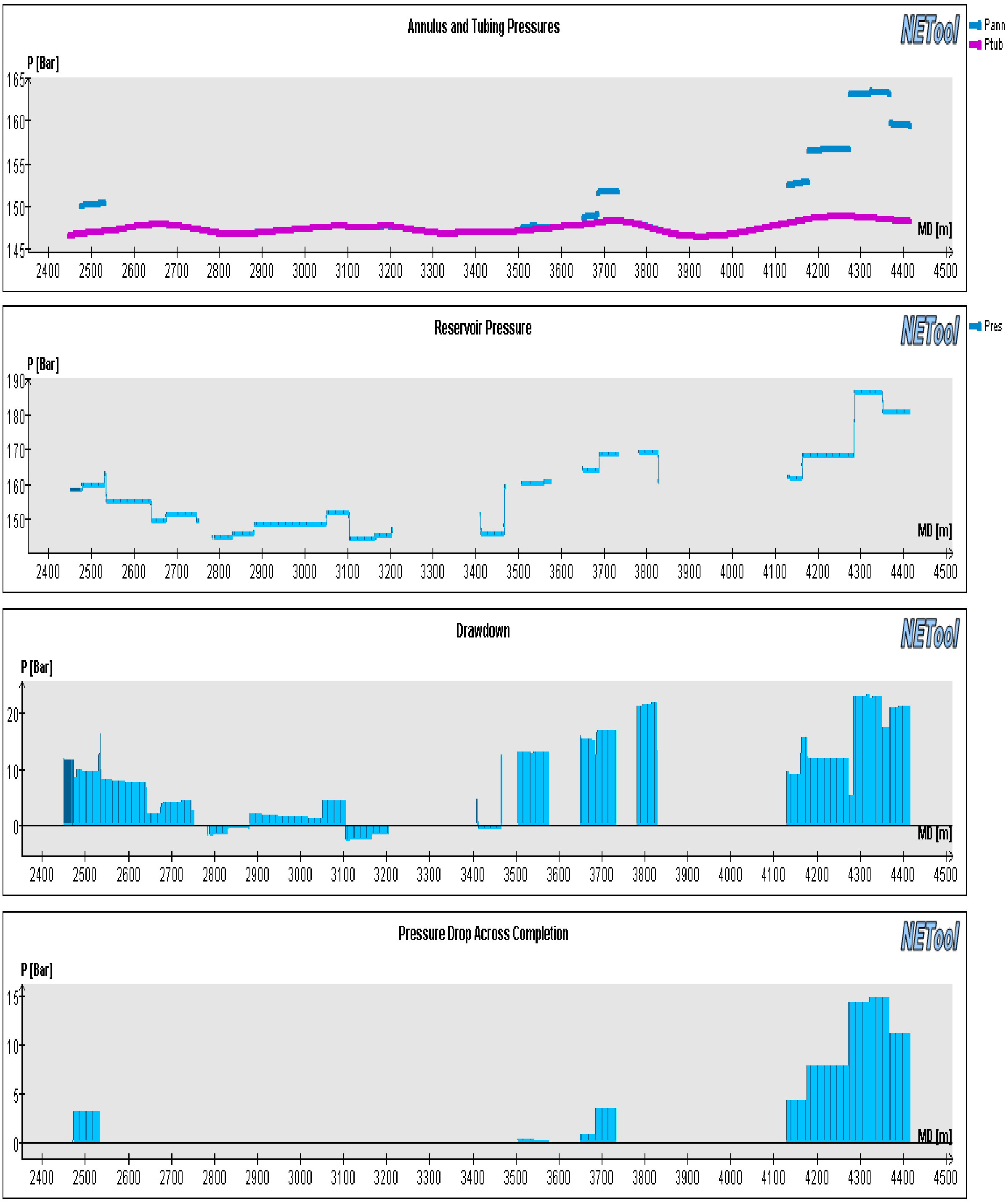


Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

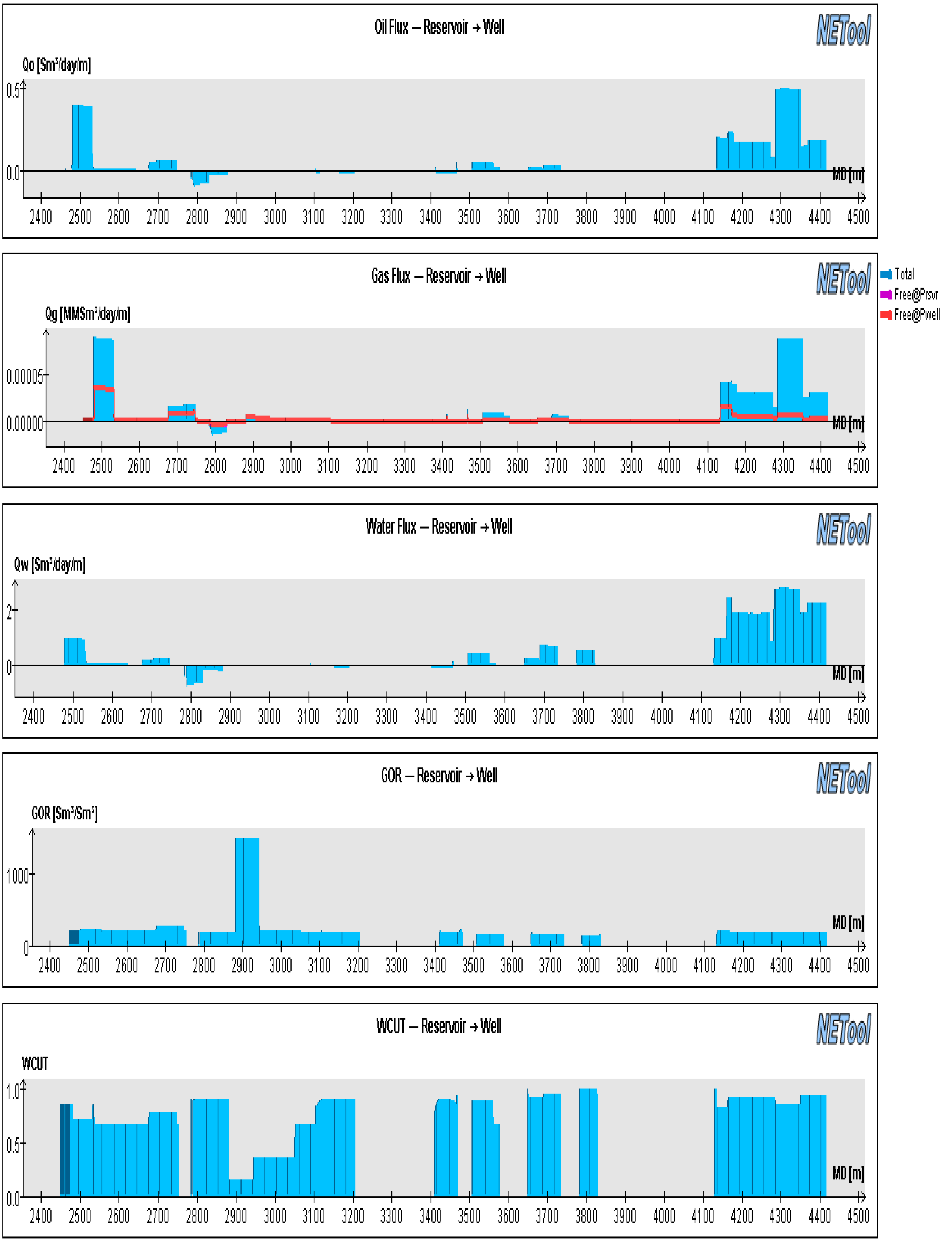
Skin factor plot for the well and given time step

A.57 Plots for well KP9, 4017 days, Tailored ICD design run with 250m longer wellbore.

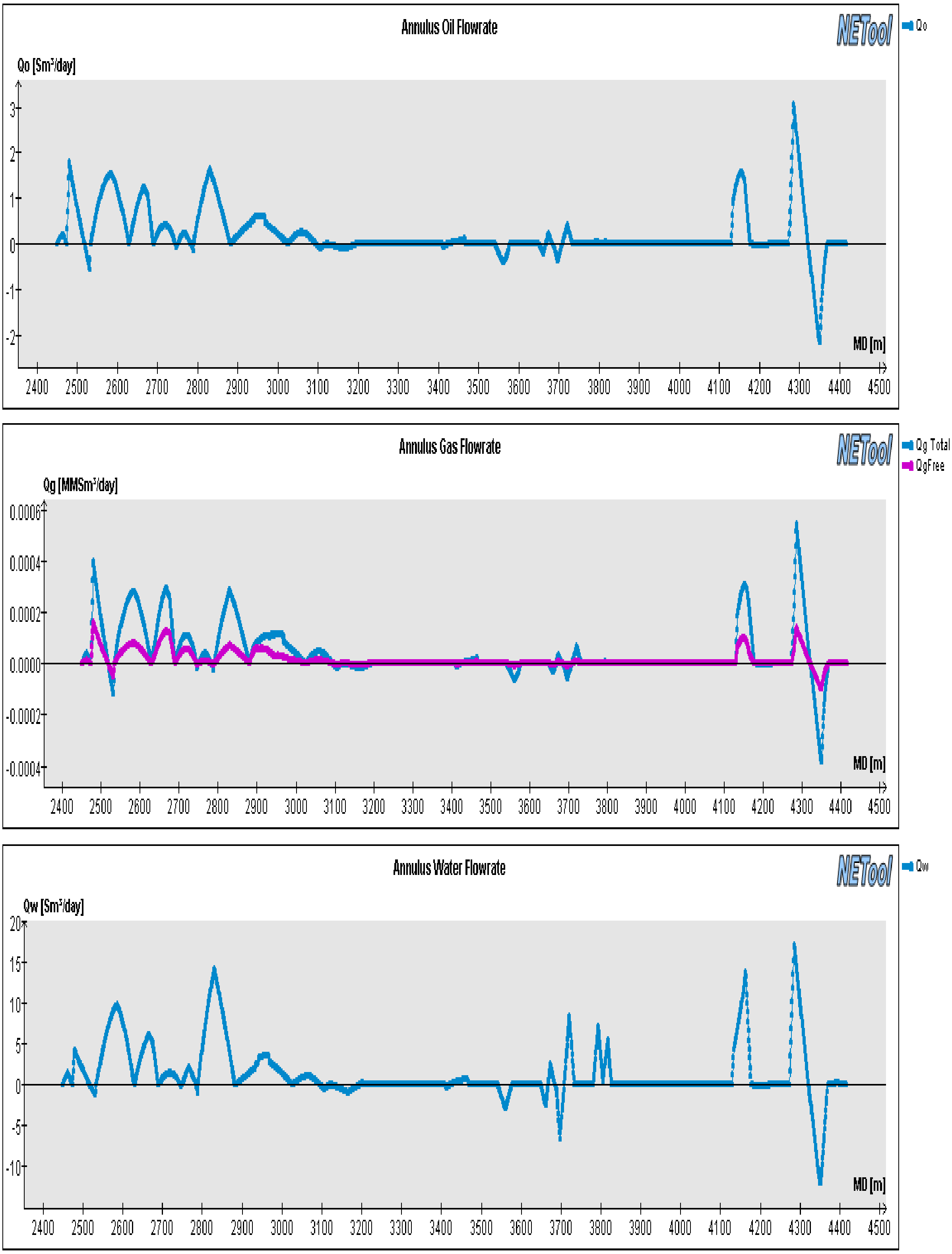
Completion overview for the case: see appendix A…



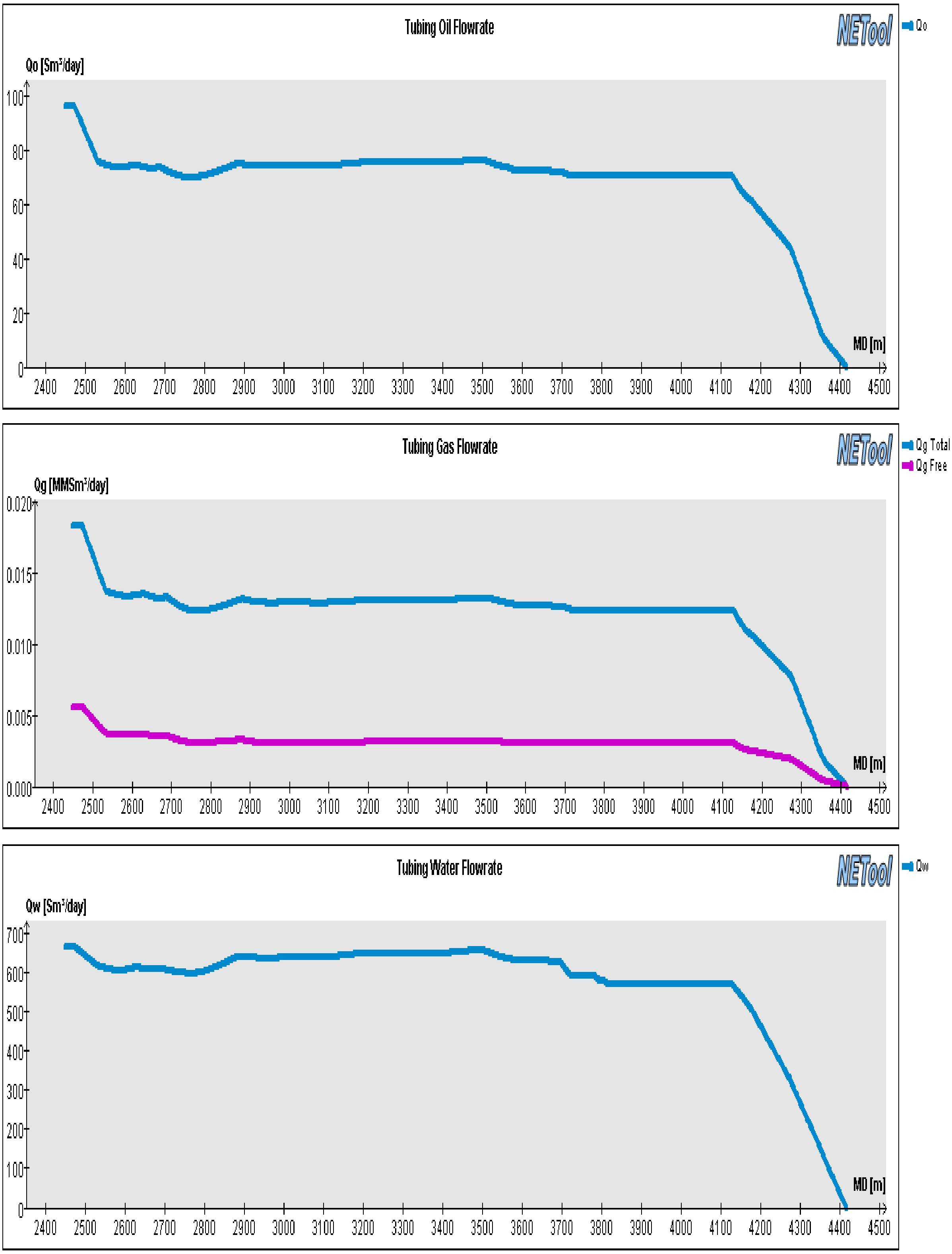
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



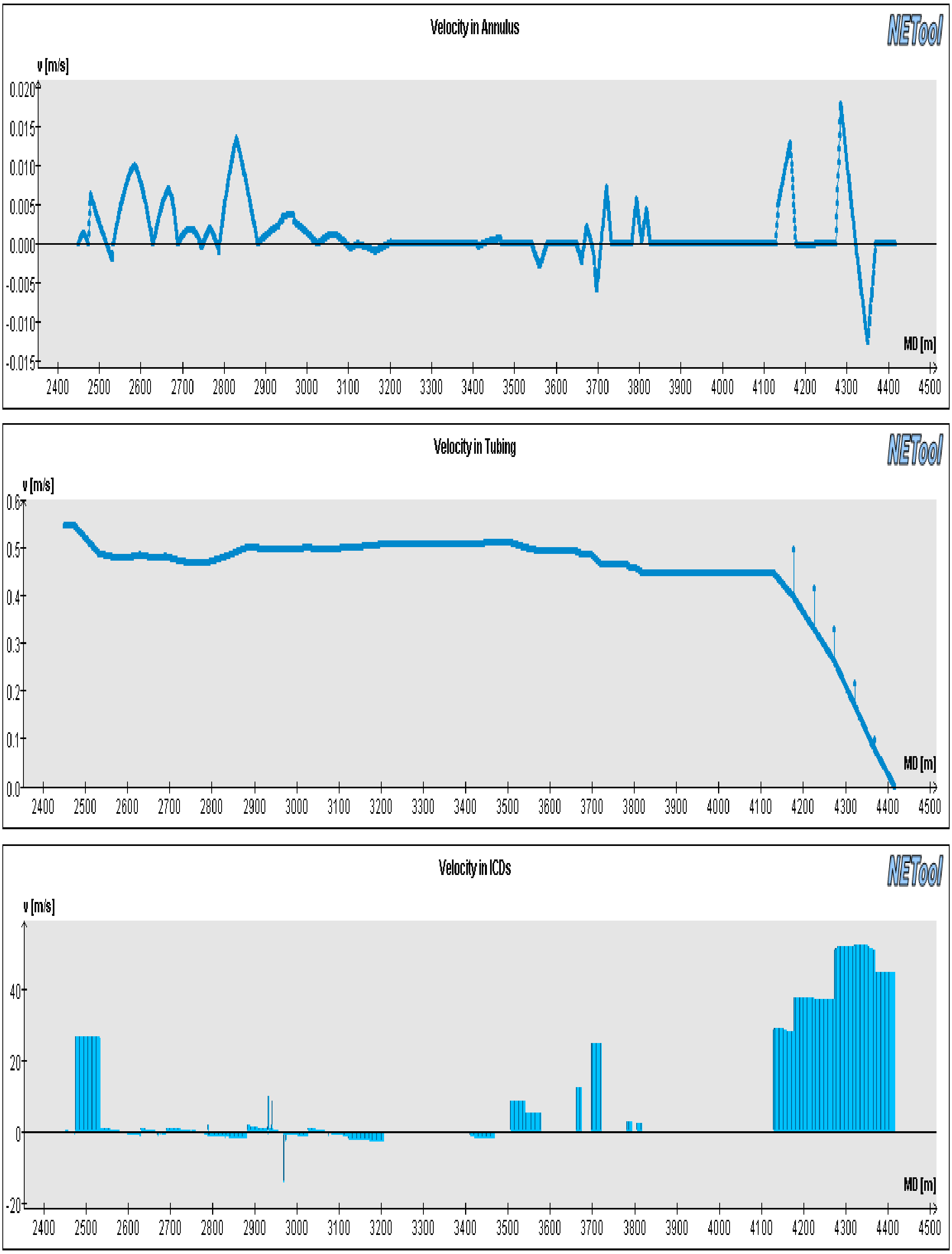
Influx of oil, gas and water from the reservoir and into the well along the wellbore



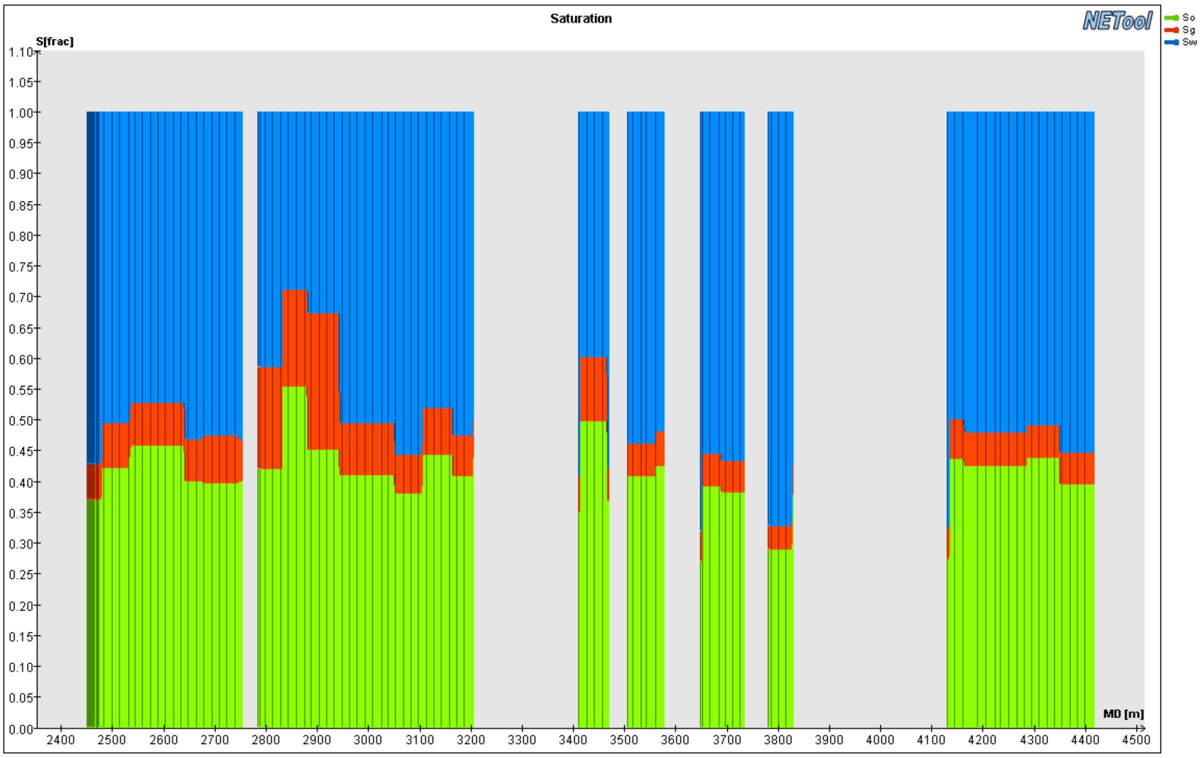
Annulus oil, gas and water flow rate along the wellbore



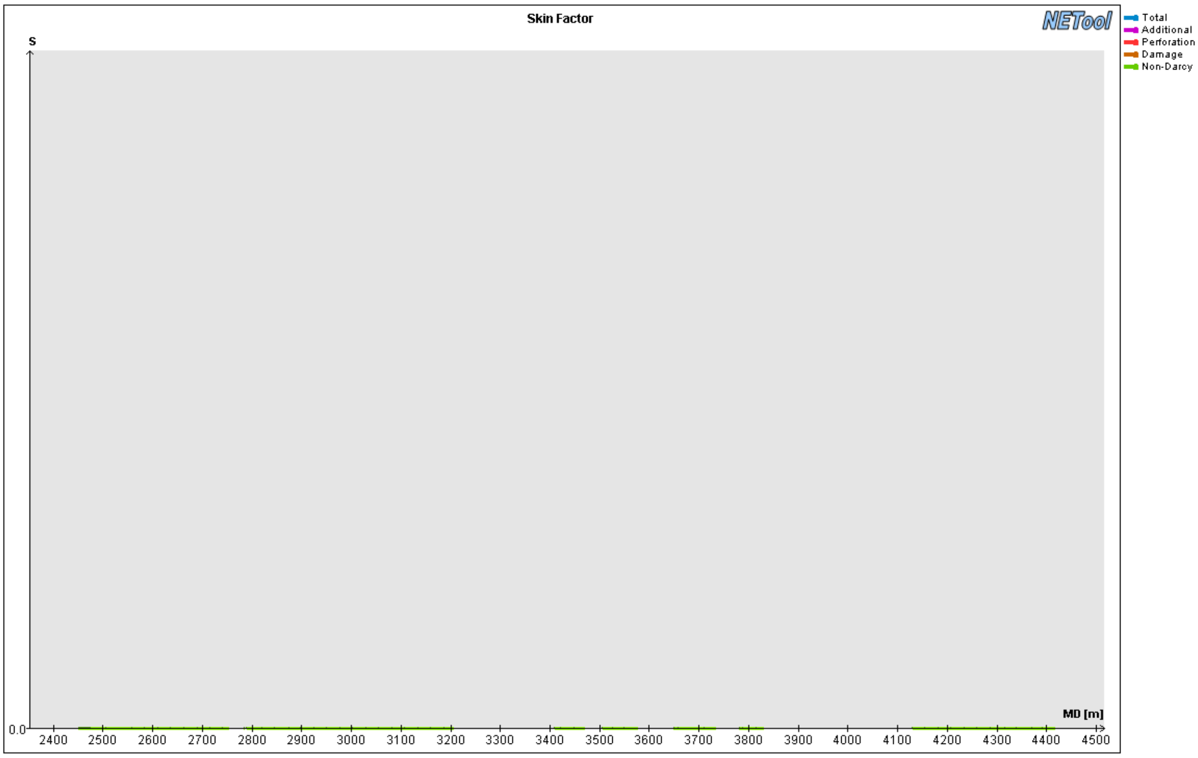
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the Annulus, tubing and through the ICDs



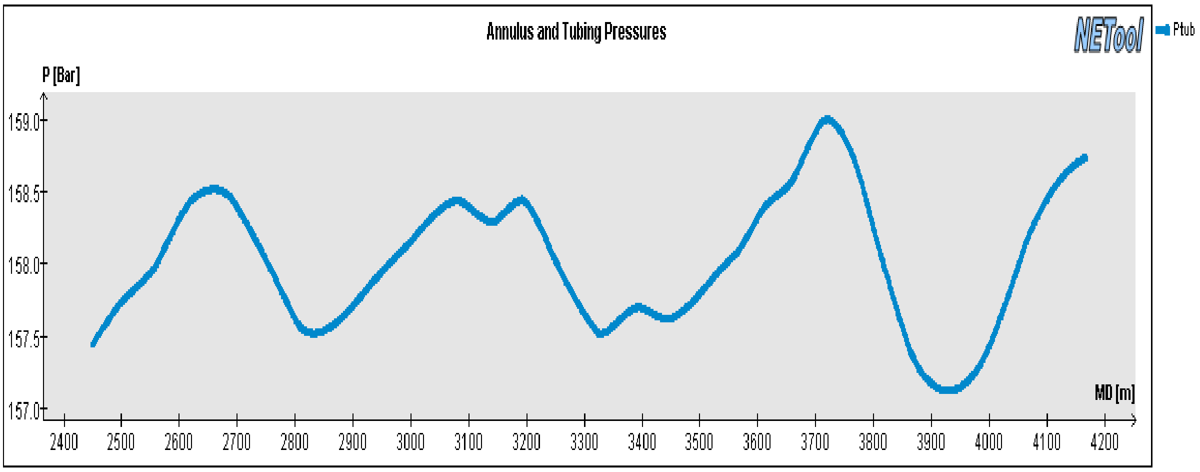
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

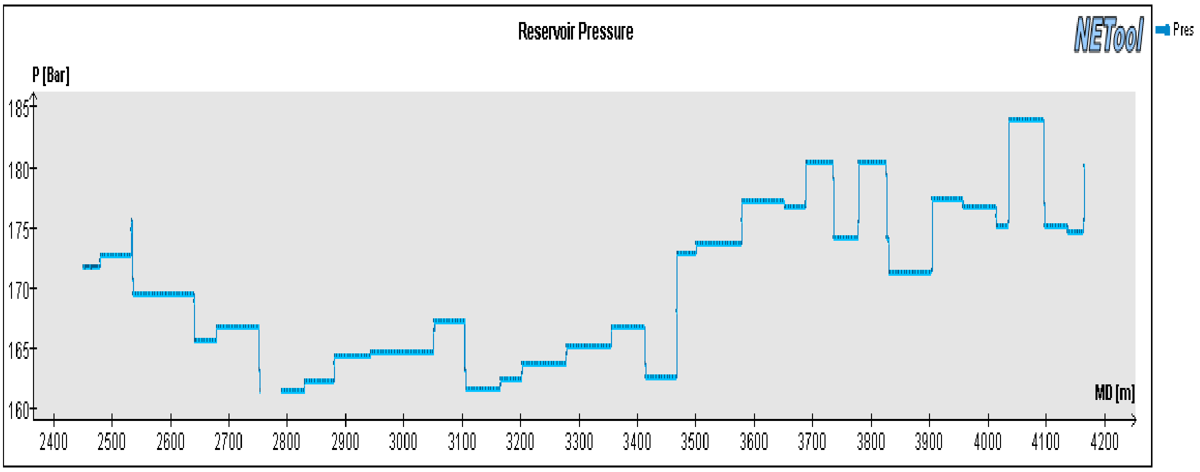


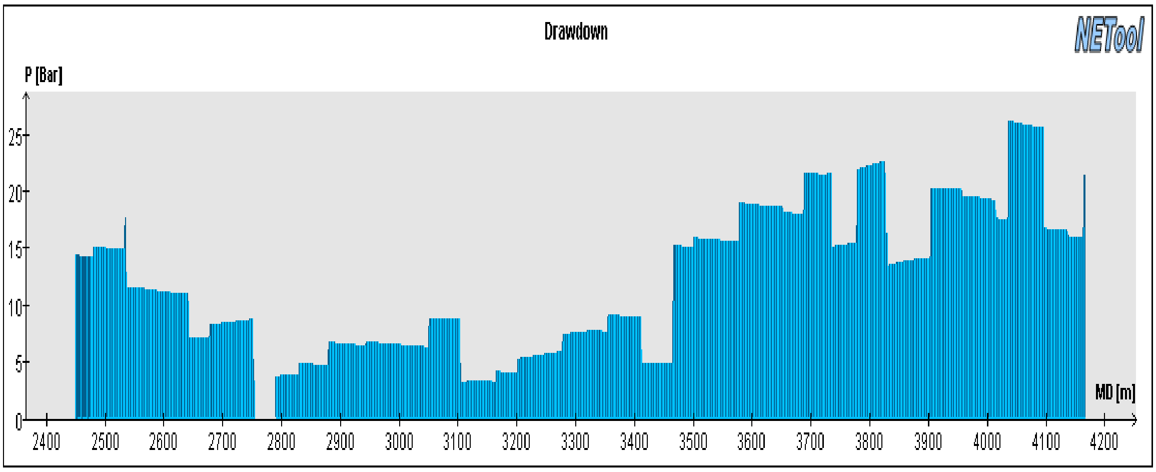
Skin factor plot for the well and given time step

A.58 Plots for well KP9, 5113 days, Reference case OH.

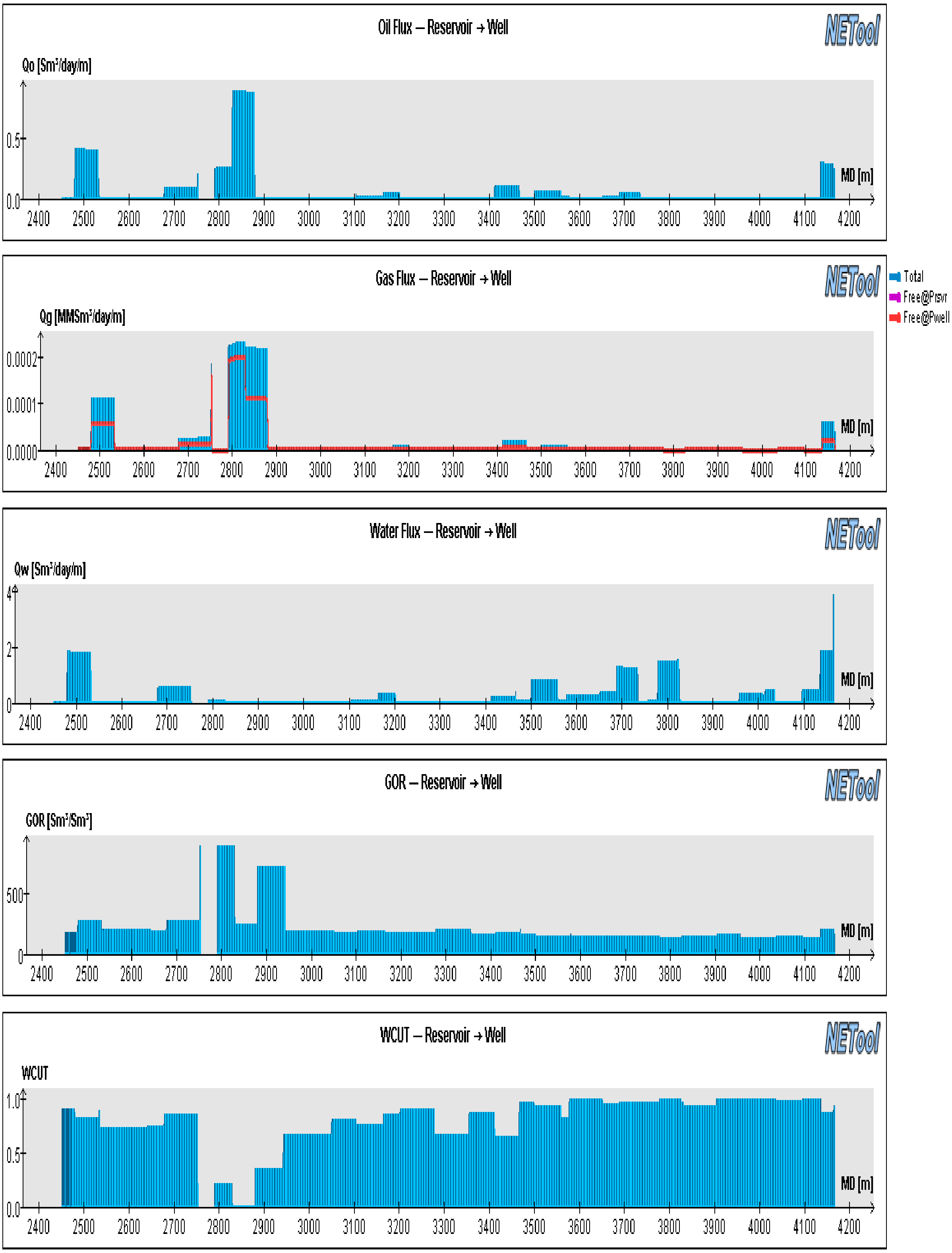
Completion overview for the case: see appendix A…



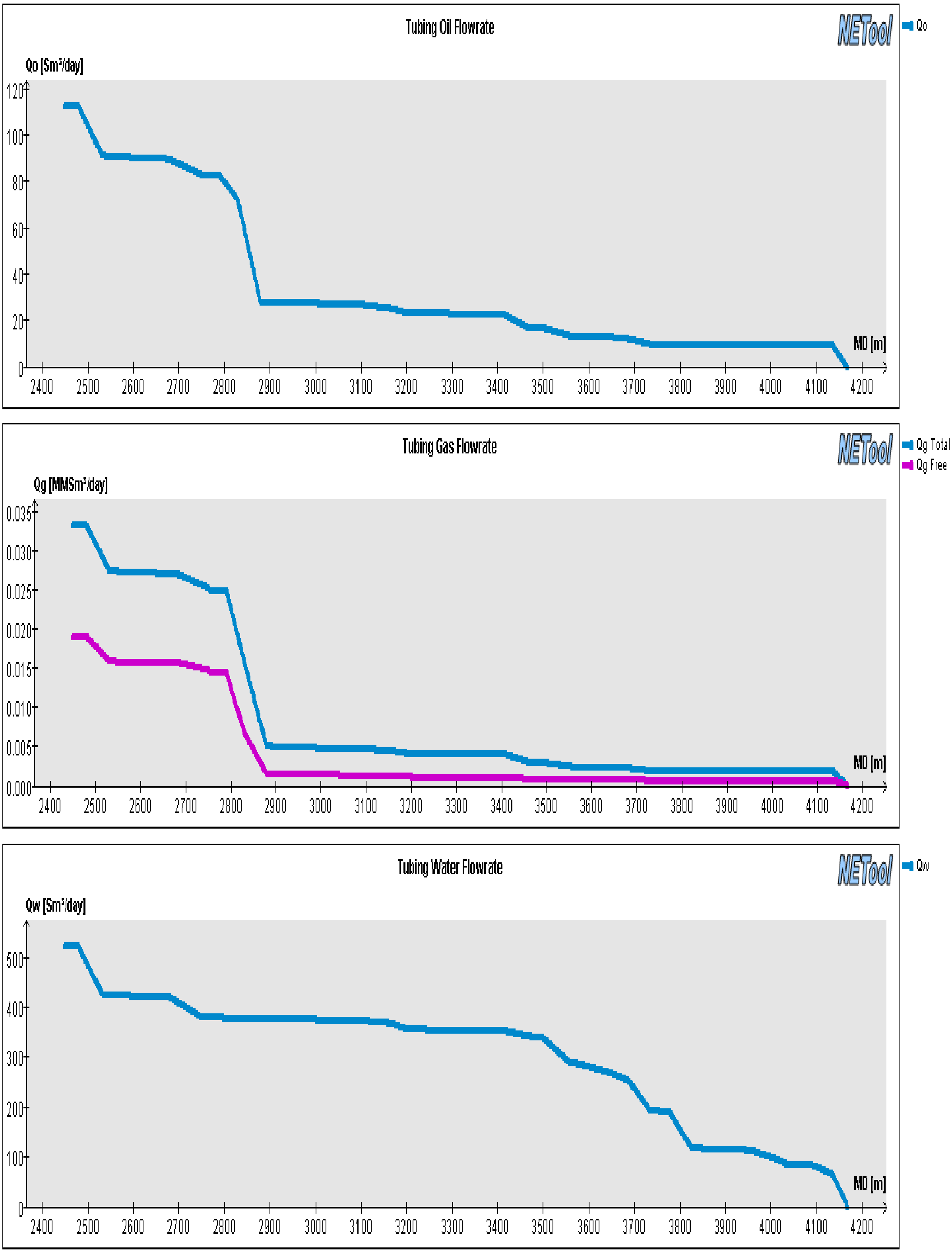




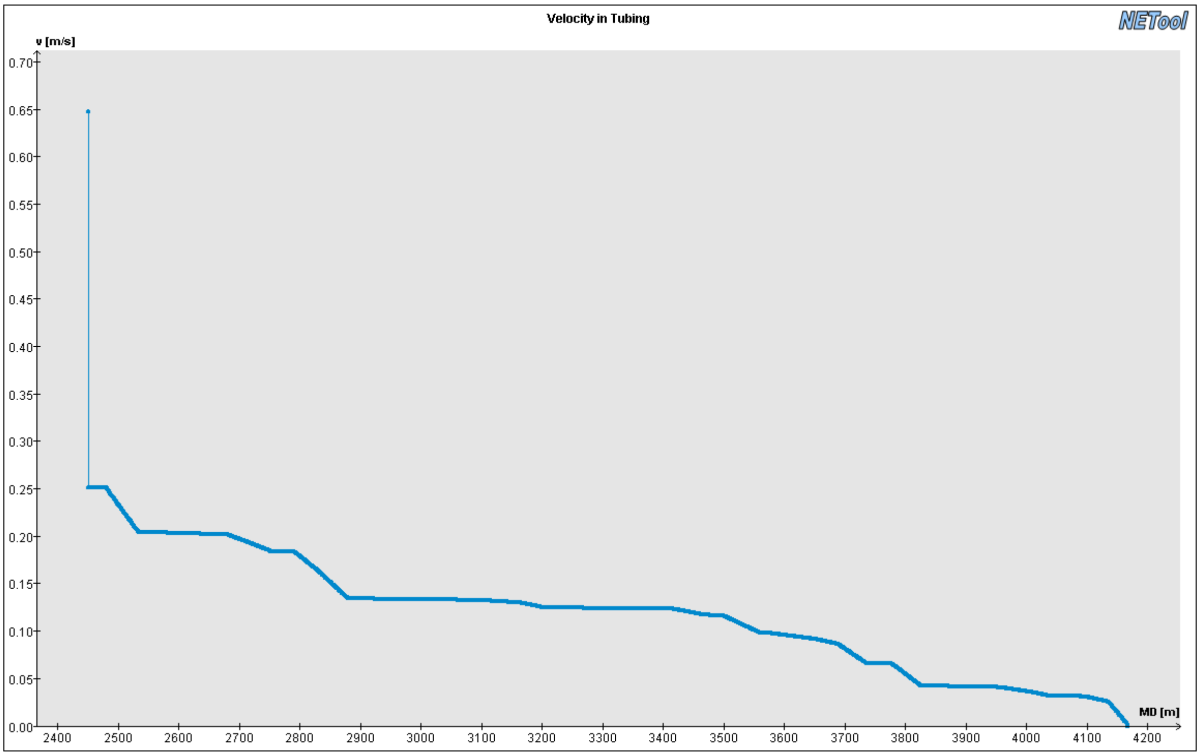
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



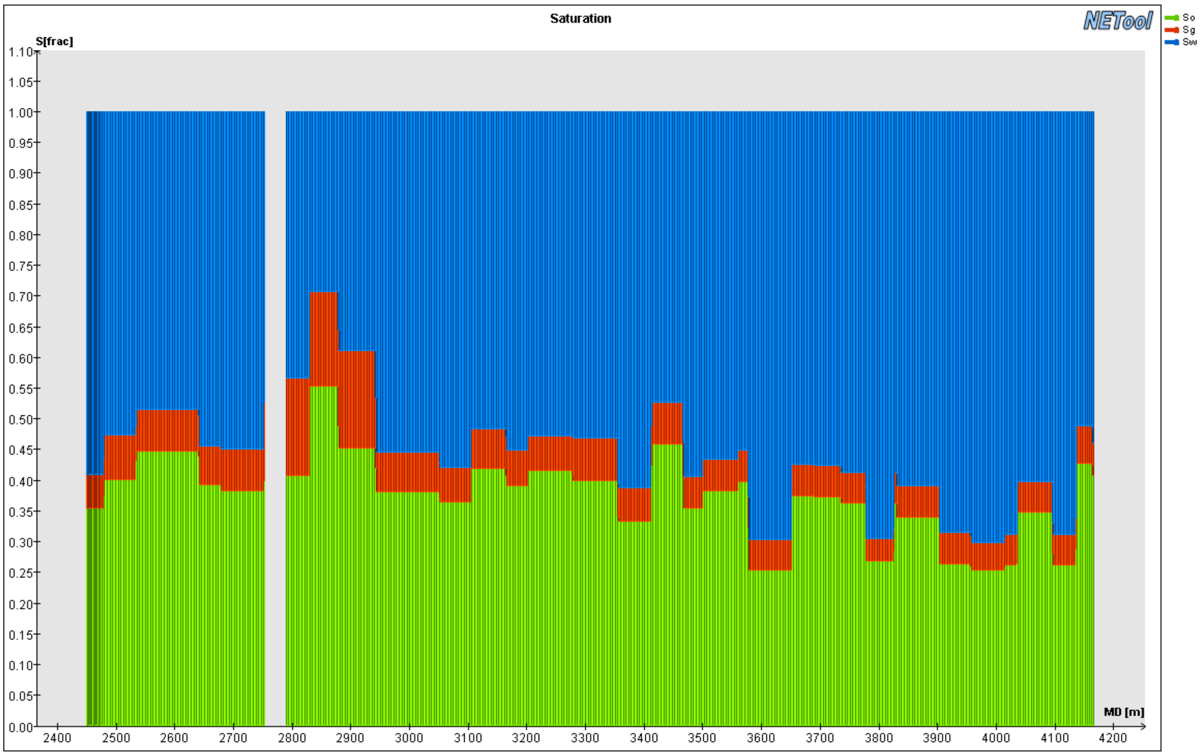
Influx of oil, gas and water from the reservoir and into the well along the wellbore



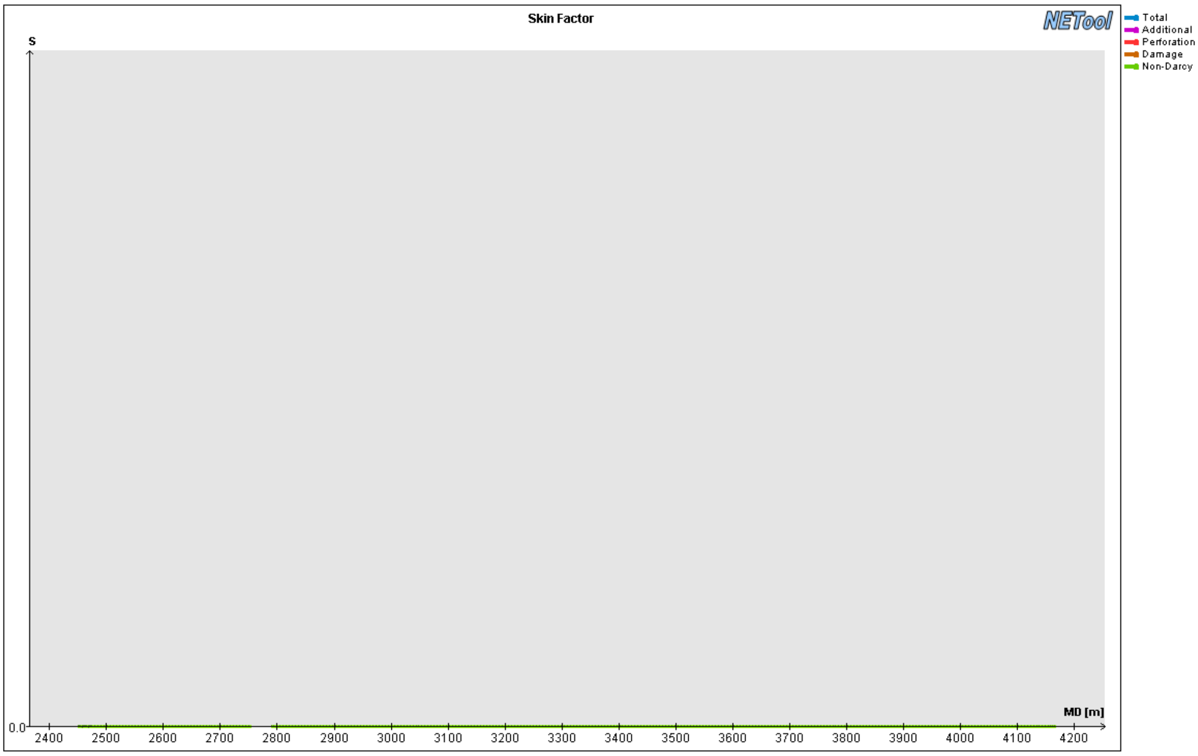
Tubing flow of oil, gas and water along the wellbore



Velocity of the flow in the tubing



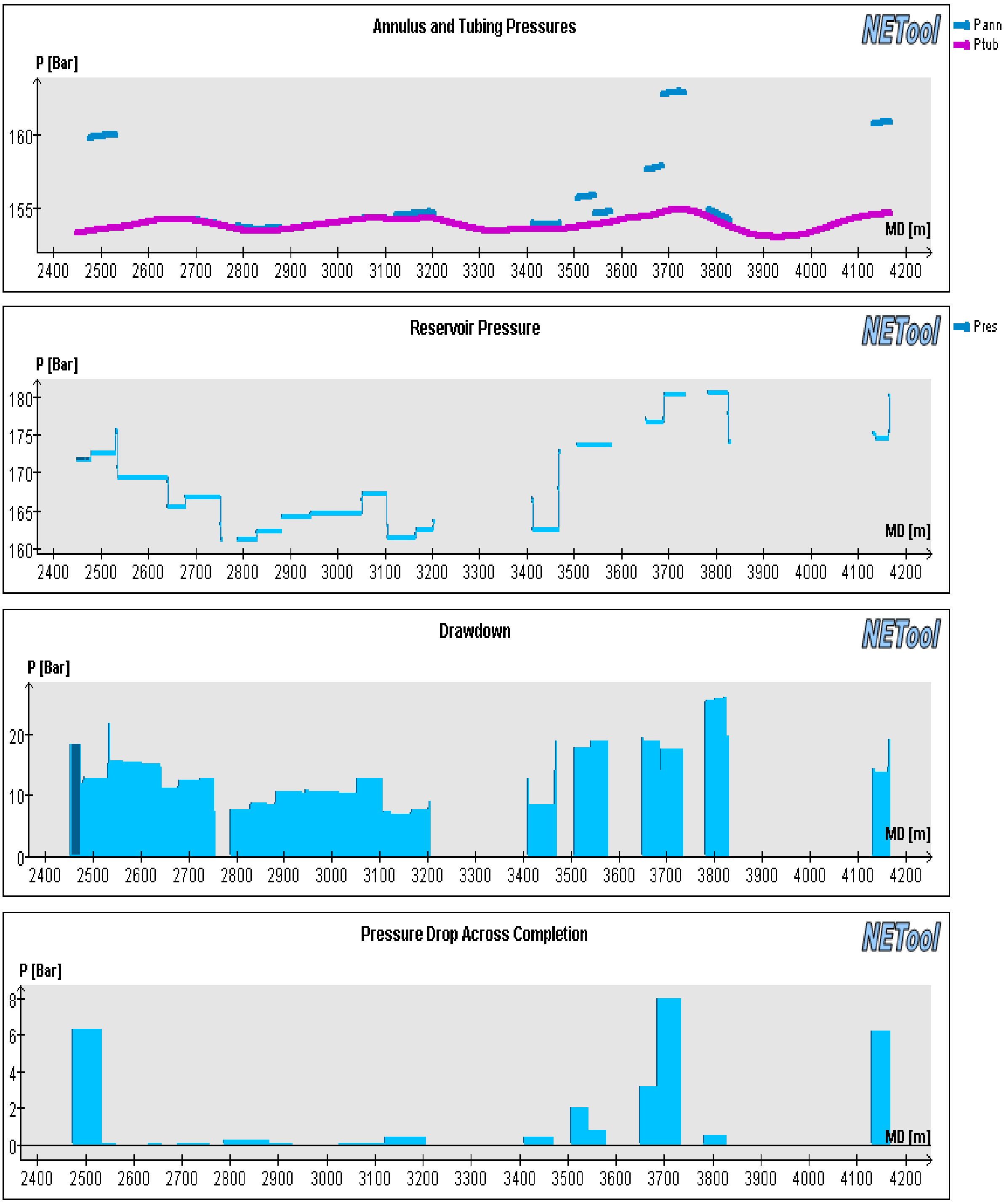
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations



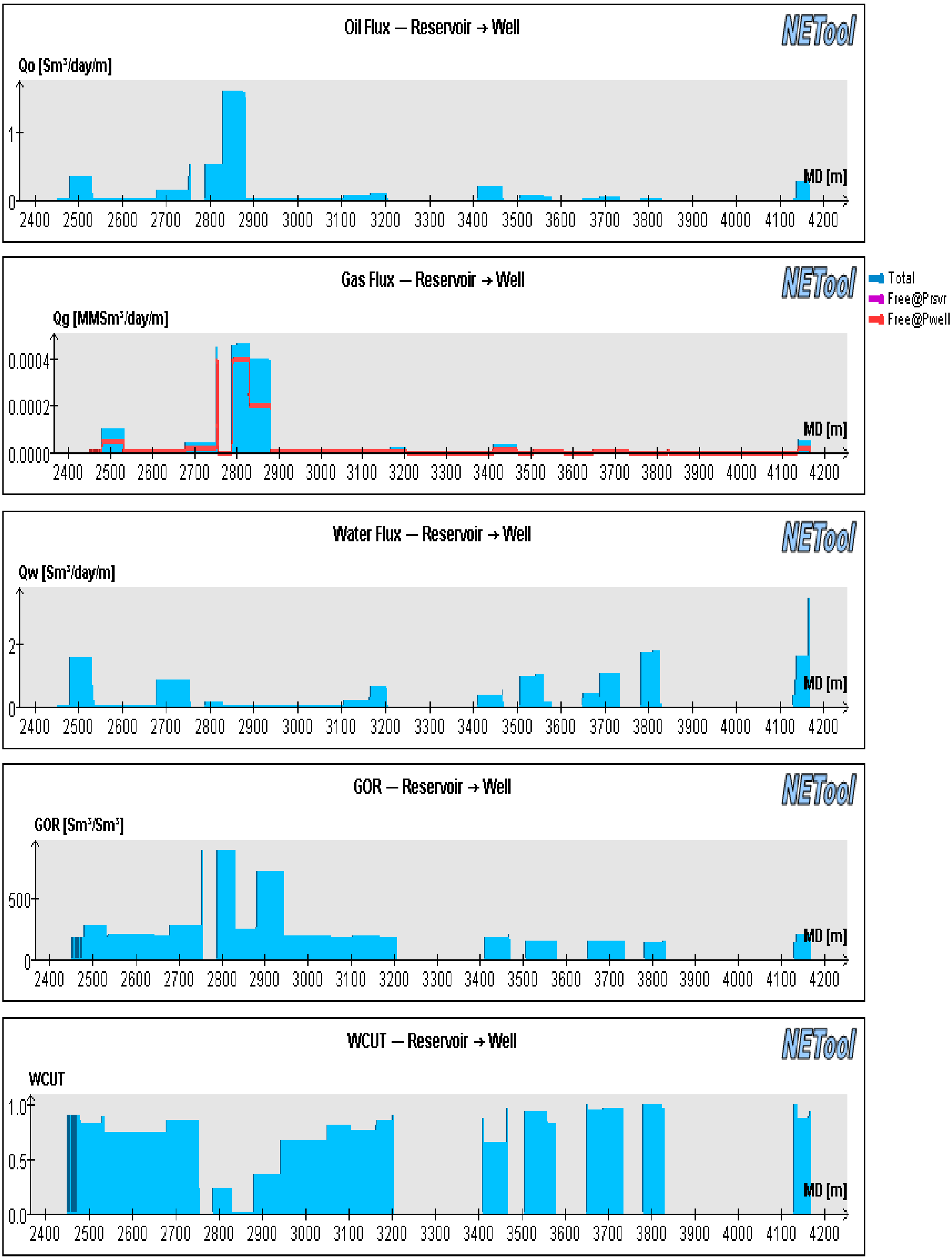
Skin factor plot for the well and given time step

A.59 Plots for well KP9, 5113 days, Tailored ICD design

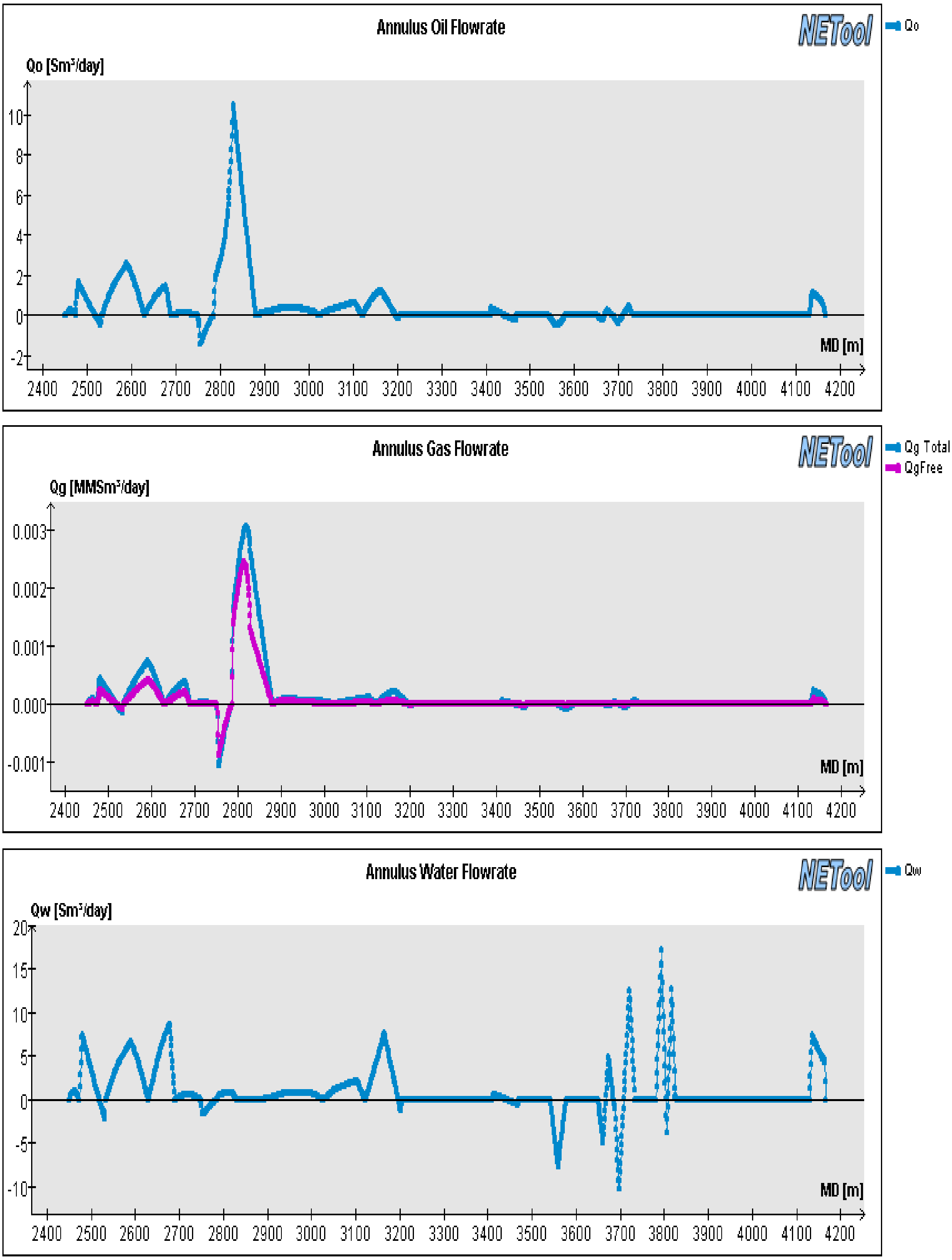
Completion overview for the case: see appendix A…



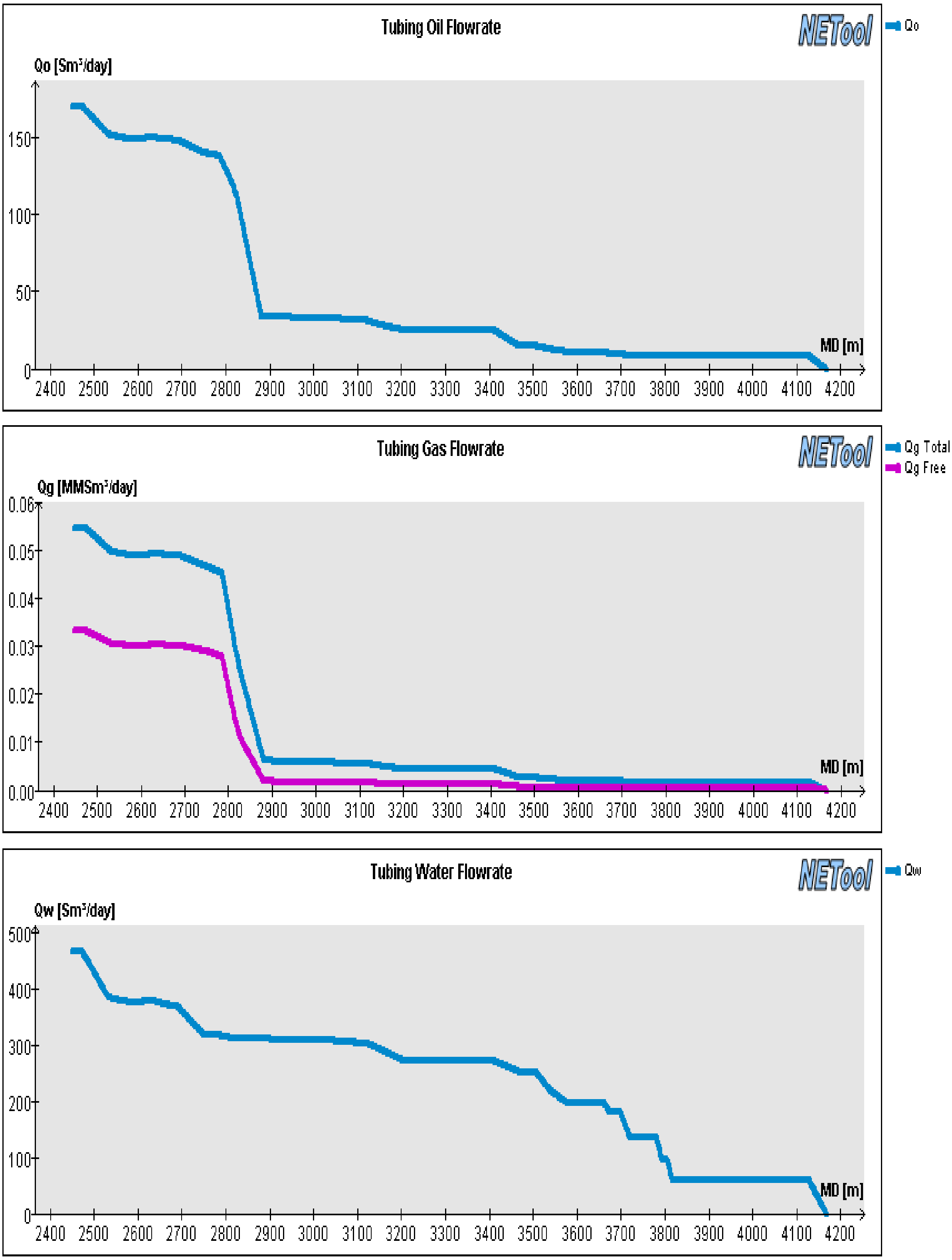
Annulus and tubing pressure, Reservoir pressure, Pressure drop across Completion and Dradown along the wellbore.



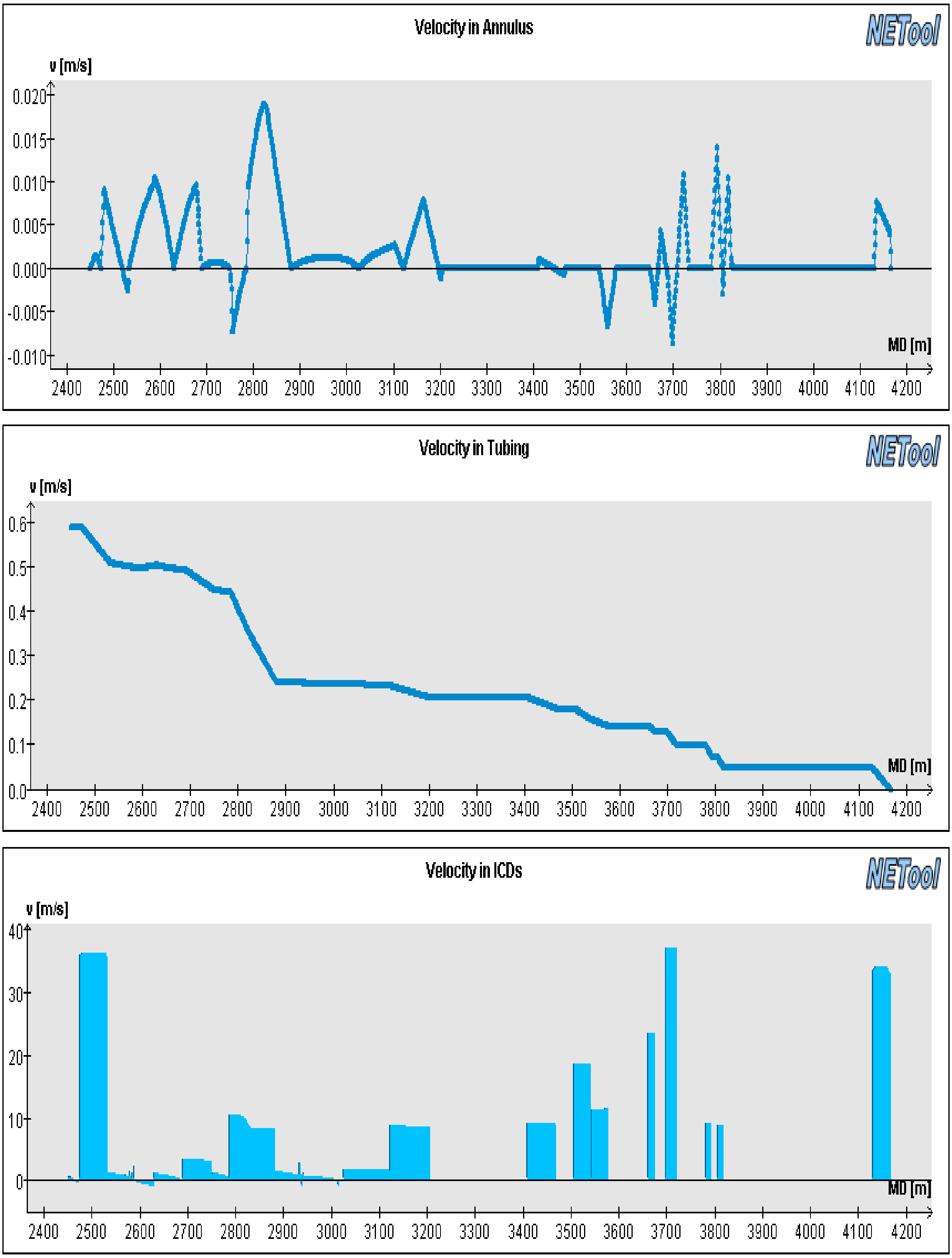
Influx of oil, gas and water from the reservoir and into the well along the wellbore



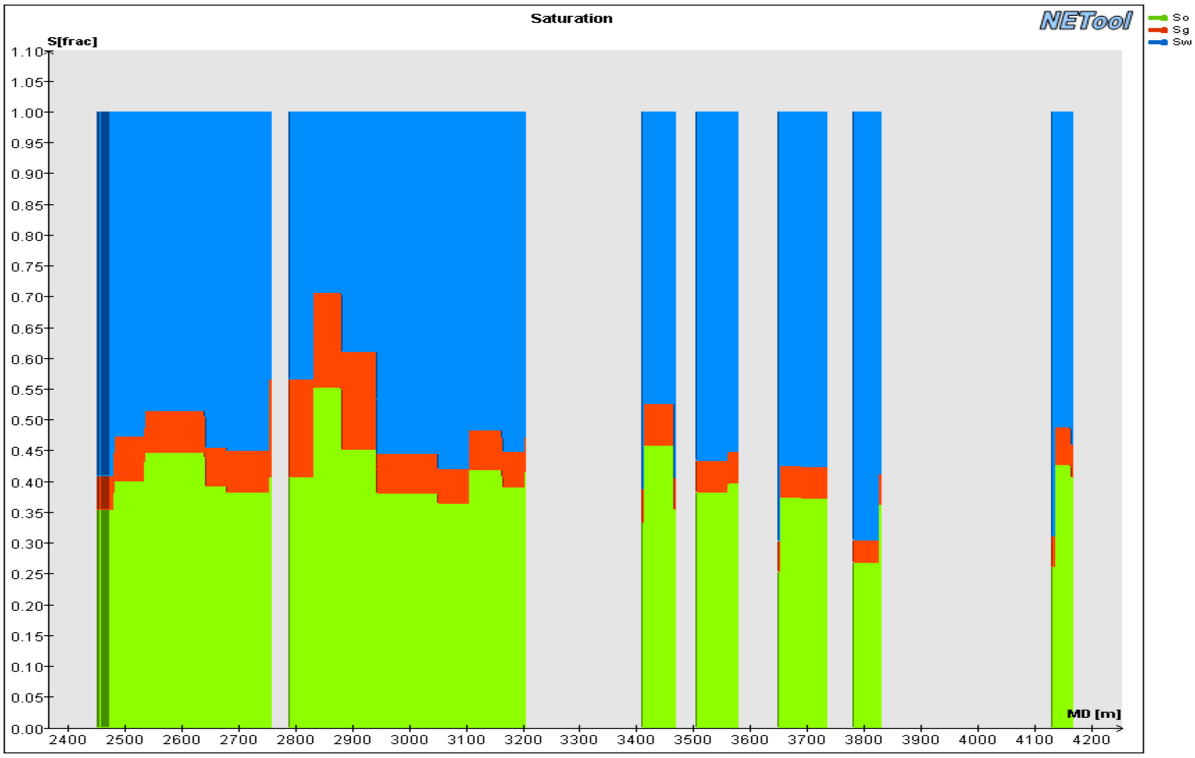
Annulus oil, gas and water flow rate along the wellbore



Tubing flow of oil, gas and water along the wellbore



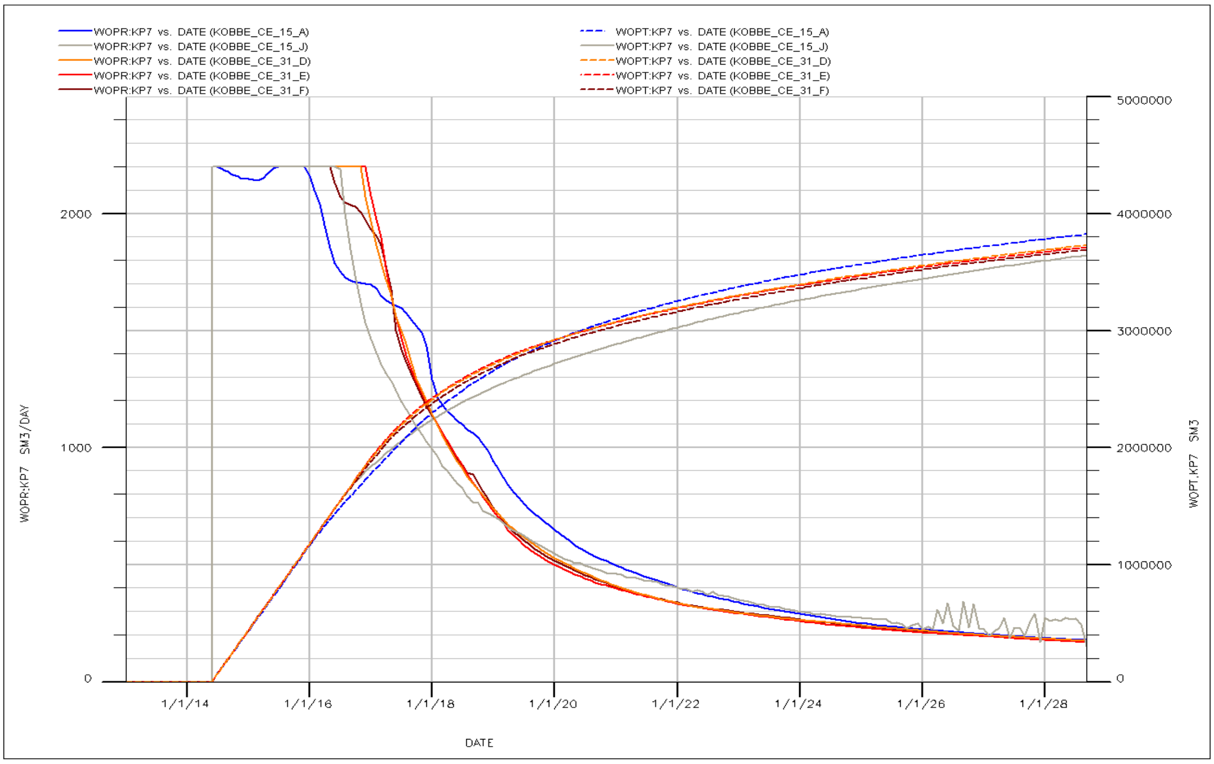
Velocity of the flow in the Annulus, tubing and through the ICDs



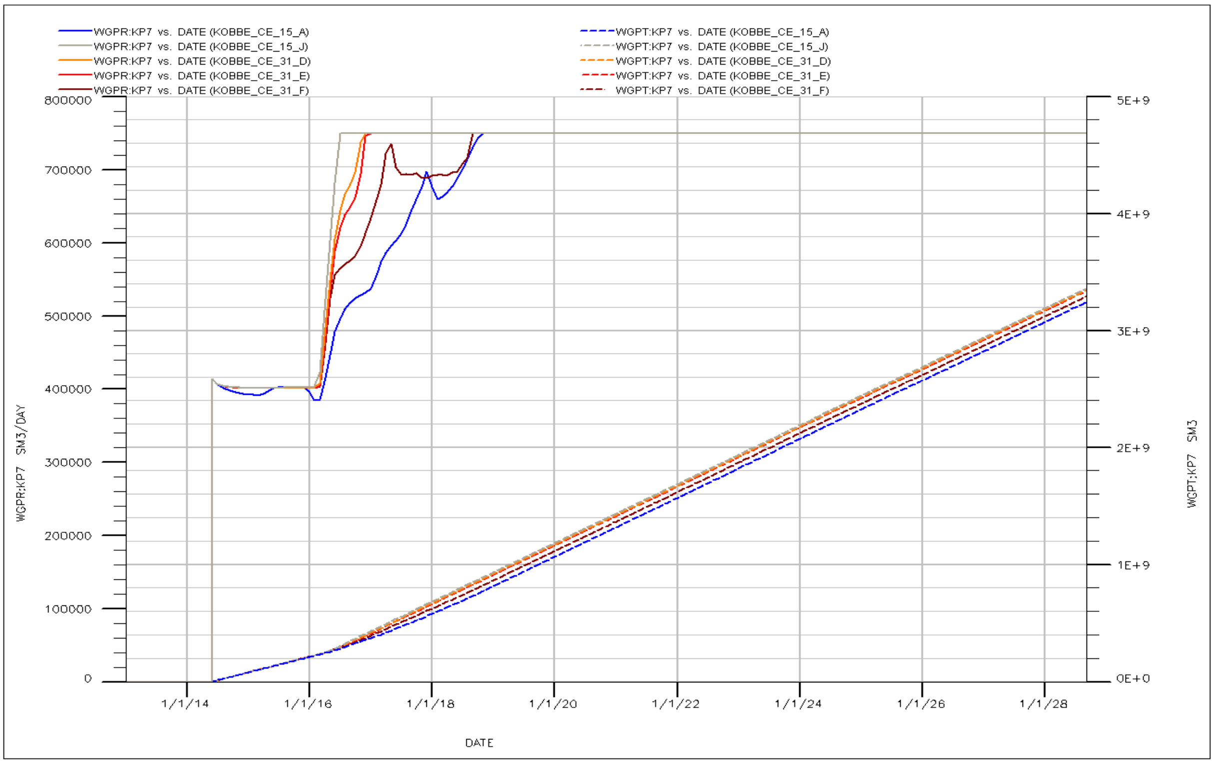
Saturation plot, showing the oil (green), gas (red) and water (blue) saturations

Skin factor plot for the well and given time step

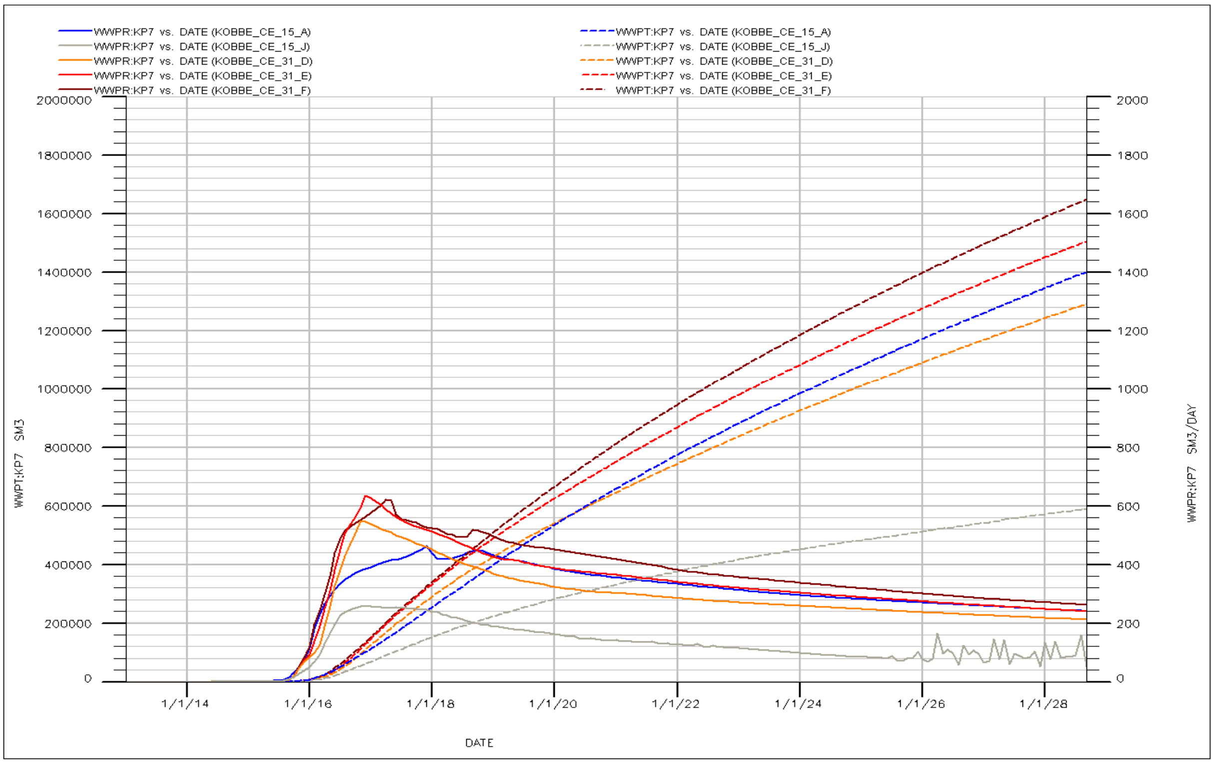
A.60 Results from Eclipse™ simulations



Plot showing daily oil production rate and cumulative oil production



Plot showing daily gas production rates and cumulative gas production



Plot showing daily water production and cumulative water production

	Oil total production			
	OpenHole	ICD 2x2,5mm	ICD 2x4mm	ICD 4x4mm
	(SM3)	(SM3)	(SM3)	(SM3)
2013	0	0	0	0
2014	437 442	437 442	437 442	437 442
2015	1 173 231	1 173 231	1 173 231	1 173 231
2016	1 833 917	1 875 508	1 909 118	1 903 594
2017	2 234 548	2 372 497	2 417 345	2 407 170
2018	2 509 849	2 683 170	2 725 079	2 712 664
2019	2 716 805	2 886 048	2 922 256	2 919 209
2020	2 882 656	3 038 461	3 070 068	3 073 982
2021	3 026 415	3 161 386	3 191 397	3 197 136
2022	3 152 309	3 266 748	3 295 060	3 301 614
2023	3 260 025	3 360 618	3 386 719	3 394 487
2024	3 354 934	3 444 406	3 468 209	3 478 868
2025	3 441 752	3 519 771	3 541 693	3 555 120
2026	3 523 136	3 588 077	3 608 954	3 624 596
2027	3 597 163	3 650 347	3 670 903	3 688 439
2028	3 666 317	3 707 633	3 728 115	3 747 826

Yearly total oil production simulated in Eclipse™

	Water total production			
	OpenHole	ICD 2x2,5mm	ICD 2x4mm	ICD 4x4mm
	(SM3)	(SM3)	(SM3)	(SM3)
2013	0	0	0	0
2014	301	313	312	312
2015	4 257	7 314	6 415	6 212
2016	68 988	151 835	146 625	125 725
2017	152 551	340 385	333 162	290 578
2018	223 295	509 861	489 668	426 433
2019	281 810	666 192	625 397	541 450
2020	331 749	811 610	750 899	645 578
2021	376 503	945 328	868 669	743 932
2022	417 114	1 068 463	978 889	836 612
2023	452 492	1 184 481	1 082 937	925 005
2024	482 798	1 294 327	1 181 972	1 010 024
2025	512 030	1 397 792	1 275 949	1 091 028
2026	541 598	1 495 373	1 365 170	1 168 462
2027	571 872	1 588 095	1 450 038	1 242 668
2028	599 696	1 676 795	1 531 464	1 314 746

Yearly total water production simulated in Eclipse™

	Gas total production			
	OpenHole	ICD 2x2,5mm	ICD 2x4mm	ICD 4x4mm
	(SM3)	(SM3)	(SM3)	(SM3)
2013	0	0	0	0
2014	80 176 112	80 127 768	80 150 000	80 156 168
2015	214 327 870	214 187 460	214 240 480	214 277 570
2016	431 051 520	393 024 960	411 045 860	417 009 340
2017	681 888 640	623 966 020	661 883 010	667 846 460
2018	932 725 760	864 425 470	912 720 130	918 683 580
2019	1 183 562 900	1 115 262 600	1 163 557 200	1 169 520 800
2020	1 435 087 200	1 366 786 900	1 415 081 600	1 421 045 100
2021	1 685 924 400	1 617 624 100	1 665 918 700	1 671 882 200
2022	1 936 761 500	1 868 461 200	1 916 755 800	1 922 719 400
2023	2 187 598 600	2 119 298 300	2 167 593 000	2 173 556 500
2024	2 439 122 900	2 370 822 700	2 419 117 300	2 425 080 800
2025	2 689 960 200	2 621 659 900	2 669 954 600	2 675 918 100
2026	2 940 797 200	2 872 496 900	2 920 791 600	2 926 755 100
2027	3 191 634 400	3 123 334 100	3 171 628 800	3 177 592 300
2028	3 443 158 800	3 374 858 500	3 423 153 200	3 429 116 700

Yearly total gas production simulated in Eclipse™

	WCUT			
	Open hole	ICD 2x2,5mm	ICD 2x4mm	ICD 4x4mm
	%	%	%	%
2013	0	0,00 %	0,00 %	0,00 %
2014	0,07 %	0,07 %	0,07 %	0,07 %
2015	0,36 %	0,62 %	0,54 %	0,53 %
2016	3,63 %	7,49 %	7,13 %	6,20 %
2017	6,39 %	12,55 %	12,11 %	10,77 %
2018	8,17 %	15,97 %	15,23 %	13,58 %
2019	9,40 %	18,75 %	17,63 %	15,65 %
2020	10,32 %	21,08 %	19,65 %	17,36 %
2021	11,06 %	23,02 %	21,40 %	18,88 %
2022	11,69 %	24,65 %	22,90 %	20,22 %
2023	12,19 %	26,06 %	24,23 %	21,41 %
2024	12,58 %	27,31 %	25,42 %	22,50 %
2025	12,95 %	28,42 %	26,48 %	23,48 %
2026	13,32 %	29,42 %	27,45 %	24,38 %
2027	13,72 %	30,32 %	28,32 %	25,20 %
2028	14,06 %	31,14 %	29,12 %	25,97 %

Development of water cut, calculated based on Eclipse™ simualation data.